BRIEF REPORTS

Diagnosing Delirium by Telephone

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To determine whether delirium can be diagnosed by telephone, we interviewed 41 subjects aged 65 years or older 1 month after repair of hip fracture, first by telephone and then face-to-face. Interviews included the modified telephone Mini-Mental State Examination and the Delirium Symptom Interview. Delirium was diagnosed using the Confusion Assessment Method diagnostic algorithm, and the telephone results were compared with the face-to-face results (the "gold standard"). Of 41 subjects, 6 were delirious by face-to-face assessment; all 6 were delirious by telephone (sensitivity 1.00). Of 35 patients not delirious by face-to-face assessment, 33 patients were not delirious by telephone (specificity = 0.94). We conclude that telephone interviews can effectively rule out delirium, but the positive diagnosis should be confirmed by a face-to-face assessment, especially in populations with a low prevalence of delirium.

KEY WORDS: delirium; telephone diagnosis; Confusion Assessment Method.

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Delirium is a common problem, affecting 20% to 40% of hospitalized elders.¹ Epidemiologic evidence suggests that a significant proportion of delirious patients require months to return to baseline.² As acutely ill patients are increasingly managed in settings other than the hospital, delirium may occur in rehabilitation, skilled nursing, and home care settings. Heretofore, the assessment of delirium has required a face-to-face interview.³⁻⁵ This poses a significant logistic challenge for patients in settings other than the hospital. A telephone assessment of delirium would greatly aid research and clinical care, but has not yet been validated. This report presents a validation study comparing a telephone strategy with the "gold standard" of face-to-face interviews.

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METHODS

Subjects

All eligible patients were aged 65 years or older and had been admitted to an urban teaching hospital for repair of hip fracture. Subjects consented preoperatively or within 24 hours of surgery and underwent an intake assessment to determine prefracture cognitive and functional status. Thereafter, they underwent daily interviews to detect delirium throughout the hospital stay. One month after surgery, subjects were contacted by telephone for follow-up mental status testing. Of 58 enrolled subjects, 17 were excluded from this validation study: 4 were unable to use a telephone at baseline (prefracture) owing to dementia or aphasia, 3 died, 1 refused follow-up, and 9 were out of geographic range for face-to-face interviews (within 10 miles of the hospital).

One-Month Follow-up Interviews

The telephone interview consisted of the modified Mini-Mental State Examination (MMSE) for telephone,^{6,7} and the Delirium Symptom Interview (DSI), which were used to elicit specific symptoms of delirium.⁵ Telephone interviews were completed on 35 of 41 patients; their caregivers reported the remaining 6 patients to be too confused to converse on the telephone. The time required to complete the telephone interviews averaged 15 to 20 minutes.

Using data from the MMSE and the DSI, the interviewer completed the Confusion Assessment Method diagnostic algorithm (CAM),⁴ which requires that the subject demonstrate an acute change in mental status with a fluctuating course, inattention, and either disorganized thinking or an altered level of consciousness. The CAM has been validated.⁴

A face-to-face interview was completed as soon as logistically possible after the telephone interview: the interval was 1 day for 10 subjects, 2 days for 12 subjects, 3 days for 11 subjects, and 4 days for 8 subjects. The MMSE, DSI, and CAM were again completed. Twenty-one face-to-face interviews were conducted in subjects' homes, 15 in skilled nursing facilities, and 5 in rehabilitation hospitals.

Outcome Definition

After telephone interviews, subjects were considered delirious by one of two criteria: (1) they completed the interview and were diagnosed with delirium using the CAM; or (2) they were unable to complete the telephone interview

because they were too confused—as all subjects could use the telephone at baseline, these patients were felt to have an acute decline in their cognitive function.

Face-to-face interviews were completed on all subjects. The CAM provided the only criteria used to diagnose delirium after face-to-face interviews.

Data Analysis

The κ statistic was used to assess the degree of concordance between the diagnosis of delirium by telephone and that by face-to-face interview.⁸ The test characteristics of the telephone assessment, including sensitivity, specificity, positive predictive value, and negative predictive value,⁹ were calculated using face-to-face assessment as the “gold standard.”

RESULTS

Study Population

The 41 subjects had mean age $\pm$ SD of 78 ± 8 years; 83% were women, and 32% had prefracture dementia based on enrollment interviews. Fifteen subjects (37%) developed postoperative delirium, and 4 (10%) were delirious at the time of hospital discharge. The mean length of hospital stay $\pm$ SD was 6 ± 4 days.

At 1-month follow-up, 6 (15%) of the 41 patients were too confused to be interviewed by telephone and were considered delirious. Thirty-five subjects completed telephone interviews. Two (5%) were diagnosed with delirium using the CAM. Thus, a total of 8 (20%) of the 41 were delirious by telephone. After face-to-face interviews, 6 (15%) of the 41 patients were diagnosed with delirium: 4 were in skilled nursing facilities, 1 in a rehabilitation hospital, and 1 at home. All patients with delirium at 1-month follow-up had been delirious in the hospital, but not all were delirious at discharge.

Concordance of Telephone and Face-to-Face Assessments

The concordance of telephone and face-to-face assessments of delirium is shown in Table 1. Of the 8 subjects diagnosed with delirium by telephone, 6 were confirmed by face-to-face interviews: 4 (67%) of the 6 subjects too confused to complete the telephone interview and both of the subjects delirious by telephone CAM. None of the 33 patients not delirious by telephone was found to be delirious after face-to-face interview. The overall κ statistic for concordance was 0.82. There was no relation between the time interval between interviews and concordance.

Test Characteristics of the Telephone Assessment for Delirium

The test characteristics of the telephone assessment are described in Table 2. These data demonstrate the value

Table 1. Concordance of Telephone and Face-to-Face Interviews for the Diagnosis of Delirium ($\kappa = 0.82$)

Telephone*	Face-to-Face†		
	Delirium Positive	Delirium Negative	Telephone Totals
Delirium positive			
Unable to interview	4	2	6
Interview positive	2	0	2
Delirium negative by interview	0	33	33
Face-to-face totals	6	35	41

*For telephone interviews, delirium was determined using the Confusion Assessment Method diagnostic algorithm (CAM) or by the subject being too confused to complete the interview (all subjects were able to use the telephone prior to the fracture).

†For face-to-face interviews, delirium was determined using the CAM, which requires that the subject demonstrate an acute change in mental status with a fluctuating course, inattention, and either disorganized thinking or an altered level of consciousness.

of the telephone interview to rule out delirium, as evidenced by its 100% sensitivity. Conversely, despite a specificity of 94%, the positive predictive value was only 75% with our population's 15% prevalence of delirium.

DISCUSSION

In this report, we present results suggesting that telephone interviews are useful for assessing delirium. Of 41 subjects interviewed by telephone 1 month after hip fracture repair, 8 (20%) were diagnosed with delirium; 6 of these 8 were confirmed by face-to-face assessment. Thirty-three patients had a negative telephone interview for delirium; none was found to be delirious on face-to-face assessment.

Our findings are useful to both researchers and clinicians. Delirium is a major barrier to recovery from acute illness,¹⁰ but heretofore its assessment has required a face-to-face interview. This is logistically difficult and costly once patients have been discharged from the hospital. Our findings support using the telephone to “check-up” on patients and can be added to the growing literature citing the benefits of “telephone medicine.”¹¹ A negative telephone

Table 2. Test Characteristics of the Telephone Assessment for Delirium

Test Characteristic*	Delirium	95% Confidence Interval†
Sensitivity	6/6 = 1.00	0.60, 1.00
Specificity	33/35 = 0.94	0.81, 0.99
Positive predictive value	6/8 = 0.75	0.32, 0.95
Negative predictive value	33/33 = 1.00	0.90, 1.00

*The test characteristics refer to the telephone assessment, with the “gold standard” being the face-to-face Confusion Assessment Method diagnostic algorithm (CAM).

†Confidence intervals for binomial proportions.

assessment for delirium effectively ruled out the diagnosis in our study population. Should the telephone interview suggest new or recurrent delirium, prompt evaluation by a clinician may be indicated. From a research standpoint, telephone assessment with face-to-face confirmation of positive results would have eliminated the need for face-to-face assessment in 80% of our patients.

In our study, all patients with delirium at follow-up had delirium in the hospital. However, before limiting follow-up to this subgroup, this finding should be confirmed in other populations. An alternative strategy of using a reliable caregiver to complete the CAM should also be examined.

Our study has several limitations. First, the fluctuating nature of delirium made the coordination of telephone and face-to-face assessments by trained interviewers challenging. Because of the wide variety of subject locations (home, hospital, nursing home), simultaneous telephone assessment and face-to-face assessment was not possible. However, the interval between the interviews was minimized, and we found no association between this time interval and concordance. Second, the study was carried out on patients recovering 1 month after hip fracture repair. The baseline prevalence of dementia was 32%, and the prevalence of delirium at 1 month was 15%, both typical for a frail elderly population after hospitalization. A telephone strategy may be less useful in very demented patients who are unable to use the telephone at baseline. Finally, the number of delirious patients in our study was relatively small; this leads to wide confidence intervals for some of our estimates of test characteristics.

Delirium, a common problem among acutely ill elderly patients, adversely impacts their recovery and may extend well beyond the acute hospital stay. In this report, we provide a useful strategy for researchers and clinicians wishing to assess delirium over the telephone. Delirium was effectively ruled out in 80% of subjects using a telephone interview. Of the remaining subjects diagnosed with delirium by telephone, 75% were confirmed by face-to-face

assessment. The approach of telephone assessment with face-to-face confirmation of positive results should facilitate closer monitoring and follow-up of vulnerable patients outside the hospital.

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