Brief Communication

Characteristics of falls in the epilepsy monitoring unit: A retrospective study

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1. Introduction

Admission of patients to an epilepsy monitoring unit (EMU) for video electroencephalography (vEEG) is an important part of presurgical evaluation of drug-refractory epilepsy, epilepsy classification, and diagnosis of nonepileptic events. In these situations it is usually necessary to record multiple seizures or events representing the habitual seizure semiology. Standard activation methods are routinely utilized in an EMU, including withdrawal of antiepileptic medications, sleep deprivation, hyperventilation, and photic stimulation [1]. Prior studies have reported different adverse events during video-EEG monitoring including postictal psychosis, falls, and status epilepticus [2–5]. Among them, falls are an important adverse event that can cause serious physical injury, increase the length of hospital stay, as well as contribute to morbidity and mortality [6]. Patterns and predictors of inpatient falls have been studied before [7,8]. However risk assessment for falls in an EMU has never been studied systematically. From a risk management and quality perspective, it is important to develop policies that will identify high risk patients as per the protocol summarized in Table 2. All patients in the EMU are staffed by nurses with specialized training who have demonstrated EMU-specific competencies.

In comparison with an inpatient neurology service, an EMU is a complex medical milieu and a restrictive physical environment, with patients ranging from young adults to geriatric patients, many of whom have behavioral comorbidities. The nurse-to-patient ratios are generally higher in an EMU in comparison with an inpatient ward. Hence, policies to predict and prevent falls in a general inpatient neurology service may not apply to patients in an EMU. In this study, we identify patterns of falls among patients admitted to a level 4 EMU and compare them with those who fall in a general neurology inpatient setting. This will help us to design interventions that will prevent fall-related injuries in patients admitted to the EMU.

2. Methods

This is a retrospective study of patient medical records and incident reporting following falls in patients admitted to the general neurology inpatient ward and to a level 4 adult epilepsy monitoring unit. The adult EMU at the Barrow Neurological Institute is a 10-bed monitored unit integrated into the general neurology floor. The unit is staffed by nurses with specialized training who have demonstrated EMU-specific competencies.

The general inpatient neuroscience wards house 108 beds. St. Joseph's Hospital has in place a policy to prescreen all patients for fall risk at admission. The protocol for fall risk evaluation (Table 1) is adapted and modified in Conley et al. [9]. Risk assessment is performed by an admitting nurse. A patient with a score equal to or greater than 4 in this scale is considered to be at high risk for falls. Interventions are applied to high risk patients as per the protocol summarized in Table 2. All patients with an inpatient fall are reported electronically using an event record system and by completing an incident report form.

For the study, data from all patients admitted to the EMU from July 2006 to July 2010 who had a reported fall were recorded. We
compared all the patients admitted to the EMU with patients who had a fall during an inpatient stay in one of the general neuroscience medical/surgical wards during the same time period. Only adults older than 18 years were included in the study. A fall was defined as any unplanned descent to the floor.

The study had the approval of the Institutional Review Board. Comparisons of proportions for categorical variables were tested with Pearson’s chi-square and Fisher’s exact tests. Tests were two-tailed, and a p-value of less than 0.05 was considered significant. All analyses were conducted using SPSS software (IBM, version 17.0).

3. Results

Over the 4-year study period, 1116 adult patients were admitted to the EMU, out of which 26 (2.3%) patients had a fall. Among these patients, 3 (11.5%) were admitted for recurrent spells of indeterminate etiology, while the remaining 23 (88.5%) were admitted for epilepsy presurgical evaluation. Ages ranged from 18 to 68 years, with a mean of 48 years. The frequency of seizures (or spells) per month among fallers prior to EMU admission was as follows: 15 (58%) had fewer than 2 seizures, 5 (19%) had 3–10 seizures, and 6 (23%) had more than 10 seizures. Twelve (46%) patients were on antiepileptic drugs (AEDs) at the time of admission, 7 (27%) were on more than 3 AEDs, and 3 (11.5%) were admitted for recurrent spells of indeterminate etiology, while the remaining 76% were predominantly in the patient’s room (68%). Most EMU patients had had seizures within 8 h prior to their fall. In comparison, these falls happened during seizures, but 4 out of 26 (16%) EMU patients had about the same chance of falling during ambulation (74%). None of the patients admitted to the EMU had multiple falls nor did the falls happen during seizures.

During the study period, 56 falls occurred in 50 patients admitted to the neurosurgery general inpatient ward. Only the first fall occurring in each patient was considered for statistical analysis. The age of the inpatient (control) fallers ranged from 23 to 77 years, with the mean of 59 years. The variation in age between the EMU and control groups was not statistically significant. Table 3 summarizes the demographics and patterns of falls among patients admitted to the EMU versus those admitted to the general neuroscience floors. Among the fallers in the EMU, most (62%) fell within the first 3 days, and the place of fall was predominantly in the bathroom (74%). None of these falls happened during seizures, but 4 out of 26 (16%) EMU patients had had seizures within 8 h prior to their fall. In comparison, general inpatient falls occurred mostly after the third day of admission (64%) and were predominantly in the patient’s room (68%). Most EMU patients (76%) were found to be alert on mental status examination prior to their fall, while most general inpatients (52%) were confused. No other differences in the pattern of falls between the two groups were statistically significant, but there was a notable trend (p = 0.054) among EMU patients to fall in the late afternoon/evening hours (77%) in comparison with general inpatients who had about the same chance of falling in the morning/early afternoon hours (40%) and in the late afternoon/evening hours (50%). About half the patients in each group had prior history of falls. It is notable that 2 (7%) patients among the EMU fallers had injuries (lacerations that needed steri-strips), while, in comparison, 10 (20%) patients among the inpatient fallers had injuries ranging from lacerations to serious fractures (hip, thoracic spine, ankle) and subdural hematoma. The patients with subdural hematoma needed a transfer to the intensive care unit, and their hospital stay was complicated by pneumonia. No deaths occurred in either group.

All patients with a fall in the EMU or on the general inpatient floors scored high on fall risk assessment and were identified as high risk for falls at the time of admission. Safety precautions were initiated to prevent falls. However, in spite of this, falls were not prevented.
4. Discussion

This study provides important information regarding demographics and patterns of falls among patients admitted to an EMU. An institution-based standard fall risk assessment protocol was able to identify all patients with high risk for falls at admission to the EMU. Standard precautionary measures were applied in these high risk patients for preventing fall. In spite of this, falls were not prevented, thereby suggesting limitations in the intervention strategies rather than in risk assessment to prevent falls in this sample. Given the retrospective nature of this study, we were not able to accurately estimate how often the intervention strategies to prevent fall worked or failed. Age, location of the fall, and mental state before the fall were some of the significant differences among patients who fell in an inpatient ward or an EMU.

The relatively younger age of fallers in the EMU may simply be representative of the demographics of patients with refractory epilepsy or atypical seizure disorders, but it is worth emphasizing that risk assessment for falls and measures to prevent fall-related injuries are no less important in these younger patients than in those admitted to the general inpatient services. It is also significant to note that a normal mental status examination does not preclude the possibility of a fall, and such patients need to be under continued vigilance, nevertheless.

While most EMU patients in our study fell within the first 3 days of admission in contrast to general inpatients who more often fell after the third day, a complete understanding of the significance of this finding would need further analysis via comparison of durations of hospital stay between the two groups of patients.

Falls in the bathroom were found to be more common among our EMU patients. The bathroom has been singled out as high risk for falls among inpatients in prior studies [10]. The standard fall prevention protocol, as followed at our institution, assesses toileting needs of high risk patients and provides appropriate intervention that ranges from providing bed pans or urinary catheterization to allowing use of the bathroom. In patients with altered mobility or in confused patients, the use of bed pans or urinary catheterization was preferred over the use of a bathroom for safety reasons. Most of the admissions to the EMU were elective and, hence, patients generally were not confused nor did they have gait dysfunction at the time of admission. Even though use of the bathroom in high risk patients admitted to the EMU was not routinely prohibited, they would have been assisted to the toilet or commode by staff and then left alone during toileting to provide for privacy and dignity. This may explain why EMU patients did not fall as often on the way to the bathroom as general neurology patients, who fell frequently in their rooms and while ambulating. The EMU also has a much higher staff-to-patient ratio that would allow most patients to be under supervision or assistance during ambulation in anticipation of a seizure, irrespective of their fall risk. Fluctuations of mental status among the general inpatients on the other hand might prevent them from seeking assistance when needed and predispose them to falls during ambulation.

This study was retrospective and therefore has its own limitations. First, there is possibility that our results may be confounded by differences in incident reporting rates between the EMU and the general inpatient wards. It is conceivable that a fall in a patient under intensive monitoring for seizures is more likely to be reported than one in a general neurological patient. Second, the total number of patients with falls in the EMU appears small. However, considering the prior published fall rates in the EMU that are around 5–8 falls per 1000 patient days [11] and considering that most of our patients’ EMU admissions lasted between 3 to 5 days, we believe that we have obtained a fairly representative sample to provide insight into the questions addressed by our study.

In summary, characteristics and circumstances of falls among patients admitted to the EMU were different from those of inpatients. Age, location of fall, and mental state before fall were some of the significant differences between these two groups of patients. While a hospital-wide standard fall risk assessment protocol was able to identify patients at risk for falls in the EMU, there is a practice gap between assessing for and preventing falls, which suggests the need for redesigning interventions that perhaps should prioritize patient safety over privacy.

References