How long is long enough? The utility of prolonged inpatient video EEG monitoring

Brian D. Moseley MD[1], Sandra Dewar RN MS[1], Zulfi Haneef MD[2], John Stern MD[1]

[1]Department of Neurology, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA
[2]Department of Neurology, Baylor College of Medicine, Houston, TX, USA

Introduction

- Video electroencephalogram (EEG) monitoring (VEM) is the definitive tool for the diagnosis and treatment of both epileptic seizures (ES) and psychogenic nonepileptic seizures (PNES)[1].
- VEM is an investment of patient time and hospital resources, and can present a large cost to payers[2].
- The average length of stay in an epilepsy monitoring unit (EMU) has previously been reported as 3-4 days in adults, with shorter durations of 1.2-1.5 days reported for pediatric patients[3].
- There is currently no consensus on the required duration of monitoring to record/classify all habitual seizure/spell types.
    - Given the changing US healthcare landscape and potential cuts to reimbursements to neurologists[4], this question is likely to become increasingly relevant in the coming months.
- We sought to determine the benefits of prolonged length of stay, specifically querying whether there was a point at which VEM became futile at yielding a diagnosis.

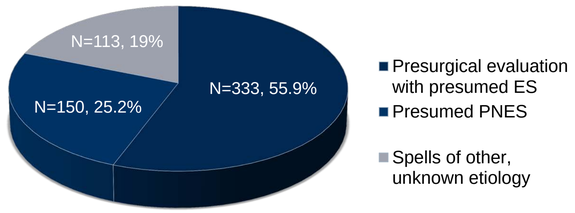
Methods

- We retrospectively reviewed the medical records of all patients admitted to the adult EMU at UCLA for VEM between 1/2004 and 12/2008.
- All patients underwent scalp EEG monitoring for classification/localization of presumed ES and nonepileptic events.
- We recorded the reason for admission, length of stay, and discharge diagnosis.
- A discharge diagnosis of inconclusive was assigned if patients had none of their habitual spells/seizures during the admission.
- For patients having >1 admission during the study period, only the first admission was analyzed.
- We progressively analyzed lengths of stay until we discovered significant differences in the rates of inconclusive admissions for stays exceeding specific limits, ranging from ≥ 4 days to 14 days.
- Data entry and statistical analysis were performed using IBM SPSS Statistics Version 19 (IBM, Armonk, NY, U.S.A.).
- We utilized chi-square analysis (Fisher's Exact Test, 2 sided).
    - p-values <0.05 considered statistically significant.
- The protocol was approved by the UCLA IRB.

Results

- Five hundred ninety six patients were admitted for VEM.
- The majority (333, 55.9%) were admitted for a presurgical evaluation with presumed ES.
- The remaining patients were admitted for differential diagnosis of presumed PNES (150, 25.2%) or spells of other, unknown etiology (113, 19%, see Figure 1).
- Only 89/596 admissions (14.9%) were inconclusive.

Figure 1. Reasons for admission (n=596).



Results (continued)

- Patients admitted for differential diagnosis of presumed PNES were significantly more likely to have an inconclusive admission (31/150, 20.7%) compared to all others (58/446, 13%, p=0.033, see Figure 2).
- Comparing all patients, there was no significant difference in the likelihood of having an inconclusive admission if monitoring was continued for any duration, including 5 or more days (62/428 patients, 14.5%) compared to less than 5 days (27/168 patients, 16.1%, p=0.61, see Table 1).
- This continued to be true if only patients admitted for a presurgical evaluation with presumed ES were analyzed (23/283, 8.1% versus 6/50, 12%, p=0.41, see Table 1).
- For patients admitted with presumed PNES, a length of stay ≥ 5 days was associated with a significantly increased risk of the stay being inconclusive (22/78, 28% versus 9/72, 12.5%, p=0.026, see Table 1).

Figure 2. Diagnostic versus inconclusive admission percentages based on preadmission hypothesis.

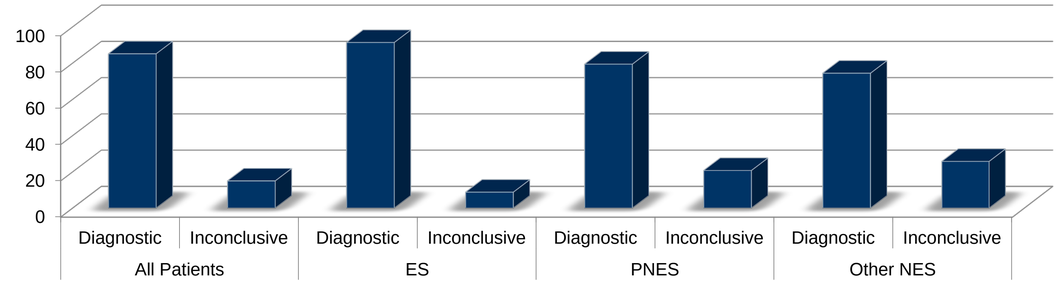


Table 1. Chances of inconclusive admissions in patients with prolonged EMU stays

	All patients (n=596)	Patients with presumed ES (n=333)	Patients with presumed PNES (n=150)
Length of stay ≥ 4 days	68/489, 13.9% inconclusive versus 21/107, 25.2% inconclusive, p=0.14	25/303 versus 4/30, p=0.31	24/104 versus 7/46, p0.38
Length of stay ≥ 5 days	62/428 versus 27/168, p=0.61	23/283 versus 6/50, p=0.41	22/78 versus 9/72, **p=0.026***
Length of stay ≥ 6 days	55/372 versus 34/224, p=0.91	20/249 versus 9/84, p=0.5	19/65 versus 12/85, **p=0.027***
Length of stay ≥ 7 days	41/296 versus 48/300, p=0.49	16/204 versus 13/129, p=0.55	11/43 versus 20/107, p=0.38
Length of stay ≥ 8 days	33/231 versus 56/365, p=0.81	12/166 versus 17/167, p=0.44	10/32 versus 21/118, p=0.14
Length of stay ≥ 9 days	26/179 versus 63/417, p=0.9	11/128 versus 18/205, p=1	8/27 versus 23/123, p=0.2
Length of stay ≥ 10 days	22/145 versus 67/451, p=0.89	9/104 versus 20/229, p=1	7/21 versus 24/129, p=0.15

Results (continued)

- Of the 21 patients readmitted for inpatient VEM during the study period, 5 had PNES captured during their previous admission.
- The diagnosis of PNES did not change for these patients.
- A single patient with presumed PNES was readmitted after an initial inconclusive VEM.
- During the second VEM, a diagnosis of PNES was made within 4 days.

Discussion

- VEM is a highly efficacious study, with <15% of our admissions being inconclusive.
    - Our data compares favorably to inconclusive rates of 15-38% reported in previous studies[1, 2, 5, 6].
- Prolonging VEM appeared to be useful for the proper classification of ES.
- Prolonging EMU stays in presumed ES patients can be argued on the grounds that it will ultimately result in cost savings.
- Canadian studies have shown such monitoring and resulting epilepsy surgery result in an incremental cost-effectiveness ratio of $25,020 to $69,451 Canadian dollars ($24,019 to $66,673 US dollars) per quality-adjusted life years (QALYs)[7].
- Conversely, lengths of stay ≥ 5 days for patients with presumed PNES was associated with significantly greater chances of an inconclusive admission.
- Such data suggests there may be a dichotomy of patients with PNES: those who have typical spells quickly during monitoring versus those who do not have recorded spells, regardless of the duration of monitoring.
    - Patients with PNES have previously been shown to typically have a shorter time to first seizure versus patients with ES[8].
- Given the changing healthcare landscape and potential for reduced resources/reimbursement, it may be more advisable to consider prolonging VEM for patients with presumed ES over patients with presumed PNES.

References

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