



Variability in Resource Utilization in the Evaluation and Management of Simple Febrile Seizures in Pediatric Inpatients at Tertiary Academic Centers

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Introduction

- Definition of simple febrile seizures (SFS): 6mos – 5yrs, otherwise neurologically healthy. Temp > 38C. Convulsion < 15 minutes duration. No focal features. No recurrence in 24 hrs.
- AAP, ACR, and NIH recommend against routine neuroimaging, electroencephalography, or use of anticonvulsants in children presenting with SFS.
- There is no strong evidence that, for the average SFS patient, clinically actionable abnormalities can be uncovered or that the potential benefits of treatment outweigh the risks associated with anticonvulsants.
- Why focus on MRI? 1) Recent spike in MRI's due to concerns about CT radiation. 2) MRI usually requires anesthesia in this age group, posing both immediate and long-term risks to the child, not to mention a significant use of physician time and resources.
- FDA recently revised labeling of anesthetic and sedative agents to warn that exposure to these agents in children < 3 years may affect brain development.
- Prior research on other diseases has indicated significant variability in imaging & resource utilization across regions and hospitals, even when controlling for patient acuity → implies overutilization, unnecessary imaging and room for some degree of standardization.
- In a study conducted prior to the establishment of the first AAP guidelines, physicians were found to have significant practice variations in their approach to SFS, with ~60% frequently utilizing EEG and ~40% regularly prescribing anticonvulsants.
- To our knowledge, there has been no re-assessment of practicing behaviors since the published guidelines.

Methods

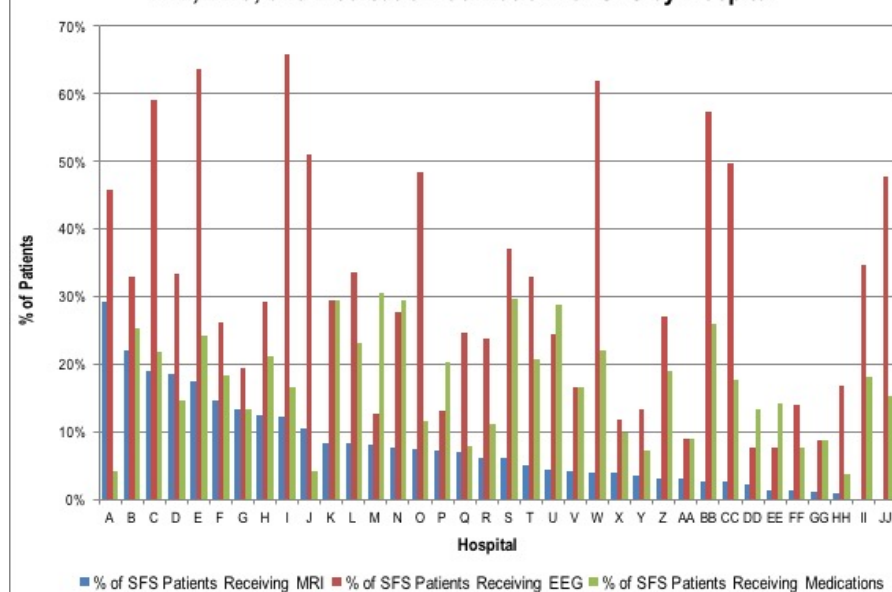
- Utilized the Pediatric Health Information Systems (PHIS) administrative database. 49 tertiary pediatric hospitals; 36 hospitals were included in the study - those that reported both ED + inpatient data.
- The full analysis below was conducted only on children that were admitted for their primary diagnosis of SFS (8.4%) in order to capture the entire patient encounter.
- ICD-9/10 codes were used to identify SFS patients. Excluded all children with any other acute or chronic neurologic conditions, developmental or congenital disorders, a history of anticonvulsant med use, or metal in the body that would preclude the possibility of MRI.
- Analyzed patient characteristics to assess for any significant differences between children that did and did not receive MRI, EEG, or anticonvulsants.
- Assessed relationship between relevant hospital characteristics (geography, case mix, patient volume, fellowships) and the utilization rates of MRI, EEG, and anticonvulsants.
- Compared individual hospitals' rates of MRI, EEG, and anticonvulsants prescribed.
- Chi-squared tests were used to test for significance. Pearson's correlation coefficients were used to determine the relationship between hospital characteristics and utilization rates. P<0.05 was deemed statistically significant. Analyses were performed using SAS software.

Results

Table 2. Analysis of Patient Characteristics Based Upon MRI, EEG or Anticonvulsants Utilization

	Did Not Receive MRI			Did Not Receive EEG			Did Not Receive Medications			
	Entire Cohort (N=3,640)	Received MRI (7.5%) (N=273)	p-value	Received EEG (32.3%) (N=1,175)	p-value	Received Medications (17.7%) (N=643)	p-value			
Age (Months)										
6-23 m	2453 (67.4)	2282 (67.8)	171 (62.6)	0.028	1714 (69.5)	739 (62.9)	<0.001	2019 (67.4)	434 (67.5)	0.99
24-41 m	895 (24.6)	826 (24.5)	69 (25.3)		570 (23.1)	325 (27.7)		738 (24.6)	157 (24.4)	
42-60 m	292 (8.0)	259 (7.7)	33 (12.1)		181 (7.3)	111 (9.4)		240 (8.0)	52 (8.1)	
Gender										
Male	2075 (57.1)	1925 (57.2)	150 (54.9)	0.460	1424 (57.9)	651 (55.4)	0.16	1714 (57.3)	361 (56.1)	0.6
Female	1561 (42.9)	1438 (42.8)	123 (45.1)		1037 (42.1)	524 (44.6)		1279 (42.7)	282 (43.9)	
Principal Payer										
Public	2278 (63.2)	2105 (63.2)	173 (63.4)	0.910	1540 (63.1)	738 (63.2)	0.31	1897 (63.9)	381 (59.8)	0.11
Private	1122 (31.1)	1036 (31.1)	86 (31.5)		769 (31.5)	353 (30.2)		910 (30.7)	212 (33.3)	
Other	206 (5.7)	192 (5.8)	14 (5.1)		130 (5.3)	76 (6.5)		162 (5.5)	44 (6.9)	
Source of Admission										
ED	2463 (67.7)	2286 (67.9)	177 (64.8)	0.002	1659 (67.3)	804 (68.4)	0.019	1961 (65.4)	502 (78.1)	<0.001
Transfer	358 (9.8)	315 (9.4)	43 (15.8)		225 (9.1)	133 (11.3)		295 (9.8)	63 (9.8)	
Other	819 (22.5)	766 (22.8)	53 (19.4)		581 (23.6)	238 (20.3)		741 (24.7)	78 (12.1)	
Prior ED Visit for SFS										
No	3295 (90.5)	3050 (90.6)	245 (89.7)	0.650	2264 (91.8)	1031 (87.7)	<0.001	2729 (91.1)	566 (88.0)	<0.017
Yes	345 (9.5)	317 (9.4)	28 (10.3)		201 (8.2)	144 (12.3)		268 (8.9)	77 (12.0)	
Length of Stay (Days)										
1	2734 (75.1)	2623 (77.9)	111 (40.7)	<0.001	1986 (80.6)	748 (63.7)	<0.001	2366 (78.9)	368 (57.2)	<0.001
2	659 (18.1)	564 (16.8)	95 (34.8)		365 (14.8)	294 (25.0)		479 (16.0)	180 (28.0)	
3+	247 (6.8)	180 (5.3)	67 (24.5)		114 (4.6)	133 (11.3)		152 (5.1)	95 (14.8)	

MRI, EEG, and Medication Utilization for SFS by Hospital



Discussion

- Key Findings

- Resource utilization exceeded the conservative approach recommended by the AAP, ACR, NIH.
- MRI: 7.5%. EEG: 32.3%. Anticonvulsants: 17.7%
- Factors associated with increased utilization: older age, increased length of stay, prior ED visit for SFS, hospitals in the Southern USA.
- Factors NOT associated with increased utilization: a hospital's average case mix index, annual inpatient volume, annual number of admitted seizure patients; mixed association for fellowships
- Wide variation in resource utilization amongst hospitals:
 - MRI interquartile range: 3.0% - 11.0%
 - EEG interquartile range: 16.0% - 46.3%
 - Anticonvulsant interquartile range: 10.9% - 22.3%
- No strong correlation between a hospital's utilization of one resource and another. For example:
 - Hospital W: very hi EEG, almost no MRIs
 - Hospital M: top prescriber of anticonvulsants, lowest utilizer of EEG
 - Hospital GG: appears to be following the guidelines better than most (below average for all)

-Limitations

- Focused only on patients admitted for SFS – there may be clinical differences not captured in the administrative data to justify a more intensive workup/treatment
- Data is pulled from administrative databases, which are not managed by clinicians and are also known to commonly underreport diagnostic procedures.
- Generalizability limited by only including tertiary pediatric hospitals; much pediatric care occurs at less-specialized community hospitals
- Retrospective study design limits ability to precisely identify the drivers of resource utilization