



## Can home video facilitate diagnosis of epilepsy type in a developing country?



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### ABSTRACT

**Objectives:** The study aimed to evaluate the feasibility and yield of semiological features from home videos and compare them to those inferred from history provided by the caregiver of a person with epilepsy (PWE). A comparison of the accuracy of classification of epilepsy based on home videos and medical history was also done.

**Methods:** We enrolled PWEs who were awaiting admission for video electroencephalography (VEEG) to the epilepsy monitoring unit (EMU) in this prospective observational study. In phase I of the study, we encouraged caregivers to make home videos which were analyzed. A structured questionnaire dealing with 29 different semiological features was completed based on the information gathered from home videos. In phase II of the study, the questionnaire was administered to the patient's caregivers. In phase III the patients underwent VEEG recording, and the semiology from VEEG was analyzed to complete the same questionnaire. We also classified epilepsy type using home videos and medical history and compared it to that using VEEG finding. The information gathered from VEEG was considered the gold standard. Accuracy was calculated for the different semiological signs comparing medical history to VEEG findings.

**Results:** A total of 340 PWE fulfilled the inclusion and exclusion criteria, and their caregivers completed the questionnaire. Home videos were collected from 312 patients and 624 seizures were analyzed. The mean number of signs of semiology recorded after analysis of home videos was  $3.3 \pm 2.2$ , and from the medical history was  $2.1 \pm 1.1$  ( $P < 0.01$ ). A total of 572 seizures in 282 patients admitted in the EMU were evaluated on VEEG. Bilateral generalized clonic movements of limbs, motor movement around mouth, fear, visual phenomenon, hemisensory phenomenon, and post-ictal unilateral weakness had the highest accuracy. The overall agreement of semiological signs inferred from medical history versus VEEG was 0.75 and between home video recordings versus VEEG was 0.92. A larger number of patients were correctly categorized into the focal epilepsy group when home videos were used to classify compared to when medical history was used.

**Conclusions:** Home videos are more reliable in picking up semiological signs and classifying epilepsy type than history provided by caregivers of PWEs. Home videos are a complementary tool in a developing country like India.

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### 1. Introduction

The diagnosis and management of a PWE is based on an accurate historical description of the ictal event. An accurate description helps in correctly classifying seizure type and epilepsy syndrome. It also guides the physician in starting the appropriate antiepileptic

drug (AED) for the PWE. In patients with drug-resistant epilepsy (DRE), the description of semiology also helps in the lateralization and localization of the possible ictal onset zone. This is important for building a hypothesis before the patient undergoes other presurgical investigations for epilepsy surgery.

Clinical practice information regarding seizure semiology is usually obtained from the patient's caregivers, which usually includes family and friends who have witnessed the seizures. Several factors influence the accuracy of description given by the caregiver. Anxiety, distress, alarm, and confusion during the ictal event are

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common limiting factors. In addition, the limited repertoire of descriptive terminologies in a population with poor educational background restricts the seizure narrative. The gold standard for determining semiology is the VEEG recording. VEEG is a resource and labor intensive investigation and is available at very few centers in a developing country like India. Several studies have focused on the accuracy of investigations like EEG, ictal SPECT, positron emission tomography (PET) etc., but literature is scarce regarding the accuracy of semiological features inferred from the description of the caregiver, particularly from developing countries. We conducted this study with two objectives. The first was to evaluate the diagnostic yield of different semiological signs inferred from the description of the caregivers. The second was to evaluate the role of home video recordings in picking up seizure phenomenology and classifying epilepsy type in this cohort.

## 2. Methods

This was a prospective observational study conducted in three phases from April 2008 to April 2012 in a tertiary care teaching hospital in India. PWEs who were waiting admission to the EMU either for characterization of seizure type or as the first step for non-invasive presurgical evaluation (in patients not responding to two or more antiepileptic drug therapy) were included after giving informed consent. PWEs were included in the study only if their caregivers were motivated to make videos of seizure episodes and could understand written Hindi and/or English. PWEs were excluded from the study if they: (1) had a history of multiple seizure types (defined as occurrence of more than one type of seizure: generalized tonic, atypical absences, myoclonic, and generalized tonic-clonic seizures), (2) a history suggestive of psychogenic non-epileptic seizures (PNES), (3) were not eligible for EMU recording (because of pregnancy or metabolic disorders), or (4) had a caregiver who was not staying with the PWE for more than 2 years or two-thirds of every day. Demographic details of caregivers including their age and gender, their educational level, and relationship to the PWE were also recorded.

A structured questionnaire was devised to record the seizure phenomenology. This questionnaire had 29 points dealing with different possible semiological features. Each point addressed commonly observed phenomenology of a seizure episode. The 29-point questionnaire (Table 1) was developed by two epileptologists based on the commonly encountered semiological signs in clinical practice (MT, AA). The questionnaire was translated from English into Hindi by experts in the Hindi department of the All India Institute of Medical Science, translated back to English, and corrected in the Hindi version. It was then administered to a group of 20 caregivers of PWEs and modifications were made according to the feedback received. The feasibility of administering the questionnaire was established, and then it was administered to the study cohort.

### 2.1. The study was conducted in three phases

#### 2.1.1. Phase I

In the first phase of the study, caregivers of patients awaiting admissions to an EMU were encouraged to make home videos of the ictal event. The caregiver was instructed to record a minimum of 3 or more home videos of the habitual ictal events. The two best videos were taken for analysis. The videos were assessed for quality according to the Quality of Video (QOV) scale, which was developed by MT to quantitatively measure the quality of videos. The QOV scale had 11 items, each of which was given points ranging from –1 to 2. Two points were given if a full view of the face and/or whole body was visible and if the event was recorded from the

very beginning. One point was given if part of the face and/or body were visible, or if there was adequate illumination and the recording included post-ictal events. One point was deducted if the view of the patient was obscured by the caregiver and/or movement, or if the recording was done too close to or too far from the patient.

The maximum score for the QOV scale was 10. A score of 1–4 was considered poor quality, 5–7 moderate quality, and 8–10 good quality. These videos were analyzed for semiological features by MT & AA. The questionnaire was completed based on the phenomenology observed on the home videos, and a diagnosis of the type of epilepsy was made.

#### 2.1.2. Phase II

The second phase of the study was conducted when the same PWE was admitted to the EMU for a VEEG recording. The questionnaire was administered to the PWEs caregivers by a trained epilepsy resident. Caregivers had to identify whether the patient had the specific features described in the questionnaire. Finally, based on the features in the questionnaire, a diagnosis of the type of epilepsy was made.

#### 2.1.3. Phase III

After admission to the EMU, the patients underwent VEEG recording following a gradual AED tapering protocol. Seizure semiology from the VEEG recording was analyzed by an epileptologist (MT) and the 29-point questionnaire was again completed and classification of the type of epilepsy was made. The information gathered from VEEG was considered to be the gold standard.

We calculated the sensitivity (SN), specificity (SP), false positive rate (FPR: false positive/[false positive + true negative]), false negative rate (FNR: false negative/[false negative + true positive]), and accuracy (ACC: [true positive + true negative]/all patients included)

**Table 1**  
The English version of 29 point questionnaire.

	Semiology sign description
1.	He/she stares blankly and does not respond to commands.
2.	He/she speaks words (irrelevant) during the episode.
3.	He/she makes sounds (irrelevant) during the episode.
4.	He/she complains of abnormal sensation in half of body (warmth/tingling/cold).
5.	My patient complains of dizziness during the episode.
6.	My patient complains of headache during the episode.
7.	There is involvement of one side (leg/hand) but don't know which side.
8.	There is involvement of one side and it is right/left.
9.	My patient has involvement of one side and is not aware of the surrounding.
10.	There is abnormal movements around mouth, chewing/lip smacking.
11.	My patient complains of coloured spots, black spots or objects during the episode.
12.	There is rhythmic jerky movements of one limb(leg/hand)
13.	There is rhythmic jerky movements of both limbs(hands/legs)
14.	There is tightening of one limb(leg/hand).
15.	There is tightening of both limbs(leg/hand).
16.	There is rhythmic jerky movements of all four limbs.
17.	There is abnormal feeling of something rising in my stomach.
18.	There is abnormal twisting/posturing of one limb.
19.	There is feeling of fear during the episode.
20.	There is first involvement of one limb(hand/leg and then all 4 limbs get involved.
21.	There is abnormal searching movement of one hand.
22.	There is abnormal searching movement of both hands.
23.	He/she complains of smells(pleasant/unpleasant).
24.	He/she complains of buzzing sounds.
25.	Not sure if starts from one side or all 4 limbs.
26.	His head and eye turns towards one side in the beginning of seizure.
27.	The time of the episode a. <1 min b. 1–5 min c. >5 min
28.	My patient complains of vague feeling and discomfort during the episode.
29.	There was weakness/inability to move or grip my hand/leg after the event.

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