



## Original Article

## The Charges for Seizures in the Pediatric Emergency Room: A Single Center Study



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## ABSTRACT

**BACKGROUND:** The direct charges for emergency department visits resulting from recurrent seizures are significant, and home intervention with abortive medications can be cost-saving. Over a 1-year period, we evaluated children with seizures who were seen in the emergency department, stabilized, and released. The information is necessary to assess the pharmacoeconomic advantages of at-home interventions for seizure emergencies. **METHODS:** We did a retrospective chart review of 90 patients and divided them into febrile versus nonfebrile seizures and existing versus new-onset seizure disorder. The hospital accounting department performed a charge analysis. **RESULTS AND CONCLUSION:** The total charges for all 90 patients treated for seizures in the emergency department were \$219,945. The minimum was \$370, for a patient with no history of febrile seizures. The maximum was \$17,126, for a patient with a nonfebrile seizure and a history of seizures. This information allows a comparison with the cost of preventive medications, such as diazepam rectal gel or intranasal midazolam.

**Keywords:** epileptic seizures, emergency room treatment, charges, at-home interventions

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## Introduction

The economic burden of having a seizure or recurrent seizures can generally be categorized as direct and indirect. The indirect costs are usually related to the cost of missing school, work, time spent in emergency departments or clinic visits, and the stigma and comorbidities associated with epilepsy, which are usually assessed by patients and families reporting through surveys. Direct costs have been calculated by prospective studies on patients in epilepsy clinics that follow expenses resulting from emergency department, clinic, and hospital visits

over 1 year.<sup>1,2</sup> These data are useful for evaluating interventions, including prehospital interventions. Ultimately this yields economic and patient outcome data that can be useful when evaluating new therapies or strategies for patients with seizures.

A large 2006 study of epilepsy in North America provides excellent data regarding the incidence and the economic cost, as well as hardship, for people with epilepsy.<sup>3</sup> This study revealed that there are more than 3 million people with epilepsy in North America. The incidence is 44/100,000 people per year; the highest rates are in children younger than 5 years old and the elderly.

A study by Begley et al., analyzing data from 1995, estimated that lifetime direct and indirect costs for the 181,000 incident cases estimated to have occurred that year in the United States were \$1.8 billion and \$9.3 billion, respectively.<sup>4</sup> Annual direct costs for the 2.3 million prevalent cases of epilepsy in the United States in 1995 were estimated at \$1.7 billion, and the indirect costs related to morbidity and mortality were approximately \$10.8 billion.

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**TABLE.**  
Charges Over a 1-Year Period for Emergency Department Visits for Epileptic Seizures

Seizure Type	Sum	Average $\pm$ Standard Deviation	Minimum	Maximum
Febrile seizure, new onset (n = 27)	\$59,119	\$2190 $\pm$ \$1514	\$370	\$5753
Febrile seizure, known epilepsy (n = 10)	\$23,875	\$2388 $\pm$ \$898	\$1179	\$3517
Nonfebrile seizure, new onset (n = 16)	\$36,204	\$2263 $\pm$ \$1290	\$794	\$5458
Nonfebrile seizure, known epilepsy (n = 37)	\$100,747	\$2723 $\pm$ \$2718	\$554	\$17,126

Patients with intractable epilepsy account for about 25% of all patients with epilepsy. They carry a disproportionately higher cost burden, making this group a target for interventions. These are also patients who have prolonged or repetitive seizures that require emergency department evaluation and treatment.

O'Dell et al. reviewed the use of rectal diazepam gel and documented success in both treatment of seizures and reduction in emergency department visits.<sup>5</sup> In this prospective study, children in an epilepsy program were enrolled, given instruction on the use of diazepam rectal gel, and followed for 6 months. The results showed a significant reduction in length of seizure clusters and a subsequent reduction in emergency department visits. Similarly, another study by O'Dell et al. showed that education and prescription of abortive medication reduced emergency department visits and positively affected the quality of life in patients with seizures.<sup>6</sup> However, no large study has been performed to assess the costs associated with an emergency room visit for uncontrolled or new-onset seizures.

This article will focus on the direct charges incurred when patients with seizures are evaluated in the emergency department. (Given the retrospective nature of the study, we could not adequately access the indirect costs, but realize these are also potentially quite substantial.) The primary concerns of cardiorespiratory and metabolic stabilization as well as control of the seizure are quickly addressed in the emergency department by physicians with expertise in acute management of such cases. However, for those patients with seizures who use abortive medications at home, and as a result do not require an emergency department evaluation, the intervention can be cost-saving in terms of both the direct and indirect costs. To better understand the typical costs for this population, we decided to evaluate children who were seen in the emergency department, stabilized, and released. This knowledge is critical in evaluating at-home interventions for seizure emergencies to assess if they would have a pharmacoeconomic advantage in addition to their established safety and efficacy profile. None of the children included in this study was pretreated with an abortive agent (e.g., rectal diazepam gel, intranasal midazolam) before being seen in the emergency department.

## Methods

This is a retrospective chart review of patients with seizures who were seen in the Le Bonheur Children's Hospital (Memphis, TN) emergency department from January 1 to December 31, 2008. Only patients who were felt to be stable enough to be released to return home were included. That is, their parents or caregivers were worried enough about their seizures to bring them to the emergency

department, but once seen and treated they were thought to be stable enough to be sent home, with follow-up by their local pediatrician or neurologist as an outpatient. This group was selected because it was thought that if an out-of-hospital intervention were applied, it might have prevented the need for an emergency department visit. There were 1031 patients who were identified with a coding for seizures on their chart. We randomly selected 110 of those children for our study. One hundred and three visits were analyzed because some patients had multiple visits to the emergency department, but only the first visit was included in the analysis. Of the 103 patients, 13 were seen for problems other than active seizures at that visit, but if they had a history of epilepsy the coding for seizures was in their chart. Excluding these patients left 90 whose primary diagnosis or reason for emergency department visit was seizures. These 90 patients were further divided into febrile versus nonfebrile seizures and existing versus new-onset seizure disorder. The cost analysis was performed by the hospital accounting department and was reported as the total charges for that emergency department visit for a specific patient, as identified by their medical record number. We reported the sum of the cost for each patient type as well as the minimum, maximum, and average cost of an emergency department evaluation and a breakdown of the total costs by categories.

## Results

The sum of the charges for the 90 patients treated for seizures in the emergency department was \$219,945. The minimum charge for an evaluation for seizures was \$370; this was for a patient with a febrile seizure who had no history of febrile seizures (Table). The maximum charge for an emergency department evaluation for seizure in our group of randomly selected patients was \$17,126 for a patient with a nonfebrile seizure and a history of seizures. Despite the significant clinical differences between groups, the average amount spent on each category was similar. The Figure shows the charges broken down into categories such as laboratory fees and imaging studies. Charges lumped together under the category labeled "other" include pulmonary function tests and respiratory therapy, anesthesia, operating and recovery room costs, and supplies. There were few electroencephalographic or imaging studies performed ordered during the emergency department visit, although they may have been performed at a later time, as clinically indicated by their seizure type; more would have a significant impact on the total charges. Emergency department charges composed almost 50% of the total.

## Discussion

The cost of treatment for patients who present with seizures to the emergency department is significant, even for patients who do not require hospitalization. Although indirect costs are significant, this study focused on the direct cost; more specifically, on the charges for evaluation and treatment of patients with seizures in the emergency

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