

The Time is Now for Mobile Home Video EEG Telemetry

Home Video-EEG Telemetry in the Post-Covid Era

Summary:

While In-Home Video EEG Monitoring has been available for two decades, improvements in technology and the enablement of intermittent and long-term monitoring provide significant enhancements that may benefit patients during the Covid-19 pandemic. This paper discusses Home Video EEG Monitoring benefits, models, and challenges and limitations

The Opportunity

With the end of the novel coronavirus pandemic not yet visible on the horizon, the need for remote monitoring of patients is increasing exponentially.

In the field of epileptology, continual remote electroencephalographic (EEG) monitoring is a growing area of research and applied practice, using a non-hospital-based approach to care termed home video-EEG telemetry (HVET).

Mobile HVET services offered by hospitals and practices enable physicians to obtain needed data while patients are able to remain at home. Key to expanding use is portability, ease of use, and secure portals to transmit and store patient data.

In mid-2020, the American Clinical Neurophysiology Society (ACNS) recommended home-based EEG monitoring for appropriate patients with epilepsy and seizure-like disorders, especially during the COVID-19 pandemic.

Background

A recent paper, titled *Past, Present, and Future of Home video-electroencephalographic telemetry: A review of the development of in-home video-electroencephalographic recordings*,* published in *Epilepsia*, explores the benefits and limitations of HVET when used to evaluate the factors that may contribute to seizure recurrence.

The study involved researchers from the United States, the United Kingdom, Iceland, and Australia, who studied three approaches to HVET: supervised HVET, mobile HVET, and cloud-based HVET.

While epilepsy monitoring units (EMUs) are the gold standard for the evaluation of epilepsy worldwide, they can mean high costs and long waiting times. HVET approaches, involving varying degrees of professional supervision, serve patients at home and can be used for diagnostic purposes.

HVET Benefits

In comparison to inpatient video-electroencephalographic telemetry (VT), researchers identified several benefits to using HVET as a result of their study.

UK researchers found home video EEG telemetry was significantly cheaper to provide than inpatient VT. U.S. researchers involved in the study also discovered that the use of HVET widened their geographical reach — a prime consideration, especially for use in more rural areas or for use by patients who could not, or did not, want to travel for inpatient VT.

Ultra-portability and compactness of HVET technology, as well as novel approaches to easily and safely secure electrodes to the scalp, also have been two key factors that have increased interest in HVET services.

HVET Models

In the multi-institutional and global study, researchers from the United States, the United Kingdom, Iceland, and Australia studied three approaches to HVET:

Supervised HVET

Supervised HVET is modeled on in-patient VT and essentially moves an EMU into the patient's home. The electrode placement can take place in the hospital or the patient's home, and video quality shows no significant difference from that in the hospital. A technologist downloads data during an on-site daily and troubleshoots issues such as camera positioning and recording problems. Systematic evaluations of home-based assessments have not been completed, and discussion of future therapies include integrated and automated seizure alarms and detections.

Mobile HVET

Mobile HVET is an evolution of an ambulatory model that involves a patient being fitted with electrodes in the hospital or office and then taking EEG equipment and a camera home for several days. Researchers found no significant differences in the inpatient recordings. Challenges included the positioning of the camera and changing of equipment batteries.

Cloud-based HVET

Cloud-based HVET uses a cloud-based platform to manage data from implantable and wearable devices to accept a stream of EEG and video in real time. In the U.S., new current procedural technology codes describe requirements including continuous intermittent monitoring for up to 12 patients simultaneously. The format allows for remote troubleshooting as well as communication with clinicians using video calling.

Cost and Time Savings

In the US, HVET recordings were found to be almost 70 percent cheaper than inpatient VT. Inpatient VT studies were more likely to undergo subsequent testing and had a longer time from physician referral to performance. In the UK, supervised recordings were found to be 30 percent cheaper than in-patient recordings, and in Australia, an 80 percent cost improvement was observed.

Implications on Research

Recording of seizure activity in the home allowed for observation of environmental and trigger factors, circadian rhythms, and social and psychological impacts. It was observed that nonepileptic seizures had a shorter duration at home than in the hospital setting, and the cloud environment was found to enable collaboration, curation, and development of new research tools.

Challenges and Limitations

Some challenges identified with the use of HVET recordings include geographic outreach, which can be a benefit or a concern. Limited technology access can make an HVET impractical to set up in rural areas. Signal quality, too, can be an issue, though in the supervised HVET model, a technologist can review camera setups during initial visits.

In the mobile HVET model, 0.3% of the EEGs were unusable due to persistent artifact, and in the cloud services, there are concerns related to regulations regarding data privacy.

Home use also relies on patients or family members to properly use HVET technology. Data can be lost due to unsupervised ambulatory recordings, and although the time span is generally long enough to make a diagnosis, there is a limitation of a few days to the data gathering. Correct camera positioning also can be suboptimal in unsupervised visits, though in data from the UK, video obtained at home was of equal quality to that in the EMU.

Future Efforts

Allowing for extended long-term HVET monitoring would widen options for the forecasting of seizures. The technology could be adapted and combined with treatment reminders and prompts for self-management. Ideally, the use of HVET could, researchers say, optimize continuous monitoring of EEG and "opens the possibility of seizure forecasting."

**Brunnhuber F, Slater J, Goyal S, et al.*

Past, Present and Future of Home video-electroencephalographic telemetry: A review of the development of in-home video-electroencephalographic recordings. Epilepsia. 2020;00:1-8.

<https://doi.org/10.1111/epi.16578>.

Authored by Anne Konopka

Anne Konopka is a content writer and editor, with experience and interest in medical and scientific subject matter. She has worked in health sciences publishing and in scientific and clinical writing for Washington University School of Medicine in St. Louis.



Imagine EEG Anywhere

To find out how Lifelines Neuro can help with your in-home video EEG monitoring needs, please visit us at:

lifelinesneuro.com or call us at **866-889-6505**