



# The safety of UK video telemetry units: Results of a national service evaluation<sup>☆</sup>



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## ABSTRACT

**Purpose:** To assess patient safety during seizures occurring on UK video telemetry units and identify factors in unit infrastructure which may improve safety with the intention of producing national guidelines.

**Methods:** A prospective multicentre national service evaluation of the occurrence of adverse events and level of nurse attendance during seizures occurring on video telemetry units was performed. Data from 272 seizures from 27 video telemetry units across the UK were analysed.

**Results:** Adverse events occurred in 12% of seizures: 7% were physical events such as falls or respiratory compromise and 5% were unnoticed seizures. Nursing staff did not attend the patients in 44% of seizures and attendance was delayed beyond 30 s in a further 29%. Only 27% of seizures were attended by a Healthcare Professional within half a minute. The most important factor shown to improve timely attendance of patients during seizures was the presence of a nurse dedicated to the telemetry bed(s). The site of the telemetry bed (bay or cubicle) and method of observation (direct or indirect) was less important. An optimal nurse-to-patient ratio was difficult to identify but the study suggests that a ratio of at least 1 nurse to 4 patients is appropriate.

**Conclusion:** The results provide an evidence base for the production of national standards and guidelines for surveillance of patients during video telemetry to improve patient safety.

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## 1. Introduction

Long term video EEG recording is increasingly used to differentiate epileptic from non-epileptic attacks, to classify epileptic seizure types and to identify seizure foci in patients being assessed for a possible surgical treatment for intractable epilepsy. To meet increasing demand, video telemetry (VT) units are expanding across the UK. Success of the investigation depends on recording the patients' habitual seizure type and anti-epileptic medication may be withdrawn to improve the likelihood of recording a seizure. During seizures patients are at risk of complications including injury and sudden unexpected death in epilepsy (SUDEP).<sup>1–5</sup> Patients with psychogenic nonepileptic seizures are also at risk of harm.<sup>6</sup> Adverse events need to be anticipated and prevented to ensure patient safety and effective

patient surveillance during seizures is of paramount importance. Although there are published surveys detailing the incidence of adverse events in video telemetry units, specific guidelines for safety in video telemetry units are lacking. The few published guidelines available<sup>6–9</sup> concentrate on electrical safety and availability of resuscitation equipment with limited recommendations specifically addressing the level and type of staffing required in a VT unit to ensure safety. This study aims to investigate the optimal requirement for health care professional (HCP) surveillance of patients in VT units through a national service evaluation.

## 2. Methods

The aim of the study was to assess how often seizures occurring in patients on UK telemetry units were attended by healthcare professionals and to measure the length of any delay to professional care being given. We aimed to identify variables in VT unit infrastructure which may aid prompt attendance during seizures to help formulate national recommendations for patient safety. There is no published guideline suggesting a minimum time from seizure onset to attendance by a healthcare professional to ensure patient safety. For the purpose of the study, after

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consultation with expert colleagues, an attendance within 30 s of seizure onset was deemed to be satisfactory for patient safety. The primary outcome measure was taken as attendance by a HCP within 30 s of seizure onset. Secondary outcome measures were any attendance by a HCP, absolute delay to attendance by a HCP and occurrence of adverse events.

Questionnaires were sent to 63 departments of Clinical Neurophysiology who had expressed an interest via the professional societies (British Society for Clinical Neurophysiology and Association of Neurophysiological Scientists) in participating in national audit studies. Not all of the 63 centres had video telemetry facilities but replies were received from 31 centres (Appendix). We believe this to be over 80% of the UK units.

The questionnaire consisted of two parts (Appendix). The first part obtained data on unit infrastructure for each department focussing on patient surveillance. The second part of the questionnaire was filled out prospectively on consecutive patients admitted for video telemetry between 1st November 2011 and 31st December 2011. The Clinical Physiologists were asked to fill out one form for each seizure to a maximum of five seizures per patient. Each unit was asked to contribute up to 5 patients over this time period. Information regarding attendance of healthcare professionals during the seizure was obtained.

The full questionnaire can be viewed in the Appendix but for clarity definitions of some of the terms used in the questionnaire and in the results are stated here.

- 'Nurse' and 'Healthcare Professional' applies to either qualified nurses or unqualified healthcare assistants.
- 'Dedicated nurses' refers to those nurses either on a dedicated VT unit or dedicated to the VT beds on a general ward.
- 'Direct' methods of patient observation included a HCP positioned in the patient's room or the bed situated within sight of the nurses' station. 'Indirect' methods of observation included a monitor at the nurses' station, patient and/or software alarms, relatives staying in the room and nurses positioned outside the room.
- 'Major motor' seizures included generalised tonic-clonic, tonic and hypermotor epileptic seizures as well as non-epileptic seizures involving the patient 'thrashing' around. All other seizure types were classed as 'Minor motor'.
- Daytime seizures were those occurring between 8 am and 8 pm and night time seizures were those occurring between 8 pm and 8 am.
- 'Missed' seizures were deemed to be an adverse event and were those seizures that were only discovered on review of the VT recording by a Clinical Physiologist and were unnoticed at the time of occurrence. 'Unattended' seizures included the 'missed' seizures as well as those that were known to have occurred at the time but a HCP had not managed to attend before the seizure ended.

Patient data was anonymised but the video telemetry centre could be identified by use of the postcode. The study was approved by the Sheffield Teaching Hospitals NHS Foundation Trust Clinical Effectiveness Unit (project registration number 4476). Data was entered onto a Microsoft Access database and analysed using Microsoft Excel and Statistica (Statsoft Inc.).

### 3. Results

Data from 27 centres were analysed; incomplete data were returned by 4 centres and these were excluded from the analysis.

#### 3.1. Survey of VT unit infrastructure

Detailed characteristics of the infrastructure of the VT units can be seen in the supplementary on-line file. Of the 27 units, 67% were

staffed by nurses performing general ward duties as well as looking after the telemetry patients and 33% were staffed by nurses dedicated to the telemetry beds. Direct patient observation by nurses occurred in 26% of units with the remaining 74% using indirect methods including one or more of the following: a monitor at the nurses' station (24), patient and/or software alarms (18), relatives staying in the room (17) and nurses positioned outside the room (8). The 27 units had a total of 60 beds (median 2; range 1–7 beds per unit). 78% of the beds were located in cubicles with 22% being in ward bays.

Intensity of HCP cover tended to be better in units staffed by dedicated nurses particularly during the night. In units with dedicated nursing the median ratio of nurse to patients was 1:2 (range 1:4 to 1:1) both during the day and during the night while in units with non-dedicated nursing the median ratio was 1:5 (range 1:14 to 1:1.75) during the day and 1:6 (range 1:16 to 1:1.75) during the night. 12 (44%) centres reported that the intensity of nursing on their VT unit was appropriate.

Although all units monitored the ECG continuously, it was only visible to nursing staff in 17 units. 21 units had a cot side policy suggesting cot sides up in 18, down in 2 and not stated in 1.

#### 3.2. Prospective study of seizures

272 seizures occurred during the data collection period, 194 in adults and 78 in children. 177 were epileptic, 83 psychogenic non-epileptic seizures and 12 were 'other' non-epileptic seizures.

56% of seizures were attended by a HCP. Of the 44% that were not, a relative was present in 22% leaving 22% of seizures not attended by either a nurse or relative.

In the 153 seizures that were attended by a HCP, the range of time to attendance was 0 s to 56 min with a median of 32 s. In 48% of attended seizures (27% of all 272 seizures) a HCP was present within 30 s from onset of the clinical seizure. In 52% of attended seizures (29% of all 272 seizures) attendance by a HCP was delayed beyond 30 s.

Adverse events were noted in 33 (12%) seizures. 18 (7%) of these were 'physical' comprising falls (8), hitting head/limbs (2), status epilepticus (2), airway or respiratory compromise (3) and vomiting (3). The remaining 15 (5%) adverse events were unnoticed seizures of which 13 were epileptic, all involving motor features and including 2 generalised tonic-clonic seizures. 52% of the adverse events occurred during the night and 48% during the day. This represented an adverse event occurring in 9% (15/160) of daytime seizures and 16% (18/112) of night time seizures.

The person reviewing the VT recording was asked to give a subjective opinion as to whether the presence of a HCP or relative during the seizure had prevented an adverse event. In 33 patients it was felt that an adverse event (e.g. falls, injury or hypoxia) was prevented during a seizure by the presence of a nurse in 26 and a parent in 7. The median time to nurse attendance in this group was 18 s.

The video telemetry recordings were reviewed by neurophysiology staff within 24 h in the majority of seizures but there was a delay in data review of between 2 days and 4 weeks after the seizure had occurred in 12% of seizures. Within this group were 2 generalised tonic-clonic seizures reviewed at 4 weeks.

Univariate analyses of factors influencing the primary outcome measure of attendance within 30 s are shown in Table 1. Univariate analyses of secondary outcome measures are shown in Table 2 (any attendance by a HCP), Table 3 (absolute delay to HCP attendance) and Table 4 (occurrence of adverse events).

The factors resulting in significantly improved HCP attendance within 30 s of seizure onset were the presence of dedicated nursing, seizures occurring in cubicles and those occurring in the absence of a relative. Factors improving any HCP attendance were

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