Seizures — Child
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. About Epilepsy. *Epilepsy and Seizure Statistics*. http://www.epilepsyfoundation.org/about/statistics.cfm. Accessed July 2009.	15	N/A	Estimates of the incidence and prevalence of seizures and epilepsy in the US.	N/A	3
2. Fisher RS, van Emde Boas W, Blume W, et al. Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). *Epilepsia* 2005; 46(4):470-472.	12	N/A	Review definitions for epileptic seizures and epilepsy.	According to the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE), epileptic seizure is a brief occurrence of signs and/or symptoms while epilepsy is characterized by an enduring tendency to generate epileptic seizures.	3
3. Weitemeyer L, Kellinghaus C, Weckesser M, et al. The prognostic value of [F]FDG-PET in nonrefractory partial epilepsy. *Epilepsia* 2005; 46(10):1654-1660.	10	90	To determine the value of FDG-PET in non-refractory partial epilepsy.	43/90 had regional asymmetry of tracer distribution. Not predictive of success of anticonvulsants. Regional hypometabolism in FDG-PET is not significantly associated with a lower likelihood of successful anticonvulsant drug therapy.	2
4. Baykan B, Ertas NK, Ertas M, Aktekin B, Saygi S, Gokyigit A. Comparison of classifications of seizures: a preliminary study with 28 participants and 48 seizures. *Epilepsy Behav* 2005; 6(4):607-612.	8	48 seizures 28 reviewers	Compare three available seizure classifications: International classification of epileptic seizures (ICES), semiological seizure classification (SSC), and proposal of a new diagnostic scheme for seizures (PDSS).	Overall diagnostic success rates were 81.4% for ICES, 80.5% for PDSS, and 87.5%, for SSC. In reliability analysis, Cronbach's alpha was 0.94 for ICES, 0.88 for PDSS, and 0.70 for SSC. 19 reviewers chose SSC, 8 chose ICES, and one chose PDSS as their preference.	1
5. Pellock JM. The classification of childhood seizures and epilepsy syndromes. *Neurol Clin* 1990; 8(3):619-632.	12	N/A	Review classification of childhood seizures and epilepsy syndromes.	Classification scheme helps in evaluation and treatment of patients.	4
6. Scheuer ML, Pedley TA. The evaluation and treatment of seizures. *N Engl J Med* 1990; 323(21):1468-1474.	12	N/A	To review diagnosis and treatment of seizures.	Electroencephalography is recommended for evaluating patients with known or suspected seizure disorder. MRI or x-ray CT can be combined with electrophysiologic studies, but MRI is more sensitive than CT in detecting cerebral lesions related to epilepsy.	4
7. Engel J, Jr. Report of the ILAE classification core group. *Epilepsia* 2006; 47(9):1558-1568.	15	N/A	To examine epileptic seizure types and epilepsy syndromes. Purpose of report is to identify research which will make possible the creation of a new classification.	No results.	3
8. Panayiotopoulos CP. Neonatal Epileptic Seizures and Syndromes. http://professionals.epilepsy.com/page/neonatal_seizures_and_syndromes.html. Accessed January, 2009.	12	N/A	To review neonatal epileptic seizures and syndromes.	Epileptic syndromes that help in diagnosis and management of seizure disorders are a major advancement.	4

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9. Calciolari G, Perlman JM, Volpe JJ. Seizures in the neonatal intensive care unit of the 1980s. Types, Etiologies, Timing. *Clin Pediatr (Phila)* 1988; 27(3):119-123.	15	150	Retrospective review to determine distribution of clinical seizure types, etiologies, and timing of neonatal seizures.	Hypoxic-ischemic encephalopathy (65% of total) was most common. Seizures with hypoxic-ischemic encephalopathy occurred 90% in the first 2-days of life. 80% of all seizures in the first 2-days of life were related to hypoxic-ischemic encephalopathy.	2
10. Sheth RD. Neonatal Seizures. Updated: Aug 21, 2008; http://www.emedicine.com/neuro/topic240.htm. Accessed March, 2009.	12	N/A	To review diagnosis, treatment and follow-up of neonatal seizures.	MRI is most sensitive for determining etiology for neonatal seizures. Cranial US is useful when determining whether intracranial hemorrhage (intraventricular hemorrhage) has occurred. Cranial CT is a more sensitive than US in detecting parenchymal abnormalities.	4
11. Krishnamoorthy KS, Soman TB, Takeoka M, Schaefer PW. Diffusion-weighted imaging in neonatal cerebral infarction: clinical utility and follow-up. *J Child Neurol* 2000; 15(9):592-602.	14	8 neonates 19 lesions	To describe the utility of echo-planar diffusion-weighted imaging in neonatal cerebral infarction.	Diffusion-weighted imaging shows findings not evident on CT or routine MRI.	3
12. DiMario FJ, Jr. Children presenting with complex febrile seizures do not routinely need computed tomography scanning in the emergency department. *Pediatrics* 2006; 117(2):528-530.	15	N/A	Examine imaging of children presenting with complex febrile seizures.	MRI is sensitive and clinically useful for most patients who are undergoing neurologic evaluation in the absence of suspected trauma or an immediate neurosurgical problem.	3
13. Kimiwada T, Juhasz C, Makki M, et al. Hippocampal and thalamic diffusion abnormalities in children with temporal lobe epilepsy. *Epilepsia* 2006; 47(1):167-175.	13	14 patients 14 control	To assess hippocampal and thalamic diffusion abnormalities in children with temporal lobe epilepsy. Fractional anisotropy (FA) and apparent diffusion coefficient (ADC) values were compared with diffusion tensor imaging (DTI) data of 14 controls (no epilepsy), as well as glucose PET findings.	DTI seems to be sensitive for detecting abnormalities in children with partial epilepsy, even in structures without apparent changes on conventional MRI.	3
14. Natsume J, Bernasconi N, Miyauchi M, et al. Hippocampal volumes and diffusion-weighted image findings in children with prolonged febrile seizures. *Acta Neurol Scand* 2007; 115(4 Suppl):25-28.	13	12 patients 13 controls	To assess hippocampal volumes and diffusion-weighted image findings in children with prolonged febrile seizures (PFS).	7/12 patients had seizures that were refractory and lasted for 60 minutes or longer. In patients with PFS for 60 minutes or longer, hippocampal volumes were significantly larger than that of controls. In all patients, there was a positive correlation between hippocampal volumes and seizure duration.	3

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15. Provenzale JM, Barboriak DP, VanLandingham K, MacFall J, Delong D, Lewis DV. Hippocampal MRI signal hyperintensity after febrile status epilepticus is predictive of subsequent mesial temporal sclerosis. *AJR* 2008; 190(4):976-983.	10	11 patients 30 healthy children 2 observers	Prospective blinded study to determine whether hippocampal MRI signal hyperintensity after febrile status epilepticus is predictive of subsequent mesial temporal sclerosis.	7 children had hyperintense signal intensity ranging from 1 (minimally increased) to 4 (markedly increased). MRI findings of a markedly hyperintense hippocampus in children with febrile status epilepticus was highly associated with mesial temporal sclerosis.	2
16. Lee ST, Lui TN. Early seizures after mild closed head injury. *J Neurosurg* 1992; 76(3):435-439.	13	4,232	Review CT findings to determine incidence of seizure in patients with mild closed head injury.	100 patients (2.36%) had seizures within 1-week after head injury. Most of these seizures were the generalized tonic-clonic type. Early post-traumatic seizures after mild closed head injury have a high incidence (53%) in patients with normal CT findings.	2
17. Sharma S, Riviello JJ, Harper MB, Baskin MN. The role of emergent neuroimaging in children with new-onset afebrile seizures. *Pediatrics* 2003; 111(1):1-5.	13	500	Retrospective review to determine the frequency of clinically significant abnormal neuroimaging in children with new-onset afebrile seizures (ASZ), and identify children at high-risk or low-risk for abnormal neuroimaging.	Clinically significant abnormal neuroimaging occurred with relatively low frequency. Emergent neuroimaging should be considered for children who meet high-risk criteria.	2
18. Garvey MA, Gaillard WD, Rusin JA, et al. Emergency brain computed tomography in children with seizures: who is most likely to benefit? *J Pediatr* 1998; 133(5):664-669.	13	99	Retrospective review to determine if emergency brain CT in patients with new-onset seizures will benefit children.	19 children had brain abnormalities on CT. CT abnormalities requiring treatment or monitoring were more frequently seen in children with their first unprovoked seizure ($P<.01$) and in those whose seizure onset had been focal or who had focal abnormalities identified on postictal neurologic examination ($P<.04$).	2
19. Jan M, Neville BG, Cox TC, Scott RC. Convulsive status epilepticus in children with intractable epilepsy is frequently focal in origin. *Can J Neurol Sci* 2002; 29(1):65-67.	13	18	A study on children with recurrent non-febrile convulsive status epilepticus to assess the evidence for focal origin. Clinical and radiological data was reviewed.	Focal brain abnormalities were detected on 18% and 55% of CT and MRI, respectively. Overall, 53% had a focal abnormality on structural neuroimaging.	3
20. Young AC, Costanzi JB, Mohr PD, Forbes WS. Is routine computerised axial tomography in epilepsy worth while? *Lancet* 1982; 2(8313):1446-1447.	13	220	To determine the value of routine CT of the brain in patients with epilepsy or isolated seizures.	CT was normal in 94% of patients without focal features. Only a quarter of the abnormalities on CT were potentially treatable by surgery, and only 10% of all the patients had their management changed as a result of CT.	2
21. Ibrahim K, Appleton R. Seizures as the presenting symptom of brain tumours in children. *Seizure* 2004; 13(2):108-112.	3b	81	To retrospectively review frequency of brain tumors presenting with seizures.	In 10 (12%) of 81 children with brain tumor, seizures were the presenting clinical symptom.	2

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22. Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M. The role of brain computed tomography in evaluating children with new onset of seizures in the emergency department. *Epilepsia* 2000; 41(8):950-954.	13	66	Retrospective chart review to determine role of brain CT in evaluating children with new onset of seizures in the emergency department.	52 patients (78.8%) had normal CT results and 14 (21.2%) had abnormal CT results. Routine CT for first seizure is not justified.	3
23. Hart YM, Sander JW, Johnson AL, Shorvon SD. National General Practice Study of Epilepsy: recurrence after a first seizure. *Lancet* 1990; 336(8726):1271-1274.	3a	564	2 to 4 year follow-up of patients with definite seizures.	67% (95% CI: 63%-71%) had a recurrence within 12 months of the first seizure, and 78% (74%-81%) had a recurrence within 36 months. Seizures associated with a neurological deficit (present at birth) had a high rate of recurrence (100% by 12 months), while seizures that occurred within 3 months of an acute insult to the brain, had a lower risk of recurrence (40% [29%-51%] by 12 months.	2
24. Hirtz DG. Generalized tonic-clonic and febrile seizures. *Pediatr Clin North Am* 1989; 36(2):365-382.	12	N/A	Review generalized and febrile seizures.	Relatively few children need daily anticonvulsant therapy.	4
25. Reinus WR, Wippold FJ, 2nd, Erickson KK. Seizure patient selection for emergency computed tomography. *Ann Emerg Med* 1993; 22(8):1298-1303.	13	115 patients 60-known seizure disorder 38-new onset seizure 17-possible seizure	To retrospectively evaluate the medical records of patients with seizures to determine the need for emergency CT.	Results of neurologic examination and CT were compared in 105 patients. Abnormal neurologic examination predicted 19/20 positive CT scans (95%) and demonstrated a strong association with CT results (P<.00004). Only a history of malignancy correlated to CT findings (P<.008). According to the results, the greatest benefit from emergency CT will be from patients with either a history of malignancy or an abnormal neurologic examination.	2
26. Itomi K, Okumura A, Negoro T, et al. Prognostic value of positron emission tomography in cryptogenic West syndrome. *Dev Med Child Neurol* 2002; 44(2):107-111.	10	17	To examine the prognostic value of PET in cryptogenic West syndrome.	Cortical hypometabolism was detected in 11 infants on the first PET and in 5 infants on the second. Rate of developmental delay at the last follow-up was significantly higher in infants with hypometabolism on the second PET than in those without PET abnormalities ($p<0.05$). Rate of seizure occurrence after initial treatment was higher in infants with cortical hypometabolism on the second PET, but the difference was not statistically significant.	3

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27. Otsubo H, Chuang SH, Hwang PA, Gilday D, Hoffman HJ. Neuroimaging for investigation of seizures in children. *Pediatr Neurosurg* 1992; 18(2):105-116.	12	N/A	Review value of different imaging modalities in children with seizures.	A number of imaging modalities (CT, MRI, and Xenon CT, SPECT and PET) are being used for studying the abnormality in order to help plan surgery.	4
28. Lefkopoulos A, Haritanti A, Papadopoulou E, Karanikolas D, Fotiadis N, Dimitriadis AS. Magnetic resonance imaging in 120 patients with intractable partial seizures: a preoperative assessment. *Neuroradiology* 2005; 47(5):352-361.	13	120	To describe MRI findings in patients with intractable partial seizures and compare different MR sequences.	Coronal, thin images are most useful in the assessment of the hippocampus. Fluid-attenuated inversion recovery (FLAIR) and inversion recovery (IR) are useful in the detection of lesions abutting cerebrospinal fluid spaces and developmental disorders, respectively, while T1 SE sequences before and after the intravenous administration of gadolinium offer great facility in identifying space-occupying lesions and infections. MRI is the most important diagnostic tool for the assessment of epileptogenic foci.	2
29. Wu WC, Huang CC, Chung HW, et al. Hippocampal alterations in children with temporal lobe epilepsy with or without a history of febrile convulsions: evaluations with MR volumetry and proton MR spectroscopy. *AJNR Am J Neuroradiol* 2005; 26(5):1270-1275.	13	55	To assess the hippocampal alterations in epileptic children with or without a history of febrile convulsions by using MR spectroscopy and volumetry.	Children with temporal lobe epilepsy and early history of febrile convulsion tend to have lower hippocampal volumes and NAA/(Cr + Cho) ratios than do temporal lobe epilepsy children without history of febrile convulsion. MR volumetry and spectroscopy are equally capable of showing the trends of hippocampal alternations in children with temporal lobe epilepsy with or without febrile history.	2
30. Avery RA, Zubal IG, Stokking R, et al. Decreased cerebral blood flow during seizures with ictal SPECT injections. *Epilepsy Res* 2000; 40(1):53-61.	13	21 patients 3 observers	To determine if ictal SPECT injections reveal a change in regional cerebral blood flow (rCBF) around 100 s from seizure onset.	There was evidence that reduced rCBF may exist during ictus when ictal SPECT injections made 90 s after seizure onset were examined. The change in rCBF around 90 s is also observed in postictal injections, suggesting a common metabolic mechanism may be responsible.	2
31. Avery RA, Spencer SS, Spanaki MV, Corsi M, Seibyl JP, Zubal IG. Effect of injection time on postictal SPET perfusion changes in medically refractory epilepsy. *Eur J Nucl Med* 1999; 26(8):830-836.	15	27 patients receiving postictal and interictal SPET scans	To examine effect of injection time on postictal SPET perfusion changes in medically refractory epilepsy.	Most patients (8/12, 67%) receiving postictal injections within 100 s after seizure onset demonstrated hyperperfusion, while all patients (15/15, 100%) receiving postictal injections >100 after seizure onset showed hypoperfusion. Explanation of this phenomenon is unknown but findings appear to parallel known changes in cerebral lactate levels.	3

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32. Weil S, Noachtar S, Arnold S, Yousry TA, Winkler PA, Tatsch K. Ictal ECD-SPECT differentiates between temporal and extratemporal epilepsy: confirmation by excellent postoperative seizure control. *Nucl Med Commun* 2001; 22(2):233-237.	10	30	To determine whether SPECT can separate temporal (TE) lobe from extra temporal lobe epilepsy (ETE).	Ictal SPECT showed isolated temporal hyperperfusion in 90% of TE patients and normal perfusion in two patients. Sensitivity of ictal ECD-SPECT for correct localization of the seizure onset zone was 80% in all patients, 86% in TE patients and 66% in ETE patients. Ictal ECD-SPECT can be used to distinguish between TE and ETE.	2
33. Calcagni ML, Giordano A, Bruno I, et al. Ictal brain SPET during seizures pharmacologically provoked with pentylenetetrazol: a new diagnostic procedure in drug-resistant epileptic patients. *Eur J Nucl Med Mol Imaging* 2002; 29(10):1298-1306.	13	33	To prove feasibility of pharmacologic induced seizures in ictal SPET.	In 27 of 33 patients (82%), interictal-ictal SPET showed the hypo-hyperperfusion SPET pattern. Video-EEG showed a single epileptogenic zone in 21/33 patients (64%), and MRI showed anatomical lesions in 19/33 patients (57%). Ictal brain SPET provides ictal images because (99m)-Tc-ECD is injected immediately upon seizure onset.	2
34. Mohan KK, Chugani DC, Chugani HT. Positron emission tomography in pediatric neurology. *Semin Pediatr Neurol* 1999; 6(2):111-119.	12	N/A	To review utility of PET in pediatric neurology.	In patients with intractable partial seizures, PET helps to localize focus for resection.	4
35. Juhasz C, Chugani DC, Padhye UN, et al. Evaluation with alpha-[11C]methyl-L-tryptophan positron emission tomography for reoperation after failed epilepsy surgery. *Epilepsia* 2004; 45(2):124-130.	10	33	To determine role of PET using alpha-[11C] methyl-L-tryptophan (AMT) in detecting nonresected epileptic foci in patients with previously failed neocortical resection.	AMT-PET can identify nonresected epileptic cortex and assist in planning reoperation.	2
36. Warden CR, Brownstein DR, Del Beccaro MA. Predictors of abnormal findings of computed tomography of the head in pediatric patients presenting with seizures. *Ann Emerg Med* 1997; 29(4):518-523.	13	203	Retrospective study to determine predictors of abnormal findings of CT of the head in children with seizures.	CT findings were abnormal in 25 patients (12%). CT showed hemorrhage in 8 patients (32%), small focal abnormalities in 4 (16%), cerebral edema in 3 (12%), and shunt obstruction in 2 (8%). The absence of defined high-risk factors predicted normal head CT findings.	2
37. American College of Radiology. *Manual on Contrast Media*. Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx.	15	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	3

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
    a. Cohort
    b. Cross-sectional
    c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews
8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.