Lowering epilepsy-related treatment costs in the era of patient choice and value-based care

In-home EEG offers cost-effective, reliable alternative to traditional diagnostic services
Introduction

One in 26 Americans will develop the neurological condition epilepsy in their lifetime. And in two-thirds of patients diagnosed with epilepsy, the cause remains unknown.

Epilepsy affects more than 60 million individuals around the globe, including 3 million in the United States, according to the Epilepsy Foundation. While the United States spends approximately $15.5 billion on epilepsy-related care each year, less than 25 percent of patients with uncontrolled seizures have access to epilepsy specialists, whose appointment backlogs can be as long as a month.

Patients who receive specialized care typically undergo electroencephalogram (EEG) testing. This most common way to diagnose epilepsy, is used by clinicians to objectively assess an individual’s brain activity, detect abnormalities and determine a course of action for the patient. This test is typically used to determine causation when a patient is in an altered mental state, assess comatose patients and observe seizure activity in conscious patients.

When diagnosing seizures, EEGs are used to monitor electrical impulses and seizure activity in the brain; if an abnormality is detected, a course of treatment can be developed for the patient. EEGs are also used to monitor the efficacy of the prescribed treatment, particularly with regards to asymptomatic seizures in patients with prior history.

When comparing EEG testing options, it is important to consider factors such as cost, quality, and patient convenience and comfort. There are four main testing options:

- Inpatient: Patients are admitted to the hospital for the test and monitored by staff.
- Outpatient: Patients are fitted EEG electrodes and a recording device at an ambulatory clinic and return home for testing. Patients return to the outpatient facility once the testing period is complete.
- Unmonitored in-home: EEG technologists setup and administer the testing in the patient’s home, but the test quality is unknown until the test is complete.
- Remote monitored in-home: EEG technologists setup and administer the testing in the home of the patient, who is then continuously monitored remotely for the entire test.

### Epilepsy: By the numbers

- **$15.5 billion**: Annual spend in the United States for epilepsy-related care
- **45,000**: Number of U.S. children diagnosed with epilepsy each year
- **$33,006**: Average emergency care costs for an individual with uncontrolled seizures
- **$2,274**: Average hospital visit costs for a child with epilepsy
- **$4,921.81**: Typical cost of in-patient EEG testing

---

1. “Who gets Epilepsy?” Epilepsy Foundation
3. Ibid.
Current landscape

Clinicians have long struggled to identify a cost-effective, convenient and reliable way to perform diagnostic EEG services outside of an inpatient clinical setting. While EEG tests historically have been administered on an inpatient basis—which may be medically necessary in some cases—a trip to the hospital can mean increased risk of infection, patient anxiety and a variety of potentially unnecessary overhead expenses, including consultation fees, nursing expenses, medications, IVs and admission fees.

Inpatient EEG testing also frequently requires wait times of up to three months. And patients undergoing outpatient or unmonitored in-home EEG testing—historically, the only alternative to an inpatient stay—are typically unmonitored, leading to repeated tests if the data collected is of poor quality and cannot be interpreted by a neurologist. In outpatient and inpatient settings alike, patients may have to travel long distances for testing, placing an additional burden on patients with driving restrictions.

As the healthcare industry transitions from a fee-for-service model and towards value-based care, the traditional inpatient and outpatient EEG testing options also pose considerable challenges for payers. With 50 percent of Medicare payments expected to be outcomes-based by 2018, clinicians are searching for a convenient, comfortable and reliable way to perform diagnostic EEG services in a more cost-effective manner.

Cost

Although there are times when an inpatient EEG is medically necessary, there are many circumstances when an in-home EEG can replace a stay in the hospital. When an EEG is conducted as an inpatient procedure, the payer and patient incur additional—often unnecessary—consultation and admission fees beyond the cost of the actual diagnostic procedure performed.

In contrast, in-home EEG is a value-based, high-quality epilepsy testing solution that patients overwhelmingly prefer.

A monitored in-home EEG is comparable to a hospital admission for the inpatient code DRG 101, Seizures w/o MCC, a procedure that typically costs $4,921.81, according to Centers for Medicare & Medicaid Services (CMS) charge data. As a comparison, in-home EEG charges per day are typically about $2,500, with managed care contracting rates which are significantly lower. In-home EEG procedures also are only billed for global and technical CPT codes (95812, 95813, 95816, 95819, 96951 and 96956).

Quality

Monitored in-home EEG offers remote observation capabilities that ensure quality results, minimizing the need for expensive repeat testing. To achieve consistent results, this alternative remotely monitors patients 24 hours a day, and continually monitors the impedance level of each patient’s electrode connections and reminds the patient to stay on video, if applicable. This allows monitoring technologists to address any problems by remotely accessing the patient’s equipment or dispatching an on-call technologist to the patient’s home to fix the problem—virtually eliminating the need for re-testing.

Recent clinical research confirms these benefits of in-home EEG testing in a variety of clinical situations, including those patients whose conditions may be affected by a hospital stay.

“This option is substantially more cost-effective than its inpatient counterparts, safe, and readily available, and it may obviate the need for intensive inpatient VEEG monitoring in select patients,” according to a 2013 Epilepsy & Behavior Case Reports study. “A further advantage of aEEG may be that spontaneous seizure frequency appears to decrease in patients with drug-refractory epilepsy on admission to a monitoring unit.”

5 “New horizons After reform transformation” EY, 2015
6 National Bureau of Economic Research
7 Neurotech data
8 “Outpatient ambulatory EEG as an option for epilepsy surgery evaluation instead of inpatient EEG telemetry,” Epilepsy & Behavior Case Reports, 2013
In-home EEGs are administered by EEG technologists, who undergo rigorous training at an accredited educational institution and demonstrate extensive knowledge of electroneurodiagnostics. They review each test in its entirety, identifying abnormalities which cannot be otherwise detected as well as "artifacts" that can corrupt the results, and note true brain signal irregularities which are important for the interpreting neurologist to make an accurate diagnosis.

**Patient satisfaction**

Surveys show that more than 90 percent of patients give high marks to this alternative diagnostic option, as it alleviates the need for them to drive—a challenge for many individuals with epilepsy—and results in fewer out-of-pocket costs for individuals with high-deductible health plans. In-home studies allow patients to continue their normal day-to-day activities and enjoy the comfort and privacy of their home. It also eliminates a patient’s fear of going to a hospital or physician’s office. This sense of security results in a more cooperative patient, leading to a more accurate diagnosis. Many physicians believe in-home EEG testing increases the likelihood of the patient having a typical episode, as they are in their natural environment. They also can be used to conduct a variety of EEG tests with or without video, including routine, sleep-deprived, and short- and long-term recordings.

Through a secured website, referring physicians have immediate access to test results, online records, dictation services, technologist’s impression and epileptologist’s comments.

In addition, monitored in-home EEG services allow for preliminary reads; for these reads, a fellowship-trained epileptologist reviews all clipped “tech events” and “patient events” that are pruned by EEG technologists. These preliminary reads result in two comments for each event—one from a registered EEG technologist and one from a physician. These professional opinions provide referring neurologists with helpful interpretations of a patient’s EEG results.

**Categorization of service**

In-home EEG services can be categorized in a variety of ways, including as a physiological lab, diagnostic testing facility, physician practice or ancillary service provider. The flexibility provided by in-home EEG allows commercial, government and other payers to categorize these diagnostic services based on their existing taxonomies, providing a convenient, cost-effective diagnostic solution that can be quickly implemented with minimal system updates.

Flexible categorization of service with in-home EEG also allows any system compatibility issues to be addressed early on in the process, minimizing the need for time-consuming paperwork and reimbursement troubleshooting down the road.

**Health systems integration**

In-home monitored EEG testing works seamlessly across the continuum of care, a top concern today for all healthcare stakeholders. A turnkey diagnostic solution, in-home EEG integrates with existing provider systems to deliver customized test results that offer superior insights into a patient’s condition.
**Conclusion**

As the healthcare industry continues to transition towards a value-based care model, finding a cost-effective, convenient, comfortable and reliable alternative to traditional diagnostic EEG services will be a priority for payers. Monitored in-home EEG testing is a proven solution that provides high-quality diagnostic services that patients prefer—and at about half the cost of a comparable inpatient procedure.

This option also begins and ends in a patient’s home, eliminating transportation concerns, capturing familiar seizure triggers, enhancing patient compliance, reducing patient anxiety and allowing patients to perform everyday tasks. It also is typically scheduled and completed within two weeks, leading to prompt diagnosis, fewer emergency room visits and improved patient outcomes.

---

**About Neurotech, LLC.**

Neurotech has been providing the most clinically comprehensive in-home electroencephalogram (EEG) service in the industry since 2006 with a commitment to consistently deliver a positive patient experience. We provide Routine, Sleep Deprived, Short- and Long-Term EEG recordings that are monitored by registered, on-call technologists. Our integrity, prompt scheduling and cost-effective service enables timely, accurate diagnoses of neurological disorders while improving the lives of our patients and their families.
<table>
<thead>
<tr>
<th>Cost</th>
<th>Inpatient Hospital EEG</th>
<th>Neurotech Monitored EEG</th>
<th>Traditional Ambulatory EEG at clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other charges apply or bundled with EEG</td>
<td>Only EEG CPT codes billed - global and technical only 95812, 95813, 95816, 95819, 95951, 95956</td>
<td>Only EEG CPT codes billed. Note: some providers bill CPT 95957 (digital EEG analysis) in addition to EEG codes. Neurotech does not; following AAN guidelines.</td>
<td></td>
</tr>
<tr>
<td>- Nursing</td>
<td>- EEG code 93041 - tracing only - billed when ordered by physician</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IV/Fluids</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Medication</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Physician visit fees</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Neurotech bills only for the EEG – saving payer additional charges**

<table>
<thead>
<tr>
<th>Quality</th>
<th>EEG monitored by hospital staff</th>
<th>Remote monitoring technologists (R. EEG T.) check impedances (electrode connections) and video compliance (if ordered) every hour – ensuring quality results</th>
<th>EEG not monitored; test may need to be repeated. -Impedance (electrode connections) and video quality unknown until test complete. - Equipment failure not identified</th>
</tr>
</thead>
</table>

**Neurotech’s remote monitoring ensures quality results, minimizing need for repeat test**

<table>
<thead>
<tr>
<th>Utilization</th>
<th>Specifics unknown: presuming eligibility checked and preauthorization obtained when required.</th>
<th>Neurotech’s dedicated billing staff works closely with all insurers, providing all necessary documentation to follow each patient’s individual policy, checking eligibility and insurance benefits, and obtaining prior authorization, if necessary, and pre-determining benefits prior to each patient’s scheduling.</th>
<th>Specifics unknown: presuming eligibility checked and preauthorization obtained when required.</th>
</tr>
</thead>
</table>

**Neurotech’s quality controls lead to a shift from inpatient to outpatient EEG’s – lowering overall costs without an increase in overall utilization**

<table>
<thead>
<tr>
<th>Location</th>
<th>EEG in hospital - Risks associated with inpatient care (DVT, infection, etc.) - Common seizure triggers not present - Patient unable to work or go to school.</th>
<th>EEG begins and ends in patient home - Eliminating transportation concerns - Capturing familiar seizure triggers - Enhancing patient compliance - Reducing patient anxiety - Patient able to perform normal daily tasks or go to work/school.</th>
<th>EEG begins and ends at facility/office, often requiring return visits during EEG for battery checks, etc.</th>
</tr>
</thead>
</table>

**Patient convenience expedites patient compliance**

<table>
<thead>
<tr>
<th>Wait Time</th>
<th>Wait time can be significant – two to three months</th>
<th>Multiple techs and equipment ensures patients scheduled within an average of two weeks</th>
<th>Wait time dependent upon equipment and staff availability</th>
</tr>
</thead>
</table>

**Prompt EEG testing, prompt diagnosis – leads to improved patient outcomes, fewer emergency room visits for seizures**