



Quality indicators in an epilepsy monitoring unit



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ABSTRACT

Examining and improving the quality of care in epilepsy monitoring units (EMUs) is essential to delivering the best possible care and to mitigating undesirable outcomes. Epilepsy monitoring units are unique in that an admission to an EMU often involves the induction of symptoms (seizures) rather than minimizing and/or treating symptoms, which can lead to an increased risk to patient safety. Very little research has addressed the quality of care and safety in EMUs. The objective of this study was to examine quality indicators in a large population of patients admitted to an EMU in a large health region.

Data were collected prospectively on 396 consecutive patients admitted to the EMU for scalp EEG recording from 2008 to 2011 using a standardized data abstraction form. Variables examined included the following: patient demographics, baseline clinical characteristics, EMU admission statistics, and EMU quality indicators.

We found that an admission to the EMU was a safe and effective tool in the management of patients with epilepsy and seizure-like events. The number of adverse events during the study period was low at 4.9%. The admission question was answered in 78.8% of cases, and it was partially answered in 6.6%. The need for systematically developed and validated quality indicators in EMUs is emphasized. The research in this area is sparse, and thus these data aid in supporting the utility of EMUs in the management and care of those with seizures and seizure-like events.

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1. Introduction

Examining and improving the quality of care that patients receive is paramount. The Institute of Medicine defines quality of care as “the degree to which health services increase the likelihood of desired health outcomes of individuals and populations and are consistent with current professional knowledge” [1]. Delivery of inadequate care places patients at risk for undesirable outcomes. Thus, there is a need to develop and examine quality indicators in every health-care setting to ensure that patients are getting the best possible health care. Quality indicators are frequently used to monitor quality of care and are defined as “measurement tools, screens, or flags that are used as guides to monitor, evaluate, and improve the quality of patient care, clinical support services, and organizational function that affect patient outcomes” [2].

Core quality indicators have been developed to track patient care in outpatient epilepsy clinics [3], but there is a paucity of literature exploring quality indicators for patient care in the epilepsy monitoring unit (EMU).

Adverse events (AEs) are often used as surrogate quality indicators. All hospital admissions are associated with a risk of an AE. Research suggests that AE rates are strongly dependent on the clinical unit. Neurology units have one of the highest proportions of all adverse events, second only to psychiatry units [4]. Contributing factors to the increased risk of incidents on neurology units include the following: gait problems, altered mental status, equilibrium disturbances, use of central nervous system acting drugs, sensory deficits, and aphasia [5]. Although these are less common in EMU patients than in general neurology patients, they are still often present in patients admitted to an EMU.

An admission to an EMU, however, is unique in that it typically involves provoking seizures rather than trying to prevent them. This can affect patients' safety. Despite a workshop being devoted to safety in EMUs at the 2008 American Epilepsy Society Annual Meeting [6], little research has been published on the subject since that time. The existing

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literature suggests that there is considerable variability in clinical practice across EMUs [7] and that the frequency of AEs in EMUs is also variable, ranging from 0 to 14% [8–11]. The need for expert consensus guidelines for patient care and safety in EMUs has been highlighted [12,13].

The objectives of this study were to evaluate the safety and the diagnostic utility of an admission to an EMU using prospectively collected proxy/surrogate quality indicators in a large health region.

2. Methods

2.1. Study setting

Our EMU is a small self-contained unit located on a general neurology ward at a large teaching hospital that serves a population of over 1.2 million. The EMU has a nursing ratio of 1 nurse for every 4 patients with additional nurses from the general neurology unit available as needed, 24 h a day. Electroencephalography technologists are in the unit 7 days a week from 08:00 to 16:00, and an EEG technologist is on call after hours until 23:00. An epileptologist is on call 24 h a day (often with a fellow and rarely a resident).

A 24-hour video surveillance system is used to detect events and alert staff. The EEG software used in the EMU has an automatic detection system which will set off an alarm if there is a significant change in the EEG pattern (e.g., seizure), although both false negative and false positive alerts are frequent. Every patient is in an individual room, and each room faces the nursing station. In addition, each of the patient rooms has a sliding glass door ensuring excellent patient visibility. Injury prevention methods include the following: bedside rails, padded beds, and fall precaution measures. While in the EMU, patients are free to ambulate but only outside of their room (for a few feet), right in front of the nursing station. They are not allowed to leave the EMU unless they require an ancillary test (e.g., SPECT scan) and cannot leave unaccompanied. Thus, it would be extremely unlikely for adverse events not to be witnessed and/or documented in the physician or nursing notes.

2.2. Study participants

Patients admitted to the EMU between 2008 and 2011 were included in the study. The patients admitted for intracranial monitoring were excluded from the data analysis. These patients were excluded because they represent a different population (e.g., clinical characteristics, EMU clinical care) than the patients admitted for scalp EEG recording and, therefore, warrant a separate evaluation.

2.3. Quality indicator form development and data collection

Quality indicators have yet to be developed or validated for EMUs. Therefore, the variables collected were used as surrogate measures for quality indicators. These surrogate quality indicators were derived through the combination of a literature review and consensus among our multidisciplinary EMU Quality Improvement Team. This team includes fellowship-trained epileptologists and a multidisciplinary team of EMU care providers and stakeholders. The literature review (2007) focused on identifying peer-reviewed publications addressing quality and safety in EMUs and was done to assist with content validity in the development of the quality indicator form. The list of quality indicators was discussed among the EMU quality improvement team members, and a standardized quality indicator form was created after the consensus. The Institute of Medicine's six dimensions of quality care were considered when creating the quality indicator form [1]. The dimensions included in the quality indicator form are equitability (patient demographics, clinical characteristics), safety (AED reduction, interventions to stop seizures, adverse events), timeliness (wait time), and effectiveness and efficiency (length of stay, completion of ancillary

tests while in the EMU, techniques to induce epileptiform activity, and diagnostic utility of admission, as defined by the referral question being addressed). Patient centeredness is measured using patient satisfaction questionnaires and is not reported here as it has been previously published [14]. Once the quality indicator form was developed, it was piloted in the EMU for approximately one year. After this pilot period, some minor modifications were made to the quality indicator form.

Data were collected prospectively using the standardized quality indicator form. A medical professional involved in that patient's care completed the standardized form throughout the admission. Baseline clinical characteristics (preadmission) were collected via chart review and consultation with the patient and/or their physician if not documented in the chart.

2.4. Ethical considerations

This research was conducted as part of an EMU quality improvement initiative. Despite not requiring ethical approval for quality improvement research, we did obtain approval from the University of Calgary Conjoint Health Research Ethic Board. Informed consent was also obtained from each patient.

2.5. Statistical analysis

Frequencies and descriptive statistics were calculated for all variables. Univariate analyses (t-tests) were used for continuous variables and Wald tests to compare the odds ratios of categorical variables. Multivariate analyses were used to determine which variables were associated with length of stay (linear regression), adverse events, and diagnostic utility (logistic regression). A p-value of 0.05 or less was considered significant. All statistical analyses were performed using Stata 12.0 (StataCorp. 2011, College Station, TX: StataCorp LP).

3. Results

Six hundred and twenty-two patients (622) were admitted to the EMU between 2008 and 2011, with an average of 125 admissions per year. Data were obtained from 71.4% (n = 444) of the patients admitted to the EMU. Only the data from the 396 patients who were admitted for scalp (not intracranial) monitoring were included in the present study. The majority of admissions were classified as "routine" admissions (n = 269; 68.1%), while 31.9% (n = 126) were classified as "urgent." The majority of the patients were admitted from home (n = 364; 92.2%), with only 7.6% (n = 30) admitted or transferred from another inpatient unit.

3.1. Equitability

3.1.1. Patient demographics

On average, the patients were 37 years old (SD = 13.6) and had 12 years of education (SD = 3). Baseline patient characteristics are shown in Table 1. The patients admitted to the EMU were primarily female, married, and unemployed and did not have moderate or severe developmental delay (Table 1).

3.1.2. Baseline clinical characteristics

Most patients admitted to the EMU had a history of generalized seizures with bilateral convulsive activity (n = 290, 73.2%; Table 1), occurring less than once a year on average. The other two most common seizure types by history were focal seizures with and without dyscognitive features, occurring at least monthly in the majority of the patients (n = 203 or 125; 68.5% or 31.6%, respectively). Most patients were experiencing daily, weekly, or monthly seizures prior to their

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