What Is the Best Dementia Screening Instrument for General Practitioners to Use?

Henry Brodaty, M.B.B.S., M.D., F.R.A.C.P., F.R.A.N.Z.C.P.,
Lee-Fay Low, B.Sc.(Psych.)Hons.,
Louisa Gibson, B.Sc.(Arch.), Grad. Dip. Psych., B.Sc.(Psych.)Hons.,
Kim Burns, R.N., B.Psych.(Hons.)

Objective: *The objective of this study was to review existing dementia screening tools with a view to informing and recommending suitable instruments to general practitioners (GPs) based on their performance and practicability for general practice.* **Method:** *A systematic search of pre-MEDLINE, MEDLINE, PsycINFO, and the Cochrane Library Database was undertaken. Only available full-text articles about dementia screening instruments written in English or with an English version were included. Articles using a translation of an English language instrument were excluded unless validated in a general practice, community, or population sample.* **Results:** *The General Practitioner Assessment of Cognition (GPCOG), Mini-Cog, and Memory Impairment Screen (MIS) were chosen as most suitable for routine dementia screening in general practice. The GPCOG, Mini-Cog, and MIS were all validated in community, population, or general practice samples, are easy to administer, and have administration times of 5 minutes or less. They also have negative predictive validity and misclassification rates, which do not differ significantly from those of the Mini-Mental Status Examination.* **Conclusions:** *It is recommended that GPs consider using the GPCOG, Mini-Cog, or MIS when screening for cognitive impairment or for case detection.* (Am J Geriatr Psychiatry 2006; 14:391–400)

Key Words: Diagnosis, dementia, screening, Alzheimer disease, primary care

The detection and early diagnosis of dementia are becoming increasingly important as our population ages. Delays to diagnosis of 8–32 months from symptom onset and caregivers' dissatisfaction with their general practitioner's (GP's) knowledge and ability to diagnose dementia in its initial stages,[1,2] indicate a need for earlier diagnosis.

Early diagnosis may enable patients to plan for the future while still competent, initiate enduring power of attorney and guardianship, address safety concerns such as driving ability, and enable caregivers to seek education sooner.[3,4] Available pharmaceutical treatments may slow dementia progress[5] and reduce costs through delayed nursing home placement.[4]

Received December 8, 2005; revised December 22, 2005; accepted February 6, 2006. From the Academic Department for Old Age Psychiatry, Euroa Centre, Prince of Wales Hospital, Randwick, Australia (HB, LG); the School of Psychiatry, University of New South Wales, Sydney, Australia (HB, KB); and Centre for Mental Health Research Building 63, The National University, Canberra, Australia (L-FL). Send correspondence and reprint requests to Dr. Henry Brodaty, Academic Department for Old Age Psychiatry, Euroa Centre, Prince of Wales Hospital, Barker St., Randwick NSW 2031, Australia. e-mail: h.brodaty@unsw.edu.au

Open-label extension trials suggest that cholinesterase inhibitors are not as effective in stemming cognitive decline if commencement is delayed.[5]

General practitioners may be best placed to detect and treat dementia in its early stages. Wilkinson et al.[2] found that 79% of people thought GPs were easily accessible, with 74% consulting a GP first after noticing symptoms of cognitive decline. Despite the advantages of early diagnosis, GPs fail to identify up to 91% of dementia cases depending on their severity.[6] Some reject routine screening[7]; however, a growing consensus recommends routinely screening patients for cognitive impairment when they are over a certain age (e.g., 75 years) or when cognitive decline is suspected.[8–12]

At present, only 39% of Australian GPs[9] and 26% of Canadian GPs[13] regularly screen for dementia. General practitioners report limited time and lack of a cure and suitable screening tools as explanations for their failure to diagnose and screen for dementia,[9] and many GPs do not attempt to screen patients even when cognitive impairment is suspected.[3]

The Mini-Mental Status Examination (MMSE[14]), the most commonly used instrument,[13] shows education and language/cultural bias[15] and is described by GPs as impractical[3] because it takes 10 minutes to administer.[16] General practitioners have identified the need for a shorter instrument,[9] and a Canadian survey found that 93% would use a brief and simple screening instrument.[13] With average Western GP consultation times ranging from 8–11 minutes,[17] simple and effective instruments with administration times of five minutes or less seem most suitable for GPs.[18]

Although the needs of GPs have been identified, reviews of dementia screening instruments have largely focused on individual scales such as the MMSE,[19] the Clock Drawing Test (CDT[20]), and The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE[21]). An exception is a review by Lorentz et al.,[18] which divided instruments according to cognitive tests subdivided by administration time, informant or proxy-rated screening instruments, and remote (telephone and mail) dementia screening instruments. Our article also aimed to 1) review existing dementia screening tools with a view to informing and recommending instruments to GPs; and 2) consider specifically test performance, time taken, ease of administration, and practicability for general practice. In addition, we wanted to consider psychometric properties in studies of populations of patients akin to those in primary care, i.e., distinct from studies of distinct cognitively impaired and normal samples, which maximize test performance characteristics.

METHOD

The review was conducted in three stages. First, a literature search was undertaken to identify available screening instruments and validation studies. Second, instrument and study parameters were obtained for each instrument identified in the literature search. Third, suitable instruments were chosen for recommendation to GPs based on a set of selection criteria.

Systematic Literature Search

A systematic search of pre-MEDLINE and MEDLINE (between 1966 and January 2004), PsycINFO (between 1974 and January 2004), and the Cochrane Library Database was undertaken for English language articles reporting development, validation, or psychometric properties of dementia screening instruments. The key words "dementia" or "cognitive impairment" combined with "screening" or "diagnosis" and the MESH terms "Alzheimer disease/diagnosis" or "dementia/diagnosis" combined with "mass screening" and "neuropsychological tests/statistics and numerical data" were used, yielding 11,229 titles. The titles of individual scales were also entered individually as key words, and reference lists of included articles were hand searched. A validation study from May 2004 was later included. Only papers available in full text and instruments written in English or with an English version available were included. Articles using a translation of an English language scale were excluded unless validated in a general practice, community, or population sample.

Instrument and Study Parameters

One empiric paper was chosen to represent each instrument identified in the literature search. Articles that validated an instrument in a general practice,

community, or population sample were preferentially chosen. If no such article was available (or there were several), the paper that contained the most information about the instrument (in terms of the screening parameters listed in Tables 1 and 2) was chosen. If information about the properties of the instrument (education bias, language/cultural bias, test–retest reliability, internal consistency, or administration time) was not stated in the article, they were referenced from another source when possible. In particular, when test administration time was not stated, it was obtained from Burns et al.,[16] with the exception of the BLT/Ash and Short IQCODE in which it was not reported in either source.

Quality and applicability information about each screening instrument was obtained according to a modified version (omitting information not relevant to dementia screening instruments) of the Cochrane criteria[22]:

1. Overall study validity (quality)—reference standard used for diagnosis of dementia.

a. Test blinding—were the reference standard and screening instrument administered/measured independently of each other?

b. Avoidance of verification bias—was the choice of subjects who were assessed independent of the results of the screening instrument?

c. Was the screening instrument measured independently of all other clinical information?

2. Direct and indirect measures of applicability

a. Screening instrument issues

Total sample size;

Overall age;

Percentage of males (for complete sample);

Threshold used for detecting dementia;

Percentage of subjects excluded because test was not feasible or the result was indeterminate; and

Dementia prevalence

b. Clinical issues

TABLE 1. Performance of Instruments Validated in Two Distinct Samples or Inpatient or Outpatient Settings

Instrument	Sensitivity (%) (95% CI)[d]	Specificity (%) (95% CI)[d]	Area Under the Curve (95% CI)	Positive Predictive Value[d] (95% CI)[d]	Negative Predictive Value[d] (95% CI)[#]	Misclassification (%)[d]	Education Bias	Language/Culture Bias	Interrater Reliability	Test–Retest Reliability	Internal Consistency	Face Validity[f]	Time
6-Item Cognitive Impairment Test	79 (0.67–0.87)	100	[c]	1.00	0.83 (0.74–0.90)	10.3	Yes	[c]	[c]	[c]	[c]	[a]	5[16]
7-Minute Screen	92 (0.82–0.97)	96 (0.89–1.00)	[c]	0.96 (0.88–1.00)	0.92 (0.82–0.97)	5.8	No	[c]	[a]	[a]	[c]	[a]	7.42
Bowles-Langley Technology/ Ashford Memory Test	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[b]	1[67]
MAT	95 (0.86–0.99)	81 (0.69–0.91)	[c]	0.85 (0.74–0.92)	0.94 (0.83–0.99)	11.5	[c]	[c]	[c]	[c]	[c]	[b]	30 s
Rowland Universal Dementia Assessment Scale	89 (0.76–0.96)	98 (0.88–0.97)	0.95 (0.88–0.98)	0.98 (0.87–1.00)	0.90 (0.78–0.97)	6.7	[c]	No	[a]	[a]	[c]	[a]	10
Short Test of Mental Status	92 (0.83–0.98)	91 (0.84–0.96)	[c]	0.89 (0.79–0.95)	0.94 (0.88–0.98)	8	Yes	Yes[e]	[c]	[c]	[c]	[a]	5
Time and Change Test	63 (0.35–0.85)	96 (0.90–0.99)	[c]	0.77 (0.46–0.95)	0.93 (0.86–0.97)	9	No	Yes	[a]	[a]	[c]	[b]	21.3 s

[a]Demonstrated to fulfill criterion adequately.
[b]Demonstrated to not fulfill this criterion.
[c]Insufficient/no published data on this criterion.
[d]Calculated using "DAGStat" program[68] (when possible) if not reported in the article.
[e]For severe language difficulties.
[f]Based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*[62] criteria requiring that instruments test memory and at least one other cognitive domain.
CI: confidence interval.

TABLE 2. Performance of Instruments Validated in General Practice, Community or Population Samples

Instrument	Sensitivity (%) (95% CI)[d]	Specificity (%) (95% CI)[d]	Area Under the Curve (95% CI)	Positive Predictive Value[d] (95% CI)[d]	Negative Predictive Value[d] (95% CI)#	Misclassification (%)[d]	Education Bias	Language/Culture Bias	Interrater Reliability	Test–Retest Reliability	Internal Consistency	Face Validity[f]	Time in Minutes
Abbreviated Mental Test	100 (0.70–1.00)	82 (0.72–0.90)	0.89	0.42 (0.23–0.63)	1.00	16	[c]	[c]	[c]	[c]	[a, 69]	[a]	3[16]
Cambridge Cognitive Examination	88 (0.64–0.99)	75 (0.67–0.83)	0.92[e]	0.32 (0.19–0.47)	0.98 (0.93–1.00)	23	Yes	Yes	[c]	[c]	[c]	[a]	20
Clock Drawing Test	76 (0.60–0.88)	81 (0.77–0.84)	[c]	0.24 (0.17–0.32)	0.98 (0.96–0.99)	20	Yes	No	[c]	[c]	[c]	[b]	2[16]
General Practitioner Assessment of Cognition	85 (0.76–0.92)	86 (0.81–0.91)	0.89 (0.85–0.94)	0.71 (0.61–0.80)	0.93 (0.89–0.97)	14	Yes	[c]	[a]	[a]	[a]	[a]	4.5
Mini-Cog	76 (0.65–0.85)	89 (0.87–0.91)	[c]	0.34 (0.27–0.41)	0.98 (0.97–0.99)	12	No[36]	No[36]	[c]	[c]	[c]	[a]	2–4
Memory Impairment Screen	80 (0.66–0.90)	96 (0.94–0.98)	0.94	0.70 (0.57–0.82)	0.98 (0.96–0.99)	5.6	No	No	[c]	[c]	[a]	[b]	4
Mini-Mental Status Examination	69 (0.66–0.73)	89 (0.87–0.92)	[c]	0.63 (0.58–0.67)	0.92 (0.90–0.94)	15	Yes[15]	Yes[15]	[c]	[a, 19]	[a, 19]	[a]	5–10
Short and Sweet Screening Instrument	94 (0.88–0.96)	91 (0.90–0.92)	[c]	0.40 (0.32–0.48)	1.00 (0.99–1.00)	8.5	[c]	[c]	[c]	[c]	[c]	[a]	10
Short Informant Questionnaire on Cognitive Decline in the Elderly	79 (0.65–0.90)	82 (0.79–0.85)	0.85	0.26 (0.20–0.34)	0.98 (0.96–0.99)	18	No	No	[c]	[a]	[c]	[a]	30 s[c, g]

[a]Demonstrated to fulfill criterion adequately.
[b]Demonstrated to not fulfill this criterion.
[c]Insufficient/no published data on this criterion.
[d]Calculated using the "DAGStat" program[68] (when possible) if not reported in the article.
[e]From memory clinic sample.
[f]Based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*[62] criteria requiring that instruments test memory and at least one other cognitive domain.
[g]Estimated by the authors as taking 30 seconds to administer, because it theoretically only requires a test administrator to hand to the patient for self-completion.
CI: confidence interval.

Severity of dementia; and

Setting (e.g., two distinct samples, outpatient)

c. Primary care—was the setting within primary care?

d. Comorbid conditions for patients with dementia

Further information was obtained about test bias and practical needs of GPs, sensitivity, specificity, area under the receiver operated characteristics curve (AUC), positive predictive validity (PPV), negative predictive validity (NPV), misclassification rate, education bias, language/culture bias, interrater reliability, test–retest reliability, internal consistency, face validity, construct validity, time to administer, ease of administration, and use of informant data.

Selection of Instruments. The following selection criteria were used to determine the most suitable instruments for general practice from the full list of instruments identified by the literature search:

1. Validated in a community, population, or general practice sample.
2. Simple to administer.
3. Administration time numerically ≤5 minutes.
4. Misclassification rate numerically ≤ MMSE.
5. NPV numerically ≥ MMSE.

The PPV was not considered, because all values were generally low and were dependent on prevalence. Suitable instruments were chosen and then compared based on overall study validity, applicability, and psychometric and administration charac-

teristics. We reviewed the literature on the performance of the MMSE as a screening test in general practice or community populations. Rates of sensitivity ranged from 64.8%–100%, specificity from 81%−93.3%, and negative predictive values from 91.1%–99.2%.[19,23–27] We used the rates quoted by Wind et al.[27] as representative (see subsequently) of the values reported by others and because they were obtained from consecutive patients attending general practice, precisely the population for which we aimed this review.

RESULTS

Systematic Literature Search

Eighty-three full-text articles were obtained generating summaries of 16 scales:

1. Seven-minute screen (7-Minute Screen[28])
2. A Short Form of the IQCODE (Short IQCODE[29])
3. Abbreviated Mental Test (AMT[30])
4. Bowles-Langley Technology/Ashford Memory Test (BLT/Ash[31])
5. Cambridge Cognitive Examination (CAMCOG[32])
6. The CDT scored using the 10-point Sunderland scale[33]
7. Memory Impairment Screen (MIS[34])
8. Mental Alternation Test (MAT[35])
9. Mini-Cog[36]
10. MMSE[14]
11. Short and Sweet Screening Instrument (SASSI[37])
12. Short Test of Mental Status (STMS[38])
13. The 6-Item Cognitive Impairment Test (also called The Short Blessed Test and The Short Orientation–Memory–Concentration Test; 6CIT[39])
14. The General Practitioner Assessment of Cognition (GPCOG[40])
15. The Rowland Universal Dementia Assessment Scale (RUDAS[41])
16. Time and Change Test (T&C[42])

Instrument and Study Parameters

Tables 3 and 4 show the instruments' quality and applicability. Most studies used clinical diagnosis as the reference standard, and avoided verification bias; however, only the RUDAS and CDT studies included blinded measurement of the test and reference standard.[41,43] Raters of the RUDAS and CDT were blinded to all other clinical information.[41,43] Most instruments were validated on reasonably large sample sizes with a mean age (or age range) representative of patients with dementia in the community (65 years and over). The percentage of males was not specified in several studies[29,31,43–45]; only 22% of the RUDAS sample were male.[41] The threshold for determining cognitive status was specified for all instruments, and the percentage excluded because testing was indeterminate or unfeasible was generally low.

A validation sample with a higher prevalence of dementia than the demographic of interest can inflate the performance of a screening instrument. The prevalence of dementia for people over 75 years, a putative key demographic for routine screening, is around 15%.[46] The T&C, AMT, CAMCOG, CDT, short IQCODE, Mini-Cog, MIS, and SASSI were all validated in studies with prevalence rates approximately less than or equal to this value.[29,34,37,43,45,47–49]

Many studies did not specify dementia severity and the 7-Minute Screen validation was specific to Alzheimer disease.[44] Only four instruments were validated within primary care settings.[27,40,43,44] Approximately half the instruments were validated in general practice, community, or population samples,[27,29,34,37,40,47–49] and their performance was tabulated separately (Table 2) to those validated in distinct samples (Table 1). All studies, with the exception of the BLT/Ash, were rated by the authors as having construct validity based on available information (correlation with related and unrelated constructs as well as ability to predict dementia). All instruments except the 7-Minute Screen and the CAMCOG were judged to be easy to administer. The AMT, CAMCOG, and Short IQCODE were the only instruments to use informant data.

Selection of Instruments

Of the instruments meeting the first of the selection criteria (Table 2), the AMT, CDT, GPCOG, Short IQCODE, Mini-Cog, and MIS had administration times of 5 minutes or less. Each of these had a NPV ≥MMSE (0.92). Only the GPCOG, Mini-Cog, and

TABLE 3. Overall Study Validity (quality)

Instrument	Source	Reference Standard	Test Blinding	Avoidance of Verification Bias	Test Independent of All Other Clinical Information
6-Item Cognitive Impairment Test	Brooke and Bullock[57]	Clinical diagnosis	[c]	Yes	[c]
7-Minute Screen	Solomon and Pendlebury[44]	Clinical diagnosis (NINCDS-ADRDA criteria)	[c]	Yes	[c]
Abbreviated Mental Test	Sarasqueta et al.[49]	Clinical diagnosis (DSM-IV)	[a]	Yes	[c]
Bowles-Langley Technology/ Ashford Memory Test	Bowles-Langley Technology[31]	[c]	[c]	[c]	[c]
Cambridge Cognitive Examination	Lolk et al.[47]	Clinical diagnosis (DSM-III and NINCDS-ADRDA criteria)	[c]	Yes	[c]
Clock Drawing Test	Kirby et al.[43]	GMS-AGECAT	[a]	Yes	Yes
General Practitioner Assessment of Cognition	Brodaty et al.[40]	Clinical diagnosis (CAMDEX and DSM-IV)	[c]	No	No
Mental Alternation Test	Salib and McCarthy[58]	Mini-Mental Status Examination 12–24 and/or clinical diagnosis (NINCDS-ADRDA criteria)	[b]	Yes	No
Mini-Cog	Borson et al.[48]	Clinical diagnosis (DSM-III-R and NINCDS-ADRDA criteria)	[c]	Yes	[c]
Memory Impairment Screen	Buschke et al.[34]	Clinical diagnosis (DSM-III-R and NINCDS-ADRDA criteria)	[b]	Yes	No
Mini-Mental Status Examination	Wind et al.[27]	GP diagnosis (CAMDEX and GMS-AGECAT)	[c]	Yes	No
Rowland Universal Dementia Assessment Scale	Storey et al.[41]	Clinical diagnosis by geriatrician	[a]	Yes	Yes
Short and Sweet Screening Instrument	Belle et al.[37]	Clinical diagnosis plus MMSE/memory tests and test battery	[c]	Yes	[c]
Short Informant Questionnaire on Cognitive Decline in the Elderly	Jorm[29]	Clinical diagnosis (DSM-III-R)	[b]	Yes	No
Short Test of Mental Status	Kokmen et al.[38]	Clinical diagnosis (DSM-III and NINCDS-ADRDA criteria)	[c]	[c]	No
Time and Change Test	Froehlich et al.[45]	mBDRS >4, or mBDRS >2 and MMSE <20 with ≥6-month cognitive symptoms	[b]	Yes	No

[a]Test and reference standard blind to each other.
[b]Test and reference standard not blind to each other.
[c]Insufficient/no published data on this criterion.
CAMDEX: Cambridge Mental Disorders of the Elderly Examination[59]; DSM-III: *Diagnostic and Statistical Manual of Mental Disorders, Third Edition*[60]; DSM-III-R: *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised*[61]; DSM-IV: *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*[62]; GMS-AGECAT: Geriatric Mental State–Automated Geriatric Examination for Computer Assisted Taxonomy[63,64]; mBDRS: Modified Blessed Dementia Rating Scale[65]; NINCDS-ADRDA: National Institute of Neurological and Communicative Disorders and Stroke–Alzheimer's Disease and Related Disorders Association.[66]

MIS also had a misclassification rate ≤ MMSE (15%[29,34,40,43,48,49]) and were therefore chosen as the most suitable instruments for use in general practice.

As well as fulfilling the selection criteria, the GPCOG, Mini-Cog, and MIS had high sensitivity and specificity (≥80%) and were validated in studies showing reasonable quality and applicability to general practice (large sample size, clinical diagnosis used as the reference standard). The GPCOG sample had a dementia prevalence of 29%,[40] suggesting that it may not perform as well in a general practice setting where prevalence is lower.

The GPCOG and MIS had high AUC values. The PPV of the GPCOG and MIS were also numerically superior to the MMSE. Only the GPCOG incorporated informant information and demonstrated good interrater reliability, test–retest reliability, and patient and GP satisfaction in its validation.[40] Unlike the MIS or Mini-Cog, the GPCOG shows education bias and has not been assessed for language/cultural

TABLE 4. Direct and Indirect Measures of Applicability and Quality Screening Instrument Issues

Instrument	Source	Sample Size (included subjects)	Sample Age in Years (complete sample)	Percent Males (complete sample)	Threshold Used	Dementia Prevalence (%)
Screening Instrument Issues						
6-Item Cognitive Impairment Test	Brooke and Bullock[57]	145	Mean 71	40	7/8	48
7-Minute Screen	Solomon and Pendlebury[44]	120	Mean 78	34	Probability ≥0.9 from logistic regression	50
Abbreviated Mental Test	Sarasqueta et al.[49]	96	>65	51	7/8	12
Bowles-Langley Technology/Ashford Memory Test	Bowles-Langley Technology[31]	[c]	[c]	[c]	<90%	[c]
Cambridge Cognitive Examination	Lolk et al.[47]	147	65–84	51	≤89	13
Clock Drawing Test	Kirby et al.[43]	564	Mean 77	[c]	6	7
General Practitioner Assessment of Cognition	Brodaty et al.[40]	283	Mean 80	41	<5 patient section, or 5–8 patient + ≤3 informant	29
Mental Alternation Test	Salib and McCarthy[58]	113	[c]	[c]	15	52
Mini-Cog	Borson et al.[48]	1,179	Mean 73	45	recall = 0 or recall <3 and abnormal clock	6
Memory Impairment Screen	Buschke et al.[34]	483	Mean 80	36	4	10
Mini-Mental Status Examination	Wind et al.[27]	533	Mean 78	40	Normal 24–30, deviant ≤23	21
Rowland Universal Dementia Assessment Scale	Storey et al.[41]	90	Mean 80	22	23	50
Short and Sweet Screening Instrument	Belle et al.[37]	1,178	Mean 72	44	Mini-Mental Status Examination <27 and verbal fluency <23 or temporal orientation >2	6
Short Informant Questionnaire on Cognitive Decline in the Elderly	Jorm[29]	684	>70	[c]	3.31/3.38	8
Short Test of Mental Status	Kokmen et al.[38]	180	Mean 63	50	≤29	48
Time and Change Test	Froehlich et al.[45]	100 validity, 42 reliability	[c]	[c]	Any incorrect response	16

Clinical Issues Instrument	Source	Severity of Dementia	Setting	Primary Care
6-Item Cognitive Impairment	Brooke and Bullock[57]	Mild	2	[b]
7-Minute Screen	Solomon and Pendlebury[44]	Alzheimer disease	2	[a]
Abbreviated Mental Test	Sarasqueta et al.[49]	[c]	C	[b]
Bowles-Langley Technology/Ashford Memory Test	Bowles-Langley Technology[31]	[c]	2	[b]
Cambridge Cognitive Examination	Lolk et al.[47]	Mild–moderate	P	[b]
Clock Drawing Test	Kirby et al.[43]	[c]	GP	[a]
General Practitioner Assessment of Cognition	Brodaty et al.[40]	Mild–severe	GP	[a]
Mental Alternation Test	Salib and McCarthy[58]	Mild–severe	2	[b]
Mini-Cog	Borson et al.[48]	[c]	P	[b]
Memory Impairment Screen	Buschke et al.[34]	[c]	C	[b]
Mini-Mental Status Examination	Wind et al.[27]	Minimal–severe	GP	[a]
Rowland Universal Dementia Assessment Scale	Storey et al.[41]	Mild–severe	2	[b]
Short and Sweet Screening Instrument	Belle et al.[37]	[c]	C	[b]
Short Informant Questionnaire on Cognitive Decline in the Elderly	Jorm[29]	[c]	C	[b]
Short Test of Mental Status	Kokmen et al.[38]	Mild–moderate	O	[b]
Time and Change Test	Froehlich et al.[45]	[c]	O	[b]

[a]Demonstrated to fulfill criterion adequately.

[b]Demonstrated to not fulfill this criterion.

[c]Insufficient/no published data on this criterion.

2: two distinct samples; I: inpatient; O: outpatient; C: community; P: population; GP: general practice.

bias.[34,40,48] The GPCOG has also been translated and validated in French[50] and Italian.[51]

DISCUSSION

The GPCOG, Mini-Cog, and MIS were chosen as the most suitable instruments for use in general practice. This review found that these fulfilled criteria of being quick and easy to administer while having psychometric properties similar to the MMSE and confirmed the findings of Lorentz et al.[18] despite using differing methodology.

Variations in study parameters alter the performance of a screening instrument. It is a limitation of the review that all 16 instruments have not been validated in the same study sample. Although many newer instruments have been validated in only one or two studies, instruments such as the MMSE show a range of performance over many studies. Positive predictive validity of the MMSE has been shown to vary from 0.31–1.00, NPV from 0.43–1.00, sensitivity from 21%–100% and specificity from 46%–100%.[19] Obtaining the performance of the MMSE from only one validation study may be a limitation; however, the screening parameters obtained from Wind et al.[27] (PPV = 0.63, NPV = 0.92, sensitivity = 69%, specificity = 89%) show an overall bias in favor of the MMSE, thus setting higher criteria against which to compare the other instruments.

Routine screening could double the number of patients with dementia identified by GPs,[52] although these diagnoses cannot be made solely on the basis of screening. Patients screening positive require further clinical evaluation to confirm a diagnosis of dementia and to exclude depression or acute medical illnesses.[12] Many GPs refer patients with cognitive impairment to specialists,[9] and the final diagnosis of dementia is usually made by a neurologist, geriatrician, or psychogeriatrician.[2]

There is a broader debate about the use of screening. Most patients identified are likely to have dementia of mild or moderate severity.[52] Although there are strong arguments for screening, these benefits have not been directly assessed. Adverse effects such as increased anxiety and/or depression[52] and the consequences of "labeling" are also possible from screening positive, although Jha et al.[53] found that despite concurrent upset, the majority of patients with dementia preferred to be informed of their diagnosis.

Should global screening be undertaken for conditions for which there is no cure? Screening for hypertension and certain cancers are readily supported; however, if only modestly effective or symptomatic treatments are available like in Alzheimer disease, is routine cognitive testing justifiable? Clearly screening should not be contemplated for low-frequency conditions, but it may be worthwhile for GP attendees aged 75 years or more in which prevalence exceeds 15%, PPV is over 70%, and NPV exceeds 90%. Even so, a positive screen is only a first step. It is important that GPs carry out follow-up assessments and referrals, appropriately educate and counsel patients and families, and have up-to-date treatment knowledge. False-positive screening results could lead to unnecessary treatment and cost, although these costs may be offset by financial gains from early treatment of genuine cases.[4] False-negative results may give misleading reassurance, but these cases would not have been diagnosed without screening, and continued screening would possibly identify them in the future.

The families of patients must also be considered. Earlier diagnosis may lead to better long-term outcomes for caregivers; education and earlier intervention for caregivers can reduce depression and psychologic, physical, social, and financial burden, and increase confidence and perceived competence.[54,55]

Whether or not GPs should adopt routine screening for cognitive impairment remains a moot question. If answered in the affirmative, usually for an older population (e.g., 75 years or older) or when cognitive impairment is suspected, then the GPCOG, Mini-Cog, or MIS appears suitable for routine use. The GPCOG should be further investigated for its potential for language or cultural bias, although using the informant section alone appears to perform well across cultures and should be free of these biases.[57] The Mini-Cog and MIS should be the target of further research to ascertain their level of GP and patient satisfaction. Computerized versions could be made available in commonly used desktop programs. Routine screening needs to be supplemented by education about use of suitable instruments and training on the management of dementia. Support from departments of health, GP divisions/col-

leges, and pharmaceutical companies may also be beneficial in encouraging GPs and increasing awareness of the advantages of testing with these instruments.

Funding was provided by the New South Wales Department of Health.

The authors thank Dr. Kate Jackson and Dr. Robert Yeoh who provided advice about the project.

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