Missed Opportunities in New-onset Seizures in the Emergency Department

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New-onset motor seizures, especially generalized convulsive seizures, are common but frightening to patients and bystanders and typically result in evaluation in the emergency department (ED). Emergency physicians are challenged to confirm whether the event precipitating the visit was indeed a seizure rather than a mimic such as stroke, syncope, nonepileptic spell, or migraine. When a true seizure is suspected, the next step is to identify a precipitating cause. This is usually done by obtaining a detailed medical history and performing a thorough physical examination. Sometimes diagnostic tests are necessary as well. Patients in whom no underlying reason for a first lifetime seizure is found may have had an isolated event or may develop recurring seizures and a diagnosis of epilepsy. The observational study by Pellinen et al.[1] published in this issue of *Academic Emergency Medicine* serves to teach us about this latter cohort of patients using a database of those subsequently diagnosed with focal epilepsy after an initial ED visit.

Focal seizures involve ictal activities produced by electrical impulses that start in a localized region of the brain. They can present with motor and nonmotor manifestations that vary according to the affected region of the brain originating the seizure impulses. Focal motor seizures present with subtle muscle activities such as jerking, loss of muscle tone, or repeated movements in isolated groups that can also rapidly generalize to involve the whole body. Focal nonmotor seizures do not present with muscle activity. Instead, they present with a variety of signs and symptoms of alterations in emotions, thinking, and sensations. Motor seizures are relatively identifiable, but subtle and nonspecific nonmotor focal seizures are difficult to diagnose in the ED.

Pellinen et al.[1] use a registry of patients with newly diagnosed focal epilepsy to describe the characteristics of a subset who presented to an ED shortly prior to their diagnosis. The authors note that the first onset of epilepsy was nonmotor focal seizures in slightly more than half of the patients in the ED subset, but that they rarely came to the ED for these types of seizures. Indeed, the initial presentation to the ED was for a first lifetime motor seizure in 90% and for a recurring motor seizure in another 5%. The patients with first lifetime motor seizures were correctly diagnosed as having had a seizure 86% of the time, but in those with prior nonmotor seizures the history of such events was only identified 21% of the time. Identification of prior nonmotor seizures did not seem to affect diagnosis or treatment of patients with first-time motor seizures. The authors conclude that improvement is needed in the recognition of seizures, particularly nonmotor focal seizures in the ED.

Accurate diagnosis and referral to specialized follow-up of patients with new-onset seizures is clearly in the wheelhouse of the emergency physician. The fact that patients with seizures present to the ED rather than to the primary care setting is not surprising. ED utilization in lieu of primary care has risen steadily. Affordability and access remain prevalent barriers to nonemergency health care for many. Relying on primary care follow-up to identify seizures missed in the ED seems unsafe. Pellilen et al. found that 83% of patients with first lifetime motor seizures who were later diagnosed with focal epilepsy were admitted or properly referred from their ED visit. However, the remaining 17% of patients with undiagnosed epilepsy who presented with a first lifetime motor seizure and

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who were discharged from the ED without a diagnosis, admission, or proper referral represent a substantial opportunity for improvement.

First lifetime seizures are a neurologic emergency warranting careful assessment and management.[2,3] Seizures could be triggered by potentially life-threatening underlying pathologies such as metabolic disorders, drug toxicities, CNS infections, intracranial hemorrhage, trauma, or structural brain lesions like tumors. Seizures and seizure-mimics can also result from more benign pathologies such as certain types of withdrawal, syncope, migraine, or psychogenic syndromes. Since all of these presentations are excluded from the cohort of epilepsy patients studied by Pellilen et al., their study does not teach us anything about the relative frequency of these diagnoses compared to those with new onset epilepsy. The morbidity and mortality associated with first-time seizures may also be underestimated due to diagnostic challenges.

Having excluded other causes of seizure, what do emergency physicians have to do for patients with first-lifetime motor seizures? The findings of Pellilen et al. reinforce the importance of obtaining a detailed medical history and performing a thorough physical examination to identify subtle clues of prior or ongoing seizures, especially nonmotor focal seizures. Patients may not connect prior episodes of sensory, cognitive, or emotional abnormalities to their index motor seizure unless specifically questioned. Subtle examination findings of myoclonus, twitching, blinking, or other automatisms and extrapyramidal signs may indicate continued ictal activity. Careful clinical evaluation may help diagnose epilepsy at the initial ED visit or risk stratify which patients get consultation and further diagnostic testing with MRI and EEG before discharge or as an outpatient. Multiple practice guidelines support outpatient testing and consultation but only if it can be obtained rapidly and reliably.[3–5] Per these recommendations, patients with a first-lifetime seizure should be evaluated within two weeks by a specialist.

The authors also imply that if emergency physicians had diagnosed epilepsy more often, by identifying a history of prior nonmotor focal seizures, emergency physicians could initiate treatment with antiepileptic drugs (AEDs) more often. It is more prudent, however, to defer the decision on initiation of an AED and the most appropriate AED to a neurologist. As usually described in the literature, "early initiation" of an AED typically refers to starting medication after the first neurology clinic visit, but could also refer to starting an AED in the ED. In either case, there is no evidence of long-term patient benefit from early initiation.[6] Guidelines suggest deferring initiation even if epilepsy can be diagnosed in the ED, especially if consultation can be conducted in an expeditious outpatient follow-up. Initiating an AED can be complex, involving confirmation of the diagnosis, titration of doses and agents, and management of adverse drug reactions. This assessment also should take into consideration the patients' preferences and circumstances. Indeed, the high rate of AED initiation reported by Pellilen et al., after first-lifetime seizure seems at variance with practice guidelines (even if it was based on the recommendation of a neurology consultant in the ED), and reducing this practice represents another opportunity for improving ED management of these patients.

There is much that the study by Pellilen et al. cannot teach us because of many limitations. It is susceptible to spectrum bias, since it only includes patients subsequently diagnosed with epilepsy and referred to specialty epilepsy clinics. Because it only enrolled patients whose seizure treatment started within 4 months of enrollment, the study systematically excludes patients experiencing long delays in diagnosis and treatment, potentially underestimating the magnitude of the problem. It is disappointing that this study did not include any data on the timing of diagnostic testing, especially EEG, in this patient population. There is evidence that acquisition of EEG closer to the time of a first-lifetime seizure has a higher diagnostic yield than studies obtained further out.[7] Finally, the study only enrolled patients within the age range of 12 to 60. Therefore, the findings might not be generalizable to young children or elderly patients.

What we can learn from Pellilen et al. is that there may be opportunities to improve several dimensions of emergency care for patients with first-lifetime seizures that subsequently end up having focal epilepsies. These include the potential to improve how often we correctly diagnose seizures and even epilepsy. It also includes more reliable and timely referral to neurology, fewer prescriptions (counter to the authors' insinuation), and better adherence to clinical guidelines on initiation of antiepileptic drugs. The path to improvement is less clear. There have been longstanding calls in the literature to improve neurologic training through emergency medicine residencies[8,9] or through professional development programs such as the Emergency Neurological Life Support program.[10] There

may also be opportunities for improvement associated with technologic innovations such as increased availability of smaller, less expensive, rapid emergency EEG systems.[11,12]

One way or another, these data suggest that we owe it to our patients with new-onset epilepsy to do better.

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