10-Point Clock Test Screens for Cognitive Impairment in Clinic and Hospital Settings

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The obvious sometimes bears repeating: Sick people have trouble thinking. They may be suffering from a delirium, a dementia or a more subtle disturbance of cognition caused by fever, drugs, infection, inflammation, trauma, hypoxemia, metabolic derangement, hypotension, tumor, intracranial pathology, pain and so forth.

The obvious sometimes bears repeating: Sick people have trouble thinking. They may be suffering from a delirium, a dementia or a more subtle disturbance of cognition caused by fever, drugs, infection, inflammation, trauma, hypoxemia, metabolic derangement, hypotension, tumor, intracranial pathology, pain and so forth. All clinicians know this, and psychiatric consultants in the general hospital or the clinic may know it best of all, as they are specifically charged with the assessment of the patient's thought processes.

Yet formal cognitive testing is often difficult because of the threat it poses to the patient's sense of integrity. Of course, it is true that the astute clinician, after history taking, often identifies problems, even makes the correct diagnosis, simply by sitting at the bedside and "chatting" with the patient. How does this clinician document findings, demonstrate them to colleagues and family members, and track changes in cognition from day to day without alienating the patient? Everyone has his or her methods, of course. I would like to share one of mine.

**Administration of the 10-Point Clock Test**

Beginning in 1986, a series of authors began to describe the use of different types of clock-drawing tests for the identification of dementia (Shulman et al., 1986; Sunderland et al., 1989; Wolf-Klein et al., 1989; Mendez and Underwood, 1992; Tuokko et al., 1993; Watson et al., 1993; Freedman et al., 1994). Some suggested that these tests might be useful for the detection of delirium (Shulman et al., 1986; Trezepacz and Wise, 1997).

Before I was familiar with the clock-drawing literature cited above, I began administering my own clock test to patients after about 10 years of full-time inpatient hospital consultation work, and after having been scowled at frequently, if not inevitably, by the defensive and cognitively impaired patients whose wits I had endeavored to test by other means.

I told my patients that when people were ill they had trouble concentrating and that I wished to observe their concentration abilities. I traced a four-inch diameter circle in the chart and then asked the patient to write in the numbers that appear in the face of a clock. When they had finished that task, I asked them to make the clock read ten minutes after 11, consciously avoiding mention of the hands of a clock. This is the entire procedure for the administration of the 10-point clock test (Manos and Wu, 1994). Eventually, I produced a clear plastic template, four inches in diameter and divided into eighths, both to trace the circle and score the test.

To score, the clock is divided into eighths, beginning with a line through the number 12 and the center of the circle. (If the 12 is missing, its position is assumed to be counterclockwise from the 1 at a distance equal to that between the 1 and 2.) Any straight edge may be used to divide the clock into eighths. This is accomplished more quickly by placing the clear, flat plastic template over the circle with a line through the number 12.

One point each is given for the numbers 1, 2, 4, 5, 7, 8, 10, and 11 if at least half the area of the number is in the proper octant of the circle relative to the number 12. One point each is given for an obvious short hand pointing at the 11 and an obvious long hand pointing to the 2. The difference in the length of the hands must be obvious at a glance. The advantage of a large (relative to the size of handwritten numbers), uniform, standard-sized circle is that it permits scoring based on the position of the numbers (Figure 1).
Interpretation of the Score for Cognitive Impairment

A score of 10 suggests that cognitive impairment (CI) is unlikely, although isolated short-term memory impairment such as that seen with carbon monoxide poisoning may be missed. A score of eight or nine must be interpreted clinically. However, a score of less than eight indicates almost CI, and a score of less than five indicates prominent impairment. In medically stable patients, scores remain stable from one day to the next. Interrater reliability is good and the clock scores correlate with a number of formal neuropsychological tests.

Two gerontologists administered the 10-point clock test to a series of ambulatory outpatients with dementia (mean Mini-Mental State Examination [MMSE] score=20)-principally Alzheimer's disease but also multi-infarct dementia and mixed or atypical dementia (Folstein et al., 1975). Seventy-six percent scored less than eight points. These data were reanalyzed (Manos, in press) for 16 patients with Alzheimer's disease and MMSE scores greater than 23 (mean score = 26). Seventy percent of these very mildly impaired patients scored less than eight points. Eighty-two percent of control subjects (mean age 78) scored greater than seven points.

Hence, this quick screen can be helpful in the office with patients whose difficulty may escape casual questioning.

Test Utility in the General Hospital

When nurses rated their medical and surgical inpatients on a clinical scale of CI (0=none, 4=severe), the Spearman's correlation between clock scores and nursing scores was 0.6, i.e., the more impaired the patients, the lower the clock score. In a separate study of patients referred for psychiatric consultation (Manos, 1997), the test was particularly sensitive to dementia and delirium, but also identified a significant fraction of patients with opioid intoxication, and the less well-defined DSM-IV diagnosis of cognitive disorder not otherwise specified.

For the diagnosis adjustment reaction, in which minimal cognitive disturbance is expected, only 5% of patients scored less than eight points (Table). Note that none of the patients with major depression, alcohol dependence and adjustment reaction scored less than five points. This observation is the basis for "prominent" designation of the CI identified by a score of less than five. Note also that none of the patients with dementia or delirium scored 10 points, and only 10% and 14% of patients with opioid intoxication or cognitive disorder not otherwise specified, respectively, did so. This is the basis for saying that a score of 10 suggests CI is unlikely.

Any of the 11 medical problems listed in the first paragraph can disturb any test of cognition; hence, without a medical history, no cognitive test makes a diagnosis. A score of less than eight on the 10-point clock test indicates CI. It does not replace formal testing in the domains of memory, for example, or word fluency. It is not an alternative to formal neuropsychiatric testing when that is clinically indicated. The clinician, not the clock test score, determines what is to be done next.

Monitoring Cognitive Improvement in Delirium

Although the 10-point clock test is reasonably good at identifying CI, its value is not limited to screening. It can be used repeatedly to monitor cognitive improvement as illustrated below (Manos, in press).

Mr. P, an 80-year-old man living independently in an apartment, developed a delirium the night after an operation. The consultant was asked to see him on postoperative day 3 because of his agitation and confusion. He was too somnolent and confused to take the 10-point clock test at that time. By postoperative day 10, his delirium had cleared although he remained cognitively impaired (10-point clock score=5). Figure 2 illustrates the course of Mr. P's cognitive improvement. The consultant is often asked to see the delirious elderly patient, especially when delirium lasts for more than a few days (Manos and Wu, 1997).

Impaired cognition following the resolution of delirium may be common in the elderly, representing lingering signs and symptoms of the delirium (Levkoff et al., 1992; Rockwood, 1993) or baseline cognitive disturbance or both.

Patients accept the 10-point clock test relatively well, even if it is administered day after day in the general hospital. The drawing of a deranged clock in a patient's chart serves to immediately and graphically notify staff of potential problems in patient management, education and compliance. It is also a confirmation of a clinical impression. As the patient population ages and the criteria for hospital admission become more restricted, the percentage of cognitively impaired patients in the
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