Palliative Medicine 2007; **21:** 559–565

Use of the clock-drawing test in a hospice population

M Henderson Department of Psychological Medicine, Institute of Psychiatry, London, **S Scott** St Christopher's Hospice, London and **M Hotopf** Department of Psychological Medicine, Institute of Psychiatry, London

Background: Cognitive impairment is common in patients with advanced disease and has significant implications for the patient, their carers and hospice staff. The effectiveness of screening tools is limited by a number of factors. The clock-drawing test (CDT) has performed well in other settings but has rarely been studied in the hospice setting. **Aim**: To assess the performance of the CDT in a hospice population. **Methods**: Consecutive admissions to a large hospice over three months were assessed using the CDT, the abbreviated mental test score and brief tests of attention and memory function. **Results**: One-hundred and nine eligible patients were admitted and 77% took part. Thirty per cent were cognitively impaired. The CDT had a sensitivity of 0.92, a specificity of 0.73 and a negative predictive value of 0.95. No patient refused to complete it. **Conclusions**: The CDT performs well as a screening tool for cognitive impairment in a hospice population. *Palliative Medicine* 2007; **21:** 559–565

Key words: clock-drawing test; cognitive impairment; palliative medicine

Introduction

Cognitive impairment is common in hospice populations. The prevalence of global cognitive impairment ranges from 16 to 68% although rates vary considerably depending on the population being studied, the method of assessment and the type of cognitive impairment under consideration.[1–5] The prevalence of delirium varies from 28 to 52% although much higher levels are reported shortly before death.[6–10] A recent review suggested that the overall prevalence of cognitive impairment in the specialist palliative care units is about 50%.[11]

Patients with advanced disease have many risk factors for cognitive impairment. They tend to be older, have multiple physical pathologies and are commonly prescribed medications, such as opioids, which might impair thinking or concentration. Most patients receiving hospice care have cancer, which might impair cognitive functioning directly or through cerebral metastases.

The presence of cognitive impairment has significant implications for those with advanced disease. It is associated with an additional morbidity, for example from falls.[12] More subtly, patients with cognitive impairment are less able to engage in their own management. They may find it more difficult to accurately report their symptoms or the effects of prescribed medications. These communication difficulties can impact on the quality of relationships with families and loved ones, potentially complicating subsequent bereavement.[13]

Despite its prevalence and impact several studies have demonstrated that cognitive impairment is often under-recognized in populations with advanced disease.[5,14,15] It has been suggested that palliative care staff fear upsetting patients, are unfamiliar with assessment tools and that they perceive interventions for cognitive impairment to be ineffective.

Such difficulties are not confined to hospices – general hospital staff also have limited skills in this area. In such circumstances the use of objective assessment tools might be helpful. Cognitive impairment is an umbrella term for disorders of thinking, concentrating, reasoning, remembering and formulating ideas. It includes but is not confined to defined disorders such as delirium and the dementias. Specific delirium assessment tools exist and several have been used in patients with advanced disease. The most commonly described is the Memorial Delirium Assessment Scale.[16] This is designed for use by psychiatrists, and can take more than 10 min and thus is often only partly completed. Similar problems have been reported with the Confusion Assessment Method[17] whereas both the Delirium Rating Scale[18,19] and the Confusion Rating Scale[19] require training to be used properly.

Other tools are available for the assessment of global cognitive impairment. The most commonly used is the mini mental state examination (MMSE).[20] This is relatively quick although deciding on what cut-off to use can be difficult in

Address for correspondence: Dr Max Henderson MBBS MSc MRCP MRCPsych, MRC Training Fellow, Department of Psychological Medicine, Kings College London, Institute of Psychiatry, Weston Education Centre, Cutcombe Road, London SE5 9RJ.
E-mail: m.henderson@iop.kcl.ac.uk

 10.1177/0269216307081936

patients with advanced disease. Several studies have shown a low sensitivity and specificity for the MMSE.[21–23] There have also been difficulties with inter-rater reliability.[22] In addition it is quite insensitive to frontal lobe dysfunction.

The shorter abbreviated mental test score (AMTS)[24] is also widely used. AMTS scores correlate well with those from the MMSE. It appears to perform well both in the general hospital and primary care settings although there is some criticism that it is to some degree dependent on premorbid educational attainment.[25] The AMTS is recommended for routine use by the Royal College of Physicians and the British Geriatrics Society.[26] Despite this only a single study has investigated its use in patients with advanced disease.[27]

The first systematic study of the clock-drawing test (CDT) was in 1983[28] and it has since been used in a variety of clinical settings, both primary and secondary.[29–31] It requires comprehension, visuo-spatial abilities, reconstruction skills, concentration, numerical knowledge, visual memory and executive function.[32] While testing a broad range of cognitive domains, the CDT places less emphasis on knowledge than the AMTS. The core task involves drawing the numbers on a clock face and then drawing the hands of the clock to show a set time, although several subtle variations exist.[32] A number of different scoring systems have been developed, the most common of which are those of Manos[33] and Shulman.[34] The CDT has been shown to correlate well with other tests of cognitive function such as the MMSE and the Blessed dementia rating scale.[35]

The CDT has some potential limitations and may be unsuitable for those with marked visual impairment or upper limb neurological difficulties such as paralysis or tremor. Some authors[36,37] have suggested that age and education might bias CDT scores although other studies fail to show this.[35,38] On the other hand, the CDT has a number of key advantages over other methods of screening for cognitive impairment. It is not affected by low mood, language or culture[35,39,40] and does not place undue emphasis on knowledge. Its particular attractiveness for use patients with advanced disease is its brevity (it takes less than a minute) and its acceptability.[41,42]

Aims

To assess the performance of the CDT in a hospice setting. To identify whether the CDT was identifying patients with a confusion state, dementia, neither or both.

Methods

The study was conducted at St Christopher's Hospice, a 48-bed unit providing palliative care services to a large proportion of south London. The hospice admits approximately 850 patients per year, 90% of whom have advanced cancer.

Inclusion criteria

All patients admitted to the hospice in-patient unit, whom the clinical team believed to have a prognosis of at least one week, were eligible to take part. Including those with at least one week's prognosis was thought to reflect those patients who would be appropriate for assessment of their cognitive status and who realistically could benefit from this assessment and be able to complete the CDT.

Exclusion criteria

Patients were not approached if the clinical team believed them to be too severely ill (and therefore unable to complete the assessment or give informed consent).

Ethical approval was obtained from the local Research Ethics Committee and the study was approved by the hospice's own research committee.

Assessment tools used

Abbreviated mental test score. A cut-off of 7/8 was used, giving a high sensitivity and specificity with a DSM-IV diagnosis of dementia.

Clock-drawing test. The Manos 10-point scoring system was used as it produces reliable results when used by non-specialists. This is fully described elsewhere[33] but involves placing a template over the clock, divided into segments. Points are awarded for the placing numbers in the correct segment as well as producing a clear 'short' and 'long' hand, and getting the time right.

Palliative care outcomes scale. This is designed to assess patients' palliative care needs and outcomes.[43] It covers a wide range of factors and consists of almost identical questionnaires filled in by the nurse and the patient independently. The two are then compared. One of the palliative care outcomes scale (POS) questions 'Over the last three days do you feel you have been affected by confusion?' was included for this study. Each question is scored 0–4.

Tests of attention. Difficulties with attention and concentration are the cardinal feature of a confusional state. Many different methods are available for testing this. 'Digit span' (forwards) and 'months of the year' (backwards) were used for their simplicity. Digit spans were recorded directly while for 'months of the year' the scoring procedure suggested by Stillman[44] was adapted for this study. The range was 0–4, with 0 indicating no impairment.

Tests of new learning. The three-item recall test forms part of the MMSE. Deficits are more strongly associated with an underlying dementing process than with attention. In the MMSE subjects are given objects as pieces of information to recall, and these have no link with their immediate

environment. We chose to adapt this using an ecological approach where the ability to recall relevant local information, more reflective of the patient's current condition was tested. The three items were (1) the name of the ward (2) the colour of the nursing team (eg, green, blue) and (3) the purpose of the call bell. Each was scored 0–2 with two indicating no impairment. The scores for each item were then summed to produce a total score (0–6).

Procedure

Part 1

A list of admissions to the hospice in the preceding 24 hours was collected on a daily basis. The researcher (SS) then checked with the clinical team to ensure patients met the inclusion criteria. Eligible patients were given a patient information sheet and the nature of the study was explained before written consent was obtained. All eligible patients were seen within 72 hours of admission.

Patients were administered the AMTS by the researcher who afterwards extracted basic demographic and clinical information from the patient's notes. Following this, the patient's nurse, blind to the result of the AMTS, administered the CDT, together with the POS.

The researcher scored the AMTS and informed the clinical team if the patient scored 7 or less. Further assessment was at the discretion of the team. The CDT was scored by another researcher (MJH) who was blind to any other patient information including the score on the AMTS.

Part 2

The three items of information were given to all newly admitted patients by their nurse and this was documented. The researcher administered the three-item recall test and the months of the year backwards/digit span in the same sitting as the AMTS was administered.

Statistical analyses were conducted using STATA 9.2 (StataCorp, College Station, Texas, USA).

Results

Study population

During the three-month study period 194 patients were admitted to the hospice. Of these 82 (42%) were felt by their team to be inappropriate for assessment or too ill and a further three were admitted only for a blood transfusion so were excluded. Twenty-five (23%) of the remaining 109 patients declined to take part in the study. Two clock tests were lost leaving 82 patients with complete data for analysis. The non-participants did not differ in terms of age and sex from the total population of 194.

The characteristics of the participants are presented in Table 1. Forty-three percent were male and the median age was 72 (61–83). Ninety-two per cent were White British and all but 3 (4%) had cancer, the most common being gastrointestinal and lung cancers. Using the standard 7/8 cut-off for the AMTS, 25 (30%) patients were found to be cognitively impaired. The differences between the impaired and unimpaired patients are shown in Table 1.

Palliative care outcomes scale

The scores from the POS were collapsed into two groups – 'No impairment' and 'Some degree of impairment'. Twenty-five patients indicated they had some level of cognitive impairment, while 37 patients were felt by the nurses to be impaired. In 19 instances both patient and nurse agreed about the presence of impairment and in 39 cases they agreed about its absence, leaving 24 cases of disagreement. Table 2 shows

Table 1 Characteristics of study population

Variable		Whole population $n = 82$	Impaired (AMTS 0–7) $n = 25$	Unimpaired (AMTS 8–10) $n = 57$
Age	Median (IQR)	72 (59 − 81)	74 (71 − 81)	67 (57 − 78)
Sex	*n* (%) male	35 (43%)	10 (40%)	25 (44%)
Ethnicity	*n* (%) White British	75 (92%)	23 (92%)	52 (91%)
Marital status	Married	36 (44%)	11 (44%)	25 (44%)
	Widowed	26 (32%)	10 (40%)	16 (28%)
	Divorced or separated	7 (9%)	2 (8%)	5 (9%)
	Single	4 (13%)	2 (8%)	11 (19%)
ECOG score	0 − fully active	3 (4%)	0	3 (5%)
	1 − restricted	24 (29%)	4 (16%)	20 (35%)
	2 – ambulatory	30 (37%)	9 (36%)	21 (37%)
	3 – limited	15 (18%)	7 (28%)	8 (14%)
	4 – disabled	10 (12%)	5 (20%)	5 (9%)

the level of agreement between both the nurses' and patients POS scores and the 'Gold Standard' AMTS. There was much greater agreement between the patients' reports and the AMTS.

Clock-drawing test

The results of the CDT are shown in Table 3. Data are available on only 81 patients as one patient was too visually impaired to complete the test. Scores were seen across the whole range from 0–10. The median score was 8 (IQR 5–9). Using the 7/8 cut-off the test suggested 38 patients were cognitively impaired. Interestingly 23 of the 25 patients identified by the AMTS were also identified by the CDT. There was a very high level of agreement between the results of the CDT and the AMTS. A receiver operating characteristic curve was drawn for the CDT, plotting sensitivity against 1-specificty (Figure 1). This supports the 7/8 cut-off as proposed by Manos – 79% of participants were correctly classified. The area under the curve was 0.85 – values exceeding 0.8 are generally held to mean that a particular screening tool is valid and efficient in a specified population.

What is the clock test measuring?

To assess attention in addition to the digit span, patients were asked to recite the months of the year backwards. Scores ranged from 0–4. Thirty-four (41%) patients scored 0 and 29 patients scored 4 with relatively few in between. These scores were dichotomized with those scoring 0 in one group ('unimpaired') and those scoring at least 1 ('some impairment').

Each item on the three-item recall test was scored 0/1/2 and these were then summed. As such the range of possible range of scores was 0– 6 with 6 being the maximum score. Very few patients scored 1 for any of the individual items; so almost all had scores of either 2 (7%), 4 (27%) or 6 (59%). These scores were dichotomized into those with 6 – 'no impairment', and less than 6 'some impairment'.

The association between the findings on these separate tests and 'caseness' on the clock-drawing test are shown in Table 4. Impairment on all these tests was strongly associated with being a case on the CDT. There was, however, no evidence of an association between scores on the 'months of the year' test and the three item recall test suggesting they were measuring different deficits (Table 5).

Table 2 Patient and nurse POS scores versus AMTS

		Gold standard AMTS		Statistics
		Case	Non-case	
Patient POS	Case	14	11	Kappa = 0.37,
	Non-case	11	46	$z = 3.32$, $P = 0.0004$
Nurse POS	Case	14	23	Kappa = 0.14,
	Non-case	11	34	$z = 1.31$, $P = 0.095$

Table 3 Clock-drawing test

CDT		Performance of CDT (7/8) against AMTS (7/8)
Score	*N* (%)	
0	9 (11)	
1	2 (2)	Sensitivity = 0.92 (0.86 – 0.98)
2	3 (4)	Specificity = 0.73 (0.64 – 0.83)
3	1 (1)	
4	5 (6)	Positive predictive value = 0.61
5	3 (4)	Negative predictive value = 0.95
6	8 (10)	
7	7 (9)	Kappa = 0.57, $z = 5.43$, $P < 0.001$
8	17 (21)	
9	9 (11)	
10	17 (21)	

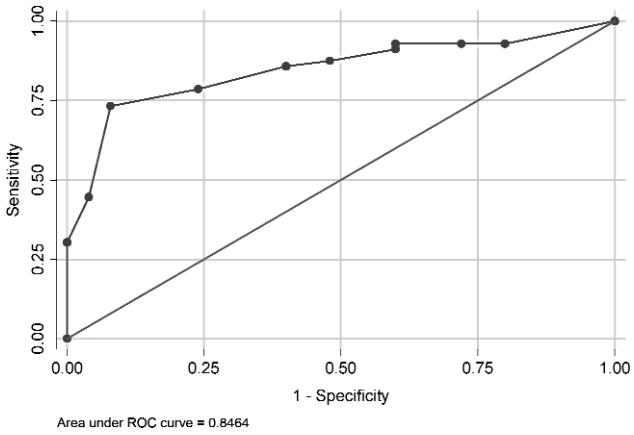

Figure 1 ROC curve for CDT using AMTS as gold standard.

Discussion

Although it was not our aim to describe prevalence, our finding that 30% of the recently-admitted hospice population showed evidence of cognitive impairment is in keeping with other studies. In this setting the clock-drawing test appeared to perform very well across a range of indices. Importantly no patient having agreed to take part in the study declined to complete the clock-drawing task. This suggests the test itself should prove acceptable to patients with advanced disease. The sensitivity and specificity were both high. The positive predictive value was 0.61 while the negative predictive value was very high at 0.95.

The importance of these findings is in how the CDT might be utilised in everyday practice. The CDT is a screening tool rather than a diagnostic tool, and thus its aim is to identify

Table 4 The association between tests of attention and memory and scores on the CDT

		CDT		Statistics
		Case	Non-case	
Months of year backwards	No impairment	30	17	Kappa = 0.39, $z = 3.59$, $P = 0.0002$
	Some impairment	8	26	
Mean Digit span (s.d.)		5.6 (1.1)	6.3 (0.9)	$t = -3.13$, $P = 0.002$
Three item recall	No impairment	21	12	Kappa = 0.28, $z = 2.50$, $P = 0.006$
	Some impairment	17	31	

Table 5 Comparison of the three-item recall test with months of the year backwards

		Three-item recall test		Statistics
		No impairment	Some impairment	
Months of year backwards	No impairment	11	23	Kappa = −0.16, $z = -1.41$, $P = 0.92$
	Some impairment	23	25	

patients whose cognitive state needs a more in-depth evaluation. The high sensitivity suggests that the test produces few 'false negatives'. The negative predictive value (NPV), which unlike the sensitivity varies with the prevalence of the condition, was very high meaning that very few patients who performed acceptably on the CDT were 'cases' on the AMTS. Thus, further assessment may safely be confined to patients performing poorly on the CDT.

Hospice patients have many risk factors for cognitive impairment. In addition to having possible underlying dementia, their disease and its treatments may precipitate confusional states. In this study, patients who performed poorly on simple tests of attention were more likely to be identified as 'cases' by the CDT, providing evidence that it is able to pick-up cases of 'confusion'. Patients with poor memory as shown by the ecological three-item recall were also identified by the CDT. That there was no evidence of an association between poor scores on the tests of attention and the memory tests suggests they were identifying distinct aspects of cognitive impairment. The CDT identified both impairments, demonstrating that it could function effectively as a screening tool but underlining the need for a more detailed assessment in those it identifies as 'impaired'.

The need for a quick and acceptable screening tool was highlighted by the findings from the POS scores. Although patients themselves were not especially good at being able to report their own cognitive impairment, they were significantly better than the nursing staff who assessed them. Interestingly the difference was mainly due to nursing staff reporting impairment when the patient actually performed well on the AMTS. It should be recognized, however, that these assessments were all performed within 72 hours (often 24 hours) of admission when the nurses had only just met the patients. It is conceivable that their ability to identify cognitive impairment may have improved over time.

Our study has a number of limitations. Although comparable with many other studies in hospice settings our numbers are relatively small and a larger scale examination of the utility of the clock-drawing test would be welcome. Although relatively few patients declined to take part, a large proportion of those admitted to the hospice were felt to be too ill by the medical teams caring for them. As such our sample could be viewed as 'selected'. The CDT may have performed less well had more severely ill patients been included or alternatively with a broader range of cognitive abilities included might have performed better. The hospice is very much used to research and is likely that the life expectancy of those excluded was short, although given the need for consent we do not have this information on those patients. While cognitive impairment has a negative impact at any point, those very close to death are much more difficult to assess, due in part to higher levels of physical morbidity and are much less likely to benefit from either the further assessment or an intervention that the use of the CDT might prompt.

Although our study was designed to minimize the possible effects of bias this may still be an issue. The nursing staff facilitated the clock-drawing test and did the POS at the same time and it is, therefore, possible that they behaved differently to a patient they concluded was impaired or based their POS score on what they perceived to be a 'poor' CDT performance (although this was scored blind to any other patient information). Similarly, the researcher asked patients the 10 AMTS questions at the same sitting as the tests of

attention and memory and might have presented these tasks in a subtly different way to those doing well on the AMTS compared with those who did less well. We believe, however, that any bias emerging here would be small and if present could have affected results in both a positive and a negative fashion. For example the researcher, noting a poor performance on the AMTS might have subconsciously concluded that the participant was cognitively impaired and been assumed that attention and memory tasks would also be preformed poorly, thus underscoring these tests. Alternatively the researcher may have been 'understanding' when assessing these patients and 'made allowances' not available to those with a high AMTS, potentially overscoring the tests.

Our tests of attention and memory are crude and should not be regarded as definitive. It is possible that more substantial testing would have more clearly distinguished those with confusional states and possible dementia. Longer tests would, however, have reduced the numbers able to complete them. These tests serve mainly as 'pointers' to demonstrate that the CDT can be used as a screening tool for global cognitive impairment.

Conclusions

Our study has provided evidence to support the use of the clock-drawing test in a hospice population. The CDT was quick, acceptable to patients and staff and performed well psychometrically, identifying patients with attention deficits as well as memory problems. We would suggest further assessment for an underlying cause in patients who score 7 or less using the Manos scoring system.

References

1 Barbato M, Rodriguez PJ. Thiamine deficiency in patients admitted to a palliative care unit. *Palliat Med* 1994; **8**(4): 320–4.
2 Klepstad P, Hilton P, Moen J, Fougner B, Borchgrevink PC, Kaasa S. Self-reports are not related to objective assessments of cognitive function and sedation in patients with cancer pain admitted to a palliative care unit. *Palliat Med* 2002; **16**(6): 513–9.
3 Radbruch L, Sabatowski R, Loick G *et al.* Cognitive impairment and its influence on pain and symptom assessment in a palliative care unit: development of a Minimal Documentation System. *Palliat Med* 2000; **14**(4): 266–76.
4 Pereira J, Hanson J, Bruera E. The frequency and clinical course of cognitive impairment in patients with terminal cancer. *Cancer* 1997; **79**(4): 835–42.
5 Bruera E, Spachynski K, MacEachern T, Hanson J. Cognitive failure in cancer patients in clinical trials. *Lancet* 1993; **341**(8839): 247–8.
6 Sarhill N, Walsh D, Nelson KA, LeGrand S, Davis MP. Assessment of delirium in advanced cancer: the use of the bedside confusion scale. *Am J Hosp Palliat Care* 2001; **18**(5): 335–41.
7 Caraceni A, Nanni O, Maltoni M *et al.* Impact of delirium on the short term prognosis of advanced cancer patients. Italian Multicenter Study Group on Palliative Care. *Cancer* 2000; **89**(5): 1145–9.
8 Gagnon P, Allard P, Masse B, DeSerres M. Delirium in terminal cancer: a prospective study using daily screening, early diagnosis, and continuous monitoring. *J Pain Symptom Manage* 2000; **19**(6): 412–26.
9 Lawlor PG, Gagnon B, Mancini IL *et al.* Occurrence, causes, and outcome of delirium in patients with advanced cancer: a prospective study. *Arch Intern Med* 2000; **160**(6): 786–94.
10 Breitbart W, Rosenfeld B, Roth A, Smith MJ, Cohen K, Passik S. The Memorial Delirium Assessment Scale. *J Pain Symptom Manage* 1997; **13**(3): 128–37.
11 Hjermstad M, Loge JH, Kaasa S. Methods for assessment of cognitive failure and delirium in palliative care patients: implications for practice and research. *Palliat Med* 2004; **18**(6): 494–506.
12 Pearse H, Nicholson L, Bennett M. Falls in hospices: a cancer network observational study of fall rates and risk factors. *Palliat Med* 2004; **18**(5): 478–81.
13 Henderson M. Mental health needs. In Oliviere DMB, ed. Death, dying and social differences. London: Oxford University Press, 2004.
14 Inouye SK, Foreman MD, Mion LC, Katz KH, Cooney LM, Jr. Nurses' recognition of delirium and its symptoms: comparison of nurse and researcher ratings. *Arch Intern Med* 2001; **161**(20): 2467–73.
15 Bruera E, Miller L, McCallion J, Macmillan K, Krefting L, Hanson J. Cognitive failure in patients with terminal cancer: a prospective study. *J Pain Symptom Manage* 1992; **7**(4): 192–5.
16 Breitbart W, Strout D. Delirium in the terminally ill. *Clin Geriatr Med* 2000; **16**(2): 357–72.
17 Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 1990; **113**(12): 941–8.
18 Trzepacz PT, Baker RW, Greenhouse J. A symptom rating scale for delirium. *Psychiatry Res* 1988; **23**(1): 89–97.
19 Williams MA, Ward SE, Campbell EB. Confusion: testing versus observation. *J Gerontol Nurs* 1988; **14**(1): 25–30.
20 Folstein MF, Robins LN, Helzer JE. The Mini-Mental State Examination. *Arch Gen Psychiatry* 1983; **40**(7): 812.
21 Anthony JC, LeResche L, Niaz U, von Korff MR, Folstein MF. Limits of the 'Mini-Mental State' as a screening test for dementia and delirium among hospital patients. *Psychol Med* 1982; **12**(2): 397–408.
22 Smith MJ, Breitbart WS, Platt MM. A critique of instruments and methods to detect, diagnose, and rate delirium. *J Pain Symptom Manage* 1995; **10**(1): 35–77.
23 Schwamm LH, Van Dyke C, Kiernan RJ, Merrin EL, Mueller J. The neurobehavioral cognitive status examination: comparison with the cognitive capacity screening examination and the mini-mental state examination in a neurosurgical population. *Ann Intern Med* 1987; **107**(4): 486–91.

24 Hodkinson HM. Evaluation of a mental test score for assessment of mental impairment in the elderly. *Age Ageing* 1972; **1**(4): 233–8.

25 Sahadevan S, Lim PP, Tan NJ, Chan SP. Diagnostic performance of two mental status tests in the older chinese: influence of education and age on cut-off values. *Int J Geriatr Psychiatry* 2000; **15**(3): 234–41.

26 R C Psych. *Standardised assessment scales for elderly people*. London: Royal College of Physicians of London, 1992.

27 Power D, Kelly S, Gilsenan J *et al.* Suitable screening tests for cognitive impairment and depression in the terminally ill–a prospective prevalence study. *Palliat Med* 1993; **7**(3): 213–8.

28 Goodglass HKE. *The assessment of aphasia and related disorders*. Philadelphia: Lea and Febiger, 1983.

29 Heinik J, Solomesh I, Lin R *et al.* Clock Drawing Test-Modified and Integrated Approach (CDT-MIA): description and preliminary examination of its validity and reliability in dementia patients referred to a specialized psychogeriatric setting. *J Geriatr Psychiatry Neurol* 2004; **17**(2): 73–80.

30 Moretti R, Torre P, Antonello RM, Cazzato G, Bava A. Ten-Point Clock Test: a correlation analysis with other neuropsychological tests in dementia. *Int J Geriatr Psychiatry* 2002; **17**(4): 347–53.

31 Manos PJ. Ten-point clock test sensitivity for Alzheimer's disease in patients with MMSE scores greater than 23. *Int J Geriatr Psychiatry* 1999; **14**(6): 454–8.

32 Shulman KI. Clock-drawing: is it the ideal cognitive screening test? *Int J Geriatr Psychiatry* 2000; **15**(6): 548–61.

33 Manos PJ. The utility of the ten-point clock test as a screen for cognitive impairment in general hospital patients. *Gen Hosp Psychiatry* 1997; **19**(6): 439–44.

34 Shulman KSR, Silver I. The challenge of time: clock drawing and cognitive function in the elderly. *Int J Geriatr Psychiatry* 1986; **1**: 135–40.

35 Brodaty H, Moore CM. The Clock Drawing Test for dementia of the Alzheimer's type: a comparison of three scoring methods in a memory disorders clinic. *Int J Geriatr Psychiatry* 1997; **12**(6): 619–27.

36 Seigerschmidt E, Mosch E, Siemen M, Forstl H, Bickel H. The clock drawing test and questionable dementia: reliability and validity. *Int J Geriatr Psychiatry* 2002; **17**(11): 1048–54.

37 Ainslie NK, Murden RA. Effect of education on the clock-drawing dementia screen in non-demented elderly persons. *J Am Geriatr Soc* 1993; **41**(3): 249–52.

38 Kirby M, Denihan A, Bruce I, Coakley D, Lawlor BA. The clock drawing test in primary care: sensitivity in dementia detection and specificity against normal and depressed elderly. *Int J Geriatr Psychiatry* 2001; **16**(10): 935–40.

39 Parker C, Philp I. Screening for cognitive impairment among older people in black and minority ethnic groups. *Age Ageing* 2004; **33**(5): 447–52.

40 Shulman KGD, Cohen C, Zucchero C. Clock-drawing and dementia in the community: a longitudinal study. *Int J Geriatr Psychiatry* 1993; **8**: 487–96.

41 Borson S, Scanlan J, Brush M, Vitaliano P, Dokmak A. The mini-cog: a cognitive 'vital signs' measure for dementia screening in multi-lingual elderly. *Int J Geriatr Psychiatry* 2000; **15**(11): 1021–7.

42 Huntzinger JA, Rosse RB, Schwartz BL, Ross LA, Deutsch SI. Clock drawing in the screening assessment of cognitive impairment in an ambulatory care setting: a preliminary report. *Gen Hosp Psychiatry* 1992; **14**(2): 142–4.

43 Hearn J, Higginson IJ. Development and validation of a core outcome measure for palliative care: the palliative care outcome scale. Palliative Care Core Audit Project Advisory Group. *Qual Health Care* 1999; **8**(4): 219–27.

44 Stillman MJ, Rybicki LA. The bedside confusion scale: development of a portable bedside test for confusion and its application to the palliative medicine population. *J Palliat Med* 2000; **3**(4): 449–56.