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## Inpatient Video-EEG Monitoring Aids in the Diagnosis and Localization of Difficult Seizure Cases

### The Challenge

Epilepsy occurs in approximately 1% of the US population. For many epilepsy patients, electroencephalography (EEG) successfully localizes and classifies seizure type as a basis for devising optimal treatment. But in some cases, EEG is not sufficiently discriminating to yield a precise diagnosis or a rational basis for initiating treatment.

Some patients present with conditions whose symptoms may be confused with epilepsy. These conditions include conversion-reaction disorders, anxiety disorders, cardiac arrhythmias, drug toxicity, migraine, mood disorders, orthostatic hypotension, panic attacks, transient ischemic attack, tremor, valvular heart disease, and vasovagal syncope. For these patients, a more comprehen-

### Points to Remember

- **A more precise diagnostic tool than electroencephalography (EEG) is often needed to clarify confusing symptoms, to diagnose and localize intractable recurrent seizures, or at times to confirm seizure diagnosis.**
- **Inpatient video-EEG monitoring provides continuous video footage of patient behavior during a seizure with time-matched EEG readings of brain activity.**
- **Research shows that inpatient video-EEG monitoring can detect previously undiagnosed seizures in up to 20% of monitored patients. Data also show that video-EEG monitoring can improve seizure control in as many as 60% to 70% of patients.**



**Figure. Continuous monitoring.** All 3 Mayo Clinic locations offer inpatient video-EEG monitoring units such as this one at Mayo Clinic in Rochester, Minnesota. Continuous monitoring of patient behavior coupled with long-term EEG recordings—in adults and children—helps clinicians determine spell type, localize seizure focus, and quantify the number of seizures or spells.

sive diagnostic tool (inpatient video-EEG monitoring) is needed to establish an accurate diagnosis and precise localization to assure optimal outcomes of treatment, including surgical resection. The potential indications for inpatient video-EEG monitoring include indeterminate spells that suggest possible seizure activity, seizure classification, quantification of seizure activity, and acute management of intractable seizures, ie, those previously refractory to medication.

### An Important Tool

Inpatient video-EEG monitoring is a specialized diagnostic procedure that simultaneously records patient behavior and brain wave activity (Figure). It is a powerful diagnostic aid in a safe environ-

To refer a patient to Mayo Clinic, please call: Rochester, Minnesota, 800-533-1564; Scottsdale/Phoenix, Arizona, 866-629-6362; Jacksonville, Florida, 800-634-1417.

### Conditions With Symptoms That May Be Confused With Epilepsy

- Anxiety disorders
- Behavioral spells
- Autonomic disorders
- Cardiac arrhythmias
- Cerebrovascular disease
- Drug toxicity
- Migraine
- Mood disorders
- Orthostatic hypotension
- Panic attacks
- Transient ischemic attack
- Tremor
- Valvular heart disease
- Vasovagal syncope
- Vestibular disorders

ment. For example, all the rooms on the inpatient video-EEG monitoring units at all 3 Mayo Clinic campuses are hard-wired with ceiling video cameras and monitored 24 hours every day by highly trained observers (see sidebar). Because patients are continually monitored in a fully equipped hospital setting, they can safely be taken off medications that might otherwise mask seizure activity. If emergency medication is needed, it can be admin-

istered quickly. Monitoring may be used anywhere from 24 hours to several days.

From the camera's visual data stream, physicians evaluate the patient's body responses to seizure discharge. They then integrate this information with the brain activity data obtained by continuous EEG recording, through either external or intracranial EEG leads, such as subdural grids or implanted depth electrodes. By correlating the 2 concurrent data streams of visually apparent behavior with internal electrical activity of the brain, video-EEG helps clinicians make more accurate diagnoses. Video-EEG also overcomes a common source of error in seizure classification: the eyewitness reports of friends or family members present during a seizure. Because these accounts are often emotionally charged, they may not be as reliable as continuous video camera documentation of seizure events.

### The Inpatient Advantage

Research shows that inpatient video-EEG monitoring can detect previously unconfirmed seizures in up to 20% of monitored patients. Among its advantages that lead to this improved detection rate are its abilities to localize seizure focus, quantify the number of seizures over time, and differentiate physiologic events that may be confused with epilepsy. Outcome data on inpatient video-EEG monitoring demonstrate that these improvements translate into better patient care: seizure control improves in as many as 60% to 70% of patients.

## Endoscopic Mucosal Resection for Barrett Esophagus–Related Dysplasia and Cancer

### The Challenge

Barrett esophagus (BE) is a premalignant metaplastic condition that has traditionally been challenging to diagnose, stage, and treat prior to the development of adenocarcinoma. An estimated 10% of patients with chronic reflux symptoms present with BE at endoscopy, and BE patients face a 30- to 125-fold increased risk of developing esophageal cancer in a progressive process that can be asymptomatic (Figure 1).

Early detection produces the best outcomes. But optimal diagnosis and management of cancers aris-

ing from BE have been hampered by the small size and unreliability of histologic samples available by traditional means of endoscopic biopsy. Missing an area of cancer or dysplasia is always a risk because the biopsy sample may not come from the most diseased area and most of the involved areas of advanced dysplasia or early cancer cannot be visually identified. Further complicating diagnosis is the distribution pattern of BE. It can occur diffusely over a large area, thus increasing the chances that a cancer may be misdiagnosed as dysplasia because too little cancerous tissue was evident in the limited











