



Patient and hospital characteristics are associated with cost of hospitalizations in children with epilepsy

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ABSTRACT

We assessed patient and hospital characteristics and cost of hospitalizations in children with epilepsy, using the United States (U.S.) Kids' Inpatient Database (KID2009). There were 114,256 pediatric admissions for epilepsy in 2009. Admission rate was highest in those with the lowest household income. Private, urban teaching, and nonchildren's hospitals and hospitals in the Southern U.S. admitted the most patients. The average length of hospitalization was 5.4 days, and adjusted cost was \$6656/day of admission. The cost of hospitalizations was higher in those with the highest household income versus in those with lower income, private versus Medicare/Medicaid insurance, admissions to private versus public hospitals, urban teaching versus nonteaching or rural hospitals, and children's versus nonchildren's hospitals. Epilepsy comorbidities did not increase the cost of hospitalization. We found that the number and cost of hospitalizations in children with epilepsy vary by patient and hospital characteristics. Such findings are essential for informing future health plans and policy decisions on resource allocation.

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1. Introduction

Epilepsy is one of the most common childhood neurologic conditions. The estimated lifetime prevalence of childhood epilepsy was 10.2/1000 in the United States (U.S.) [1]. The number of hospital admissions for combined adults and pediatric patients with epilepsy (PWE) has increased over the last 15 years in the U.S., from 68,676 admissions in 1993 to 170,484 admissions in 2008 [2]. Despite the increasing number of admissions in PWE, the factors influencing hospital admissions have not been evaluated. The patient and hospital characteristics of children admitted with a diagnosis of epilepsy are unknown at present. Population studies to evaluate inpatient admissions of children with epilepsy are needed to provide a profile of children who require inpatient care. Understanding the factors that influence hospital admissions is important to implement strategies to minimize these admissions and to inform allocation of scarce resources.

The high prevalence, high morbidity, and low mortality of epilepsy have led to a disproportionately high cost of illness compared to other diseases [3]. Inpatient care accounts for about a third of the direct cost of epilepsy [4]. However, the factors influencing the cost of hospitalizations in children with epilepsy are currently unknown. A previous study on the hospitalization cost of children with acute stroke indicated that

patient and hospital characteristics such as patient demographics, length of stay, and the type and location of hospitals could affect the cost of hospitalizations [5]. Further evidence suggests that hospital cost in PWE may be influenced by comorbidity [6,7]. Adult PWE who had comorbidities were 3.7 times more likely to be admitted to a hospital than those without comorbidity [7]. The relative risk of admission and cost of hospitalizations were highest in PWE and depression [7], and resource utilization was also higher in PWE and depression [8]. Adults with both epilepsy and intellectual disability (ID) have increased rates of hospitalizations compared to those with ID alone [6]. Children with epilepsy frequently have comorbidities such as ID, attention-deficit hyperactivity disorder (ADHD), autistic spectrum disorder (ASD), depression, and anxiety [1]. The contribution of these comorbidities on cost of inpatient care has not been assessed.

The aims of the study were to assess the patient and hospital characteristics of inpatient admissions in children with a diagnosis of epilepsy and to identify factors that influence the cost of hospitalizations, such as patient demographics, hospital characteristics, and comorbidities associated with epilepsy.

2. Methods

2.1. Data source

The patients' data were obtained from KID (Kid's Inpatient Database) 2009, an administrative health database that measures the

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use of inpatient hospital services by children aged 0 to 20 years in the U.S. for the year 2009. Kid's Inpatient Database is a component of the Healthcare Cost and Utilization Project [9]. The design of KID2009 has been described in detail in the Healthcare Cost and Utilization Project—U.S. website (<http://hcup-us-ahrq.gov/db/nation/kid/kidrelatedreports.usp>). The database contains discharge abstract data from pediatric hospital admissions from 4121 hospitals, including

variables such as age at admission, demographics, hospital characteristics, diagnoses (up to 25 per admission), length of stay, and hospital charges. Nonfederal, short-term, community general and specialty hospitals from 44 states participated. Federal hospitals, long-term hospitals, psychiatric hospitals, rehabilitation facilities, and hospital units within institutions were excluded. National estimates were obtained using discharge weights that were developed using the American

Table 1
Patient and hospital characteristics of children with epilepsy.

	All epilepsy		Epilepsy and all comorbidities		Epilepsy and no comorbidity	
	Weighted N	95% CI	Weighted N	95% CI	Weighted N	95% CI
Total	114,256	103,667, 124,845	17,397 (15.2%)	15,844, 18,950	96,859 (84.8%)	87,679, 106,039
Gender						
Males	60,096 (52.9%)	54,311, 65,881	10,454 (60.2%)	9465, 11,443	49,642 (51.6%)	44,747, 54,537
Females	53,422 (47.1%)	48,598, 58,246	6906 (39.8%)	6302, 7510	46,516 (48.4%)	42,210, 50,821
Total	113,518	102,963, 124,073	17,360	15,809, 18,911	96,158	87,010, 105,306
Age (years)						
≤4	27,547 (26.3%)	24,590, 30,503	1015 (5.9%)	856, 1175	26,531 (30.3%)	23,690, 29,373
5–9	23,925 (22.8%)	21,270, 26,581	3865 (22.4%)	3385, 4346	20,060 (22.9%)	17,829, 22,291
10–14	20,684 (19.8%)	18,493, 22,876	4649 (26.9%)	4139, 5160	16,035 (18.3%)	14,286, 17,784
15–20	32,557 (31.1%)	30,488, 34,625	7729 (44.8%)	7198, 8260	24,828 (28.4%)	23,200, 26,455
Total	104,713	95,152, 114,274	17,259	15,721, 18,798	87,454	79,289, 95,619
Race						
White	51,554 (45.1%)	45,387, 57,721	9076 (52.2%)	8114, 10,039	42,478 (43.9%)	37,205, 47,750
African-American	16,820 (14.7%)	14,536, 19,103	2202 (12.7%)	1894, 2510	14,618 (15.1%)	12,597, 16,638
Hispanic	20,192 (17.7%)	16,904, 23,481	2203 (12.7%)	1817, 2589	17,990 (18.6%)	15,041, 20,938
Other	8588 (7.5%)	7009, 10,167	1072 (6.2%)	847, 1296	7517 (7.8%)	6131, 8902
Missing	17,093 (15.0%)	11,627, 22,558	2844 (16.3%)	1867, 3822	14,248 (14.7%)	9712, 18,785
Total	114,247	103,658, 124,836	17,397	15,844, 18,950	96,850	87,670, 106,030
Household income						
\$24,999 or less	33,282 (29.8%)	29,739, 36,826	4806 (28.4%)	4281, 5332	28,476 (30.1%)	25,395, 31,557
\$25,000–\$34,999	28,103 (25.2%)	25,447, 30,759	4390 (25.9%)	3978, 4801	23,713 (25.1%)	21,405, 26,021
\$35,000–\$44,999	25,927 (23.2%)	23,094, 28,760	3875 (22.9%)	3434, 4317	22,051 (23.3%)	19,595, 24,508
\$45,000 or more	24,259 (21.7%)	20,702, 27,815	3859 (22.8%)	3296, 4422	20,400 (21.6%)	17,353, 23,446
Total	111,571	101,158, 121,984	16,930	15,405, 18,456	94,641	85,610, 103,671
Insurance payer						
Medicare/Medicaid	60,670 (53.2%)	54,939, 66,401	9053 (52.1%)	8214, 9891	51,617 (53.3%)	46,624, 56,611
Private	45,344 (39.7%)	40,089, 50,598	7164 (41.2%)	6340, 7987	38,180 (39.5%)	33,670, 42,690
Other	8122 (7.1%)	6825, 9418	1160 (6.7%)	1003, 1317	6962 (7.2%)	5788, 8135
Total	114,135	103,551, 124,719	17,376	15,823, 18,929	96,759	87,584, 105,934
Mean length of stay (days)	5.4	5.2, 5.6	5.5	5.1, 5.8	5.3	5.1, 5.5
Admission type						
Urgent/emergent	73,707 (64.5%)	66,155, 81,260	11,189 (64.3%)	10,136, 12,242	62,518 (64.5%)	55,902, 69,135
Elective	26,651 (23.2%)	22,635, 30,666	4364 (25.1%)	3677, 5051	22,287 (23.0%)	18,891, 25,682
Other/missing	13,898 (12.2%)	9243, 18,553	1844 (10.6%)	1246, 2442	12,054 (12.4%)	7969, 16,138
Total	114,256	103,667, 124,845	17,397	15,844, 18,950	96,859	87,679, 106,039
Disposition of patients						
Routine	98,993 (86.7%)	89,575, 108,411	15,039 (86.5%)	13,621, 16,457	83,954 (86.7%)	75,821, 92,088
Short-term hospital	2931 (2.6%)	2663, 3199	470 (2.7%)	406, 535	2461 (2.5%)	2227, 2695
Other transfer	12,295 (10.8%)	10,724, 13,866	1875 (10.8%)	1674, 2076	10,420 (10.8%)	8993, 11,847
Total	114,219	103,631, 124,807	17,384	15,831, 18,937	96,835	87,655, 106,014
Hospital region						
Northeast	24,331 (21.3%)	17,750, 30,911	3879 (22.3%)	2953, 4806	20,452 (21.1%)	14,760, 26,143
Midwest	26,305 (23.0%)	19,559, 33,050	4552 (26.2%)	3458, 5647	21,752 (22.4%)	16,029, 27,476
South	39,524 (34.6%)	32,604, 46,444	5795 (33.3%)	4924, 6666	33,729 (34.8%)	27,617, 39,841
West	24,097 (21.1%)	18,005, 30,189	3171 (18.2%)	2413, 3929	20,926 (21.6%)	15,555, 26,296
Total	114,256	103,667, 124,845	17,397	15,844, 18,950	96,859	87,679, 106,039
Hospital ownership						
Public	12,338 (12.1%)	9142, 15,534	1797 (11.4%)	1326, 2269	10,541 (12.2%)	7782, 13,300
Private	89,967 (87.9%)	80,102, 99,831	14,016 (88.6%)	12,543, 15,489	75,950 (87.8%)	67,440, 84,461
Total	102,305	92,353, 112,257	15,813	14,328, 17,298	86,492	77,896, 95,087
Hospital location						
Rural	4782 (4.7%)	4134, 5430	910 (5.8%)	769, 1051	3872 (4.5%)	3332, 4413
Urban nonteaching	16,796 (16.4%)	14,391, 19,201	3024 (19.1%)	2678, 3371	13,772 (15.9%)	11,652, 15,892
Urban teaching	80,726 (78.9%)	70,939, 90,514	11,879 (75.1%)	10,433, 13,326	68,847 (79.6%)	60,393, 77,302
Total	102,305	92,353, 112,257	15,813	14,328, 17,298	86,492	77,896, 95,087
Children's hospital						
Yes	27,387 (27.2%)	20,902, 33,871	3605 (23.3%)	2572, 4638	23,782 (27.9%)	18,233, 29,330
No	73,233 (72.8%)	65,774, 80,691	11,864 (76.7%)	10,812, 12,916	61,369 (72.1%)	54,882, 67,856
Total	100,620	90,736, 110,503	15,469	13,995, 16,944	85,150	76,614, 93,687
Epilepsy surgery						
Yes	887 (0.8%)	621, 1154	142 (0.8%)	88, 196	745 (0.8%)	523, 968
No	113,369 (99.2%)	102,945, 123,793	17,255 (99.2%)	15,727, 18,783	96,114 (99.2%)	87,072, 105,156
Total	114,256	103,667, 124,845	17,397	15,844, 18,950	96,859	87,679, 106,039

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