Background: Ictal confusion, particularly if protracted, often presents a diagnostic challenge.

Objectives: To define protracted ictal confusion in elderly patients and to characterize its features and outcome.

Design: Case series.

Setting: Neurology outpatient and emergency departments at 2 tertiary care centers.

Patients: Consecutive series of 22 ambulatory patients with acute ictal confusion.

Main Outcome Measures: Duration of ictal confusion was correlated with age and lesions noted on cerebral images and videoelectroencephalographic studies.

Results: The ictal basis underlying confusion was not recognized for up to 5 days in 22 patients (mean ± SD age, 70 ± 8.5 years). Twenty patients had partial complex status epilepticus, and 2 patients had newly diagnosed primary generalized status epilepticus. Motor movements were not present in either group, although reduced mood states and ictal neglect were noted in some patients. Fifteen patients had previous episodes (2-10) of protracted ictal confusion. Once identified, treatment reversed confusion, and eventually patients were discharged to home, although a few patients sustained persistent reduction in baseline cognition.

Conclusions: Protracted ictal confusion is often not considered in the ambulatory elderly patient, with resulting delay in diagnosis. Electroencephalographic and videoelectroencephalographic studies performed while the patient is experiencing symptoms are crucial to early diagnosis and timely management.
undertaken to better define protracted ictal confusion in elderly patients and to characterize its features and outcome.

### METHODS

**PATIENTS**

We reviewed the medical records for a consecutive series of ambulatory elderly patients with prolonged confusion seen in the clinic or emergency department at the Comprehensive Epilepsy Program, University of Wisconsin–Madison, or the Department of Neurology, Mayo Clinic, Scottsdale, Ariz. The following data were collected: demographic, clinical seizure activity, EEG, and status epilepticus management.

Ictal confusion episodes were defined as episodes during which the patient was unable to function and think with customary speed, clarity, and coherence and that were associated with EEG features consistent with status epilepticus. Only patients with episodes of ictal confusion with or without subtle clonic activity were included in the study. Patients in an intensive care setting or who were hospitalized because of serious metabolic disorders were excluded.

Semiology before the patient was seen was correlated with clinical manifestations once the ictal nature of the confusion was determined. Time to diagnosis was then determined as the interval between the estimates of onset and the confirmation of the diagnosis. Localization and character of the electrographic seizures were characterized at EEG.

Duration of confusion before the patient was seen was determined by history. In patients without observable motor activity, onset of confusion was often difficult for family members to determine. In such cases, a conservative estimate of duration of confusion was made by noting the time when delirium onset of confusion was often difficult for family members to determine. In such cases, a conservative estimate of duration of confusion was made by noting the time when delirious activity, onset of confusion was often difficult for family members to determine. In such cases, a conservative estimate of duration of confusion was made by noting the time when delirious

### RESULTS

**TIME TO DIAGNOSIS**

Time to diagnosis was delayed in all 22 patients (Table 1 and Table 2). Duration of confusion was 1 to 140 hours (mean ± SD, 31 ± 30 hours) before a diagnosis of protracted ictal confusion was made. In 7 patients, the index episode of status epilepticus was the first occurrence of protracted ictal confusion. These 7 patients had status epilepticus for a mean of 37 hours. Fifteen patients had recurrent protracted ictal confusion, occur-
ring 2 to 10 times previously. In these 15 patients, there was a trend toward earlier diagnosis (mean, 22 hours) compared with the 7 patients with initial protracted ictal confusion ($P = .13$, $t$ test). Previous recurrence of protracted ictal confusion occurred in 15 patients.

**SEMILOGY**

All patients had protracted confusion, although some had fluctuating levels of responsiveness. Typically during protracted ictal confusion, patients appeared bewildered, had impaired attention and concentration, or had impairment of goal-directed action. Speech was reduced to simple semiautomatic phrases or gestures; counting or repetition of the alphabet typically was impossible. Subtle ictal manifestations included a subtle gaze preference and low-amplitude fragmentary myoclonic jerks, typically in the face, eyelids, or hands, and at times associated with hand automatism. Some patients had contralateral apraxia, such that a command to raise the hands was followed only with the hand ipsilateral to the hemisphere with status epilepticus. Regardless, patients who were able to respond to commands had impairment of motor activity. Speech was often reduced to phrases.

**INITIAL DIAGNOSIS**

Initial diagnosis in 7 patients with a first episode of protracted ictal confusion was dementia, transient ischemic event, a metabolic disorder, or a psychiatric disorder. In most patients with previous protracted ictal confusion, the confusion was attributed to exacerbation of underlying neurocognitive impairment or to dementia, depression, or a movement disorder. In the remaining patients, dementia, depression, or a movement disorder was the initial diagnosis. In 5 patients without preexisting neurologic conditions, the diagnosis was delayed for 14 hours.

**ELECTROGRAPHIC SEIZURE CHARACTERISTICS**

Electrographic seizures were partial in 13 patients and were either diffuse or frankly generalized in 9 patients (Table 1). Partial status epilepticus remained regionalized, typically with a persistent repetition rate of 2 to 3 Hz. Partial status epilepticus was frontally predominant in 5 patients, although in 4 other patients there was either a frontocentral or temporal distribution. Seven patients had protracted ictal confusion with diffuse epileptiform discharges. We were surprised to note a pattern suggestive of true primary generalized epilepsy in 2 patients. In both of these patients, the generalized spike wave discharges alternated with a normal background that was associated with a posterior dominant rhythm in the alpha range.

**MAGNETIC RESONANCE IMAGING**

Nine patients had normal MRIs. In 13 patients, MRIs exhibited lesions; in only 5 patients did the lesion correspond with EEG flocality, and in the remainder, the MRIs showed nonspecific small-vessel disease or atrophy. Lesions were most commonly consistent with small-vessel disease or nonspecific atrophy. Two patients had middle cerebral artery stroke. In both of these patients, the electrographic seizures were localized to the region of the stroke. Time to diagnosis was considerably longer (34 hours) if the MRIs was normal than if the MRIs showed a lesion (21 hours). Patients with lesions seen on MRIs, however, were more likely to have had recurrence of protracted ictal confusion.

**ANTIEPILEPTIC DRUGS USED TO CONTROL STATUS EPILEPTICUS**

Seizures were controlled with phenytoin sodium alone in 5 patients. Thirteen patients were treated acutely with lorazepam and subsequently with loading doses of phenytoin, and seizures were eventually controlled. In 2 patients, primary generalized seizures were treated successfully with valproate sodium administered intravenously. In 2 patients, pentobarbital sodium–induced coma was required for 2 to 7 days to control protracted ictal confusion. Findings in both of these patients returned to baseline, although with some suggestion of loss of cognitive skills. All patients were discharged with antiepileptic drugs.

Previous antiepileptic drugs that were used varied, and included both first-generation and second-generation antiepileptic drugs. Phenytoin and phenobarbital were the most commonly used medications for maintenance therapy, although leviteracetam was used in 5 patients and valproate in 2 patients. In 3 patients, a vagal nerve stimulator was implanted because of established epilepsy.

**CAUSE AND OUTCOME**

Premorbid causes included remote traumatic brain injury in 3 patients, senile dementia of the Alzheimer type in 4 patients, lupus erythematosus and lung cancer in 1 patient each, and primary generalized epilepsy in 2 patients.

All 22 patients eventually recovered from protracted ictal confusion and could be discharged to home (Table 2). More than half of all patients required a few weeks of rehabilitation before they could be discharged to home. Older patients generally required intermediate care more frequently than younger patients did. Families of more than 14 patients reported a reduction in cognitive abilities or a worsening of previously identified minimal cognitive impairment. Both patients with primary generalized epilepsy had a full recovery.

**COMMENT**

Our findings suggest that the ictal basis underlying protracted confusion is often not appreciated in the elderly patient. Several contributing factors may underlie this diagnostic delay. In the context of a baseline neurocognitive impairment, discerning further subtle cognitive decline is difficult. Ambulation and the absence of subtle convulsive movements also contribute to diagnostic delay. Patients were grouped into 2 broad categories: those...
with isolated confusion and those with psychiatric symptoms in addition to confusion. Younger patients were more likely to manifest aggression, whereas older patients in this cohort were more likely to exhibit a depressive disposition. Depression was severe enough in 3 patients to prompt urgent formal psychiatric evaluation.

Tatum et al\textsuperscript{12} reported 5 elderly patients evaluated because of confusion in the context of presumed dementia who were later found to have complex partial seizures with pseudodementia. Features that delayed the correct diagnosis were subtle clinical signs, loss of awareness, or the occurrence of seizures during sleep. Uncharacteristically in dementia, patients in that study were lucid during many weeks of the month, which should have led to further diagnostic evaluation.

As in our study, delay in diagnosis is common. Thomas et al\textsuperscript{14} describing 10 patients with protracted ictal confusion, found diagnostic delays averaging 48 hours (range, 2-96 hours). The mean age of their patients was 56 years, younger than our population. Knake et al\textsuperscript{16} also reported diagnostic delays ranging from 18.6 to 430 hours.

Elderly patients have seizures more commonly than is generally appreciated. High prevalence of neurodegenerative disorders in this population seems to increase the risk for epilepsy by 2 to 20 times over that in the general population. In Germany, the rate of 54.2 per 100 000 population for protracted ictal confusion in the elderly was twice that in younger patients.\textsuperscript{16} As in our study, approximately 20% of patients had primary generalized nonconvulsive status epilepticus (primary generalized status epilepticus, 15%, and absence status epilepticus, 6%). Thomas et al\textsuperscript{13} reported 3 older patients with generalized polyspike and wave discharges that promptly responded to valproate therapy.

Imaging studies seem to be of limited value (Table 2). Even when lesions were detected, their location often was not thought to be consistent with the region or location of the ictal confusion. Negative symptoms, such as apraxia in the contralateral extremity, were sometimes noted in these patients. This finding may have raised the diagnostic suspicion of stroke rather than epilepsy. The diagnosis may have been complicated further by the presence of nonspecific white matter lesions on MRIs, suggestive of a vascular cause, not epilepsy.

An EEG and video-EEG studies, however, were useful in quickly identifying the ictal nature of the protracted confusion.\textsuperscript{17} DeLorenzo et al\textsuperscript{10} found that in elderly patients with nonconvulsive status epilepticus in an intensive care setting the mortality rate was 36% and was heavily determined by an underlying cause for protracted ictal confusion. Our patient population consisted of ambulatory patients, which may explain the more favorable prognosis in this series.

Given the retrospective nature of our study, precise quantification of degree of neuropsychologic compromise that occurred as a result of protracted ictal confusion was difficult. The critical goal appears to be determining how much added morbidity protracted ictal confusion contributed to a preexisting mild cognitive impairment that is so common in elderly populations. Identification and evaluation of previous neuropsychologic function is inherently difficult. Such efforts in future studies, however, could prove useful but would require large studies of dementia in patients identified as having pseudodementia caused by epilepsy.

In summary, our study results indicate that elderly ambulatory patients with confusion should undergo diagnostic EEG, particularly if the confusion is episodic or there have been previous episodes of protracted ictal confusion. Often, the family will note that the patient had a bad day or bad weekend. If EEG is not performed during the symptomatic period, the diagnosis is likely to be missed. Early aggressive treatment seems to be reasonable in these patients. To further investigate predictors, clinical features, and outcome in elderly patients with protracted ictal confusion, the establishment of a prospective multicenter database may be helpful.

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Correspondence: Raj D. Sheth, MD, Department of Neurology, University of Wisconsin–Madison, 600 Highland Ave, Box H6/574 CSC, Madison, WI 53792-5132 (sheth@neurology.wisc.edu).

Author Contributions: Study concept and design: Sheth and Hermann. Acquisition of data: Sheth, Drazkowski, and Sirven. Analysis and interpretation of data: Sheth, Sirven, Gidal, and Hermann. Drafting of the manuscript: Sheth and Drazkowski. Critical revision of the manuscript for important intellectual content: Sheth, Drazkowski, Sirven, Gidal, and Hermann. Statistical analysis: Sheth and Hermann. Study supervision: Drazkowski.

REFERENCES