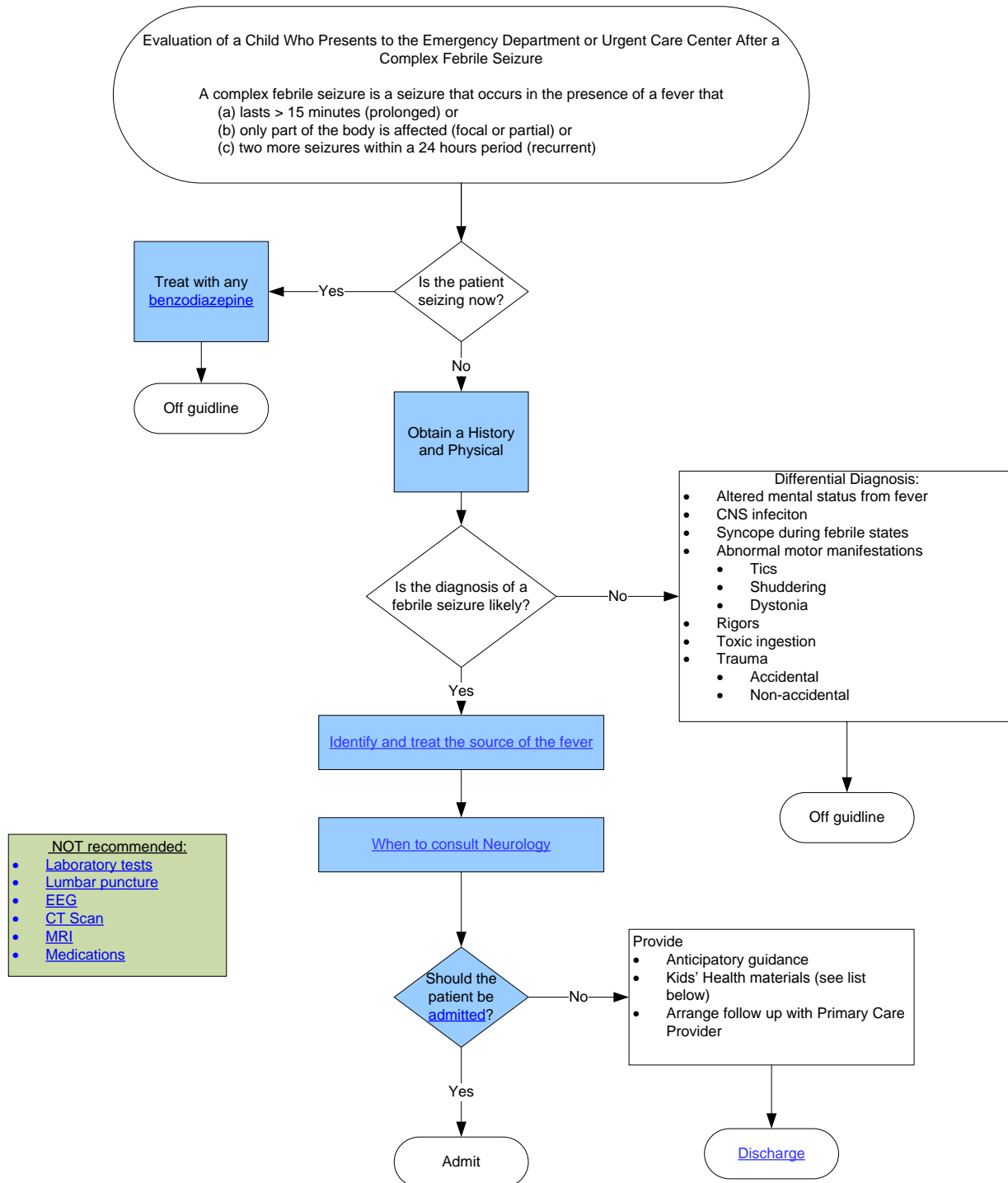


**Children's Mercy Hospital
Evidence Based Practice Clinical Practice Guide**

Complex Febrile Seizure



Epidemiology:

Febrile seizures are seizures that occur during a febrile illness in typically developing children who are 6 months old to 60 months of age. A complex febrile seizure has the following characteristics: (a) prolonged, > 15 minutes; (b) focal or partial (only part of the body is affected); or (c) recurrent (two or more seizures within a 24 hour period).

The primary goals of management are to stop the seizure if it is still occurring, and determine the cause of the fever and treat it appropriately. Therefore, medications for the seizure are not recommended, but medications to treat the causative infection are recommended.

Objective of Guideline: The objective of this guideline is to standardize care of the child with a complex febrile seizure in the Emergency Department/Urgent Care Center (ED/UCC) setting or a patient referred to an inpatient unit.

Target Users: ED/UCC providers, including physicians, fellows, resident physicians, advance practice nurses, direct care nurses, and inpatient providers.

Guideline Inclusion Criteria:

- Children 6 months to 60 months
- Neurodevelopmentally normal
- Seizures are complex febrile seizures
 - Prolonged- > 15 minutes
 - Focal, or partial- only part of the body is affected
 - Seizures occur more than once within a 24 hour period
- The child is back to baseline with a non-focal examination

Guideline Exclusion Criteria:

- Presence of:
 - Focal neurological examination
 - Intracranial infection
 - Known underlying condition, such as an inborn error of metabolism or genetic condition
 - History of afebrile seizures
 - Recent history of head trauma

Differential Diagnosis

- Includes:
 - Altered mental status from fever

- Syncope during febrile states
- Abnormal motor manifestations such as tics, shuddering or dystonia
- Rigors
- Toxic ingestion

Clinical Questions Answered by Guideline:

1. If a medication is required to stop the complex febrile seizure (prolonged, focal, or recurrent), which medication should be used to stop the seizure?
2. If a medication is required to stop the complex febrile seizure, should a benzodiazepine be prescribed for home use for recurrence of prolonged seizure with a fever?
3. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), and has a non-focal neurological exam, should the following be obtained:
 - a. Laboratory studies
 - i. Serum studies
 - ii. Urine studies
 - iii. CSF studies
 - b. Radiologic studies
 - i. Head CT without contrast
 - ii. Brain MRI
 - c. Neuro-diagnostic studies
 - i. EEG
4. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), should a Neurology consult be obtained?
5. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), should the child be admitted to the hospital?

Search Strategies:

Question	Search Strategy												
Lab tests	<p>PubMed- ("Seizures, Febrile/blood"[Mesh] OR "Seizures, Febrile/diagnosis"[Mesh] OR "Seizures, Febrile/epidemiology"[Mesh] OR "Seizures, Febrile/etiology"[Mesh]) AND ("CBC"[tiab] OR "BMP"[tiab] OR "CMP"[tiab] OR "Blood Cell Count"[Mesh] OR "Glucose/blood"[Mesh] OR "Clinical Laboratory Techniques"[Mesh] OR "Sodium/blood"[Mesh] OR "Magnesium/blood"[Mesh] OR "Phosphorus/blood"[Mesh] OR "Biological Markers/blood"[Mesh] OR "Calcium/blood"[Mesh] OR "Water-Electrolyte Imbalance/blood"[Mesh] OR "Electrolytes/blood"[Mesh] OR "Hypoglycemia/blood"[Mesh] OR "Hyperglycemia/blood"[Mesh] OR "Blood Sedimentation"[Mesh] OR "C-Reactive Protein/blood"[Mesh] OR "Leukocyte Count"[Mesh] OR "laboratory studies"[All Fields] OR "laboratory"[tiab]) AND ("2010/01/01"[PDAT] : "2015/12/31"[PDAT]) 63 results</p> <p>PubMed-("Seizures, Febrile/radiography"[Mesh] OR "Seizures, Febrile/radionuclide imaging"[Mesh]) OR ("Seizures, Febrile"[Majr] AND ("Neuroimaging"[Mesh] OR "Diagnostic Imaging"[Majr])) AND (("2010/01/01"[PDAT] : "2015/12/31"[PDAT]) AND "humans"[MeSH Terms] AND English[lang] AND ("infant"[MeSH Terms] OR "child"[MeSH Terms] OR "adolescent"[MeSH Terms])) 11 results</p>												
Imaging	<table border="1"> <thead> <tr> <th>EMBASE Terms</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td># 3 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND</td> <td></td> </tr> <tr> <td>#4 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/kun</td> <td>9</td> </tr> <tr> <td>#3 #1 AND #2</td> <td>68</td> </tr> <tr> <td># 2 'febrile convulsion/exp/mj OR 'imaging and display/ exp/mj</td> <td>331627</td> </tr> <tr> <td>#1 "febrile convulsion"/exp/mj</td> <td>2824</td> </tr> </tbody> </table> <p>PubMed-"Seizures, Febrile"[Majr] AND ("Electroencephalography"[Mesh] OR "EEG"[tiab]) NOT (Editorial[ptyp] OR Letter[ptyp] OR Case Reports[ptyp]) AND (("2010/01/01"[PDAT] : "2015/12/31"[PDAT]) AND "humans"[MeSH Terms] AND English[lang] AND ("infant"[MeSH Terms] OR "child"[MeSH Terms] OR "adolescent"[MeSH Terms])) Filters: From 2010/01/01 to 2015/12/31, Humans, English, Child: birth-18 years 30 results</p>	EMBASE Terms	Results	# 3 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND		#4 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/kun	9	#3 #1 AND #2	68	# 2 'febrile convulsion/exp/mj OR 'imaging and display/ exp/mj	331627	#1 "febrile convulsion"/exp/mj	2824
EMBASE Terms	Results												
# 3 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND													
#4 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/kun	9												
#3 #1 AND #2	68												
# 2 'febrile convulsion/exp/mj OR 'imaging and display/ exp/mj	331627												
#1 "febrile convulsion"/exp/mj	2824												
EEG	<table border="1"> <thead> <tr> <th>EMBASE Terms</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td>#9 #8 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py) AND [embase]/lim NOT [medline]/lim</td> <td>35</td> </tr> </tbody> </table>	EMBASE Terms	Results	#9 #8 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py) AND [embase]/lim NOT [medline]/lim	35								
EMBASE Terms	Results												
#9 #8 AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py) AND [embase]/lim NOT [medline]/lim	35												

	# 8 'febrile convulsion/exp/mj AND "electroencephalogram"/exp	224
Treated with meds in the ED and discharged with medications	PubMed: ("Seizures, Febrile/drug therapy"[Mesh] OR "Seizures, Febrile/prevention and control"[Mesh]) AND ("2010/01/01"[PDAT] : "2015/12/31"[PDAT]) AND ("humans"[MeSH Terms] AND English[lang] AND ("infant"[MeSH Terms] OR "child"[MeSH Terms] OR "adolescent"[MeSH Terms])) 35 results. April 16 2015	
Neuro consult	No results	
Be admitted to the hospital	No results	
	PubMed -("Seizures, Febrile/cerebrospinal fluid"[Mesh]) AND ("Seizures, Febrile"[Mesh] AND ("Spinal Puncture"[Mesh] OR "lumbar puncture"[tiab] OR "Cerebrospinal Fluid"[Mesh])) Filters: From 2010/01/01 to 2015/12/31 4 Results	
	EMBASE	Results
	#5	0
LP	#4 AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/lim	
	#2 AND #3	24
	#3 'febrile convulsion'/exp	6004
	#2 'lumbar puncture'/exp AND 'cerebrospinal fluid'/exp	2985
	An ancestry search of the AAP Taskforce statement yielded two additional papers	

The six studies included in this review (see Table 4):

Shah, James, and Elayaraja (2014)

Berzosa Lopez, Ramos Fernandez, Martinez Anton, Espinosa Fernandez, and Urda Cardona (2014)

Kanemura, Sano, Yamashiro, Sugita, and Aihara (2011)

Karimzadeh et al. (2013)
Kuang et al. (2014)
Nordli et al. (2012)

Studies not included in this review with rationale for exclusion:

Study	Reason for exclusion
Asku et al. (2011)	Does not address ED management of CFS. Compares dexmedetomidine vs. midazolam for sedation during EEG for CFS
Kuang et al. (2013)	Does not answer the EEG question. Compares children with Nonfebrile seizure to febrile seizure (does not differentiate between simple and complex) Number of subsequent seizures was higher in the febrile seizure group than the nonfebrile seizure group. None developed epilepsy N= 755 over 12 years with seizure d/t mild rotavirus gastroenteritis.
Teran, Medows, Wong, Rodriguez, and Varghese, (2012)	Simple febrile seizure

After an extensive literature search, the only evidence identified was for (a) imaging for complex febrile seizure and (b) electroencephalogram after a complex febrile seizure.

Studies for (a) obtaining laboratory tests, including CSF studies, (b) efficacy of medications either in the ED or as a prescription for home use, (c) when to consult Neurology, or (d) when to admit to the hospital were not located. Therefore, we developed a survey in REDCap and sent it to members of the Divisions of Emergency Medicine, Hospital Medicine, and Neurology to develop consensus around these questions, including the questions regarding imaging.

Practice Recommendations:

1. If a medication is required to stop the complex febrile seizure (prolonged, focal, or recurrent), which medication should be used to stop the seizure?

The majority of respondents from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine recommend prescribing **ANY** benzodiazepine for abortive therapy. However, a consensus, as defined by 75% of respondents, for a particular agent was not reached (see Table 5).

Recommended doses for medications:
ED/UCC/INPATIENT-

- Lorazepam- 0.1mg/kg (max of 4mg) IV every 5 minutes x3 doses OR

- Midazolam- 0.2mg/kg (max 10mg) Intranasal until IV line is established

OUTPATIENT-

- Consider diazepam rectal gel

2-5 years 0.5 mg/kg	
Weight (kg)	Dose (mg)
6 to 11	5
12 to 22	10
23 to 33	15
34 to 44	20

6-11 Years 0.3 mg/kg	
Weight (kg)	Dose (mg)
10 to 18	5
19 to 37	10
38 to 55	15
56 to 74	20

12+ Years 0.2 mg/kg	
Weight (kg)	Dose (mg)
14-27	5
28 to 50	10
51 to 75	15
76 to 111	20

2. If a medication is required to stop the complex febrile seizure, should a benzodiazepine be prescribed for home use for recurrence of prolonged seizure with a fever?

Consensus from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine was NOT reached regarding prescription of a benzodiazepine at the time of discharge for community use as abortive therapy for potential recurrence of a prolonged complex febrile seizure. Therefore, we do not recommend prescribing a benzodiazepine for all patients at discharge. However, this could be considered based on individual or parent factors, and provider comfort (see Table 5).

3. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), and has a non-focal neurological exam, should the following be obtained to evaluate the seizure:

- Laboratory studies
 - i. Serum studies
 - ii. Urine studies
 - iii. CSF studies

The majority of respondents from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine recommended against obtaining emergent laboratory studies including cerebrospinal fluid (CSF) analysis for a child with a prolonged or focal complex febrile seizure who is back to baseline. However, a consensus was not reached, likely a consequence of the phrasing of the question. Most providers recommending laboratory investigations did so in exploration for the source of fever rather than the seizure, or for a child described with signs or symptoms of central nervous system injury or infection, who would be off-guideline (see Table 5).

- Radiologic studies
 - i. Head CT without contrast

ii. Brain MRI

The American College of Radiology's (ACR) Appropriateness Criteria ® seizures – child (Dory et al. 2012) were used as the basis of this recommendation. The results of the evaluation using the AGREE II tool for guidelines are included in Table 1. The AGREE II Tool is used to assess guideline quality. It assesses the methodology of guideline development. An AGREE II score is composed of the scores of six domains, with various numbers of items in each domain. It is reported as a percent of the maximum score for that domain. Ideal AGREE II Scores are not established. The Domain "Applicability" received the lowest score by 4 raters (9% agreement) with the following items:

The guideline describes facilitators and barriers to its application (score of 8/32)

The guideline provides advice and or tools on how the recommendation can be put into practice (score of 7/32)

The potential resource implication of applying the recommendations have been considered (score of 5/32)

The guideline presents monitoring and/or auditing criteria (score of 5/32)

However, tables from the ACR Appropriateness Criteria ® seizures – child (Dory et al. 2012) are useful in that they report the relative radiation level of neuroimaging examinations (ultrasound, CT and MRI) (see Tables 2 and 3). Based on low quality evidence the Complex Febrile Seizure CPG team recommends against obtaining neuroimaging (CT, MRI) after a complex febrile seizure and the neurological exam is back to baseline. Imaging tests for complex febrile seizure are unlikely to change emergent care (Boyle & Sturm, 2013; Dory et al. 2012; Hardasmalani & Saber, 2012; Shinnar et al. 2012).

This question was also included on the consensus survey (see Table 5) and the results are:

CT: Respondents from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine **reached consensus against** obtaining an emergent head computerized tomography (CT) imaging for children with prolonged or recurrent complex febrile seizures. Though consensus was not reached regarding head CT for children with focal seizures, the majority of respondents recommended against imaging. Those recommending imaging did so for a child described with signs or symptoms of central nervous system injury, who would be off-guideline.

MRI: Respondents from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine **reached consensus against** obtaining an emergent brain magnetic resonance imaging (MRI) for children with *prolonged* or *recurrent* complex febrile seizures. Though consensus was not reached regarding brain MRI for children with *focal* seizures, the majority of respondents recommended against imaging. Those recommending imaging did so for a child described with signs or symptoms of central nervous system injury, who would be off-guideline.

4. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), should a Neurology consult be obtained?

A consensus was not reached regarding the need for Neurology subspecialty consultation for complex febrile seizures, likely a consequence of the phrasing of the survey question, which did not differentiate between phone and in-person, either inpatient or outpatient, consultation. The majority of respondents from Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine recommended obtaining some form of consultation with Neurology for focal or recurrent complex febrile seizures requiring abortive treatment (off guideline), or parental or referring provider requests (see Table 5).

5. For a child who is back to baseline after a complex febrile seizure (prolonged, focal, or recurrent), should the child be admitted to the hospital, or how long should a child be observed in an inpatient setting?

A consensus was not reached, nor was a majority preference noted among respondents from the Divisions of Child Neurology, Emergency Medicine, and Hospital Medicine, regarding admission for observation for complex febrile seizures. Comments provided as part of the survey developed clinical characteristics to consider (see Table 5).

6. When evaluating a child who presents to the ED/UCC or referred to an inpatient unit after a complex febrile seizure, and is now back to baseline, should an electroencephalogram (EEG) be obtained?

Based on low quality evidence, the Complex Febrile Seizure CPG team recommends obtaining an outpatient EEG for children who present to the ED after a complex febrile seizure. The reported studies provide conflicting results regarding the utility of EEGs after a complex febrile seizure.

Shah, James, & Elayaraja (2014) attempted a meta-analysis on the use of EEG and its timing after complex febrile seizure in children less than 5 years of age. From an extensive search that ended October 17 2013, they found no evidence in the form of a randomized control trial to support or refute obtaining an EEG after a complex febrile seizure. However, they comment on three cohort studies that report conflicting findings. Maytal, Steele, Eviatar, & Novak (2000) report no EEG with abnormality in 33 subjects within one week of a complex febrile seizure. Joshi, Wawrykow, Patrick, & Prasad (2005) reported that children with complex febrile seizure are 3.5 times more likely to EEG abnormalities within 7 days than subjects who had an EEG later than 7 days post event. Finally, Yucel, Aka, Yazicioglu, & Ceran, (2004) reported that 71/145 (45%) subjects had abnormal EEGs after complex febrile seizure. They conclude the reports are conflicting, and stronger studies should be conducted and reported.

- Five studies were not included in Shah (2014) were identified.
 - Kanemura, Sano, Yamashiro, Sugita, and Aihara (2011) reported on 119 subjects who had an EEG after a febrile seizure. Twenty of whom had a complex febrile seizure. Of the 20 with complex febrile seizure, 11 subjects had no EEG abnormalities and 9 displayed abnormalities on EEG. Subjects who had complex febrile seizure had a significantly higher risk for the development of epilepsy than those with simple febrile seizures. ($p < 0.05$) No specific data given.

- Berzosa Lopez, Ramos Fernandez, Martinez Anton, Espinosa Fernandez, and Urda Cardona (2014) reported on 65 subjects with complex febrile seizure. EEG was performed on 62 of the subjects. Thirteen EEGs showed focal slow wave activity, three of which were associated to a focal seizure and 7 cases showed EEG alterations. However, none of the seven cases with EEG alterations had a recurrence in a minimum 12 month period.
- Karimzadeh et al. (2013) evaluated 36 children after a complex febrile seizure. Early EEG abnormality was reported in 29/36 (80%) of the subjects (24-48 hours) and 25/36 (69%) Late EEG abnormality was reported in 25/36 (29%) of the subjects (69%). They conclude that EEG abnormalities are not influenced by the time of EEG recording.
- Nordli et al. (2012) evaluated 191 normally developing children aged 1 month to 5 years of age who presented with febrile status epilepticus. The odds of focal slowing on the EEG were significantly increased by a focal complex febrile seizure adjusted $OR = 4.5$, 95% CI [1.6,12.6] and the odds of focal slowing were significantly decreased with a high peak temperature (≥ 104 °F) adjusted $OR = 0.2$, 95% CI [0.06,0.69]
- Kuang et al. (2014) reported retrospectively on 378 normally developing children with febrile seizures. They identified the following factors increased the risk of the child developing epilepsy: (a) a prolonged seizure, (b) the number of seizures, and (c) a family history of epilepsy.

Outcome Measures:

Medications used
Number of admissions
Numbers of imaging studies performed

Potential Cost Implications:

The goal of the Complex Febrile Seizure CPG is to reduce the cost by decreasing unnecessary interventions for this population. The Emergency Department (ED), Urgent Care Center, and in-hospital neuro-diagnostic evaluation for complex febrile seizures is costly. The recommendations against routine laboratory tests including CSF analysis and neuroimaging studies including head CT and brain MRI in this Clinical Practice Guideline could have cost implications. From a retrospective cohort study the average direct charge for ED visits related to febrile seizures was \$2190 (range \$370 to \$5753) reflecting ED care, laboratory and imaging studies, medications, other pharmacy-related charges, and electroencephalography (Caron, Wheless, Patters,& Wheless, 2015).

Potential Organizational Barriers:

Education
Parental expectations

Supporting Tools

PowerPlan- See Appendix A.

Guideline Preparation: This guideline was prepared by the Office of Evidence Based Practice (EBP) in collaboration with content experts at Children's Mercy. Development of this guideline supports the Center of Clinical Effectiveness's initiative to promote care standardization that builds a culture of quality and safety that is evidenced by measured outcomes. If a conflict of interest is identified the conflict will be disclosed next to the team members name. The Hospital Medicine team member was the source of input from the General Pediatrics

Complex Febrile Seizure Team Members:

Team leaders:

Britton Zuccarelli, MD, Neurology Fellow

Team members:

Cheryl Chadwick, Coordinator, Family-Centered Care

Ibad Siddiqi, PharmD Pharmacy

Rebecca Fahlgren, DO Physician, ED and Urgent Care

Ali Fenton-Church, MD, FAAP, Physician, Hospital Medicine

Robin Lund, MD, Pediatric Resident

Laura Diddle, BS, IS Analyst

Office of Evidence Based Practice

Jeff Michael, DO, FAAP, Medical Director of Evidence Based Practice

Jacqueline Bartlett, PhD, RN, Director of Evidence Based Practice

Jarrod Dusin, MS, RD, LD, CNSC, Evidence Based Practice Program Manager

Nancy Allen, MS, MLS, RD, LD, Evidence Based Practice Program Manager

Librarian

Keri Swaggart, MLIS, AHIP

Guideline development funded by:

No external funding was obtained in the development of this guideline

Development Process:

The review summary documents the following steps:

1. Review of existing internal and external guidelines and standards
 - a. Internal guidelines: None identified
 - b. External guidelines: (Dory et al. 2012)

2. Review preparation
 - a. PICOT questions established
 - b. Team leaders confirmed search terms used
3. Databases searched
 - a. AHRQ National Guideline Clearinghouse
 - b. Medline
 - c. Cochrane
 - d. CINAHL
4. Critically analyze the evidence
 - a. Guidelines
 - i. AGREE II criteria were used to analyze published clinical guidelines
 - b. Literature (see Appendix B)
 - i. GRADE criteria evaluated the literature based on:
 1. The balance between desirable and undesirable effects
 2. Patient values and preferences
 3. Resource utilization

Approval Process: Guidelines are reviewed and approved Michelle K Hughes, D.O. (external reviewer) and Grant Latta, D.O. (internal reviewer). Agree II Scoring of this guideline by the reviewer is in Table 6. Content Expert Team, the Office of EBP, and other appropriate hospital committees as deemed suitable for the guidelines intended use.. Guidelines are reviewed and updated as necessary every 3 years within the Office of EBP at CMH&C. Content expert teams will be involved with every review and update.

Disclaimer:

The content experts and the Office of EBP are aware of the controversies surrounding Complex Febrile Seizure CPG. When evidence is lacking or inconclusive, options in care are provided in the guideline and the power plans that accompany the guideline.

These guidelines do not establish a standard of care to be followed in every case. It is recognized that each case is different and those individuals involved in providing health care are expected to use their judgment in determining what is in the best interests of the patient based on the circumstances existing at the time.

It is impossible to anticipate all possible situations that may exist and to prepare guidelines for each. Accordingly, these guidelines should guide care with the understanding that departures from them may be required at times.

Table 1

Agree II scoring of the American College of Radiology's ACR Appropriateness Criteria® seizures—child (Dory, 2012)

Domain Name	Score (0-100) Higher is better
Domain 1 - SCOPE AND PURPOSE	89%
Domain 2 - STAKEHOLDER INVOLVEMENT	53%
Domain 3 - RIGOR OF DEVELOPMENT	64%
Domain 4 - CLARITY AND PRESENTATION	79%
Domain 5 - APPLICABILITY	9%
Domain 6 - EDITORIAL INDEPENDENCE	19%
Overall Guideline Assessment (range 1-7, higher better)	5

Note: Score is the mean percentage of four reviewers.

Table 2

ACR Appropriateness Criteria® seizures—child. Variant 3, Complex Febrile Seizures

Radiologic Procedure	Rating	Comments	Relative Radiation Level (Scale of 0-5) ^a Lower is better
MRI head with contrast	4		-
MRI head without and with contrast	4		-
CT head without contrast	3		3 (0.3-3 mSv)
CT head without and with contrast	3		4 (3-10 mSv)
CT head with contrast	3		3 (0.3-3 mSv)

US head	1	-
---------	---	---

Note: Rating Scale-1, 2, 3-Usually not appropriate; 4, 5, 6, May be appropriate; 7, 8, 9 Usually appropriate
 a mSv (millisievert)= a measure of the absorption of radiation by the human body

Table 3

ACR Appropriateness Criteria® seizures—child. Variant 5, Partial Seizures

<i>Radiologic Procedure</i>	<i>Rating</i>	<i>Comments</i>	<i>Relative Radiation Level(Scale of 0-5)^a Lower is better</i>
MRI head with contrast	9		-
MRI head without and with contrast	7		-
CT head without contrast	5		4(3-10 mSv)
CT head without and with contrast	5		3 (0.3-3 mSv)
CT head with contrast	5		4(3-10 mSv)
US head	1		-
Rating Scale 1,2,3 Usually not appropriate; 4, 5, 6, May be appropriate' 7,8,9 Usually appropriate			

Note: Rating Scale 1, 2, 3-Usually not appropriate; 4, 5, 6, May be appropriate; 7, 8, 9 Usually appropriate
 a mSv (millisievert)= a measure of the absorption of radiation by the human body

Table 4

Characteristics of included studies, alphabetically
Berzosa Lopez 2012
Methods

Retrospective Cohort study

Participants

Participants: 65 children 6 months to 6 years of age with a mean age of 20.7 months of which 31 were female and 34 were male, with complex febrile seizure

Setting: Spain

Number randomized: Not randomized, but included 65 children with complex febrile seizure

Number complete: 65 children with complex febrile seizure

% Male subjects: 52%

Inclusion criteria: Patients seen at a tertiary hospital between 2003-2011 meeting complex febrile seizure criteria

	<p>Exclusion criteria: patients with a previous history of neurological disease</p> <p>Power analysis: cohort study, not needed</p> <p>Covariates identified: age, sex, personal and family histories; clinical variables (mean temperature during the event, mean duration of the seizure, number of seizures, time to onset of seizure, focal neurologic signs, type of complex febrile seizure) complementary tests, (acute phase reactants, LP), complications, EEG, neuroimaging tests, and diagnosis associated to the fever.</p>
Interventions	Data were collected from the hospital's medical records
Outcomes	<p>Primary outcome: Evaluate the usefulness of : EEG, neuroimaging, lumbar puncture and laboratory examination of the cerebral spinal fluid, and admission for observation</p>
Notes	<p>Results: This study found that there were no subsequent complications during the follow-up period for a mean stay of 4.6+/- 2.5 days.</p> <ul style="list-style-type: none">• EEG was performed on 62 patients in the cohort- 13 EEGs showed focal slow wave activity, three of which were associated to a focal seizure and 7 cases showed EEG alterations. However, none of the 7 cases with EEG alterations had a recurrence in a minimum 12 month period• Analysis of acute phase reactants-CRP was obtained in 44 of the cohort. Ninety percent (90%) of cases had levels below 85 mg/l. Only two cases had levels higher than this and they were associated with (a) invasive acute gastroenteritis and (b) bacteremia.• Lumbar puncture was indicated in only 12 cases, no abnormalities were found.• Neuroimaging (either CT or MRI) was done in 34 cases, only one showed mild sub cortical atrophy and did not result in additional treatment <p>Only of the 65 cases returned to the ED for a nonfebrile seizure within the next 12 months From this pediatric cohort with complex febrile seizure EEG does not appear to be justified. They are recommending admission to the ED for 24- hour observation period as an appropriate intervention for complex febrile seizure.</p>

Boyle 2013

Methods	Retrospective cohort study Definitions- complex febrile seizure is defined as seizures lasting 15 minutes or longer, more than one seizure in 24 hours, and/or focal attributes to the seizure.
Participants	Participants: Children presenting to the emergency department with a complex febrile seizure from April 2009 to November 2011 Setting: Two tertiary care pediatric emergency departments in the United States Number randomized: Not randomized, but 216 subjects were diagnosed with a complex febrile seizure during the study period, 190 subjects met inclusion criteria and were included in the analysis. Percent male subjects: not defined Inclusion criteria: Age on presentation was 6 months to 6 years, diagnosed with a complex febrile seizure (defined as a seizure equal of great than 15 minutes in length, more than one seizure within a 24 hour period, and/or a focal seizure) Exclusion criteria: No documented fever (greater than 38 degrees C) in the emergency department or at home immediately prior to arrival to the emergency department, history of a previous non-febrile seizure, history of a ventriculoperitoneal shunt Power analysis: cohort, not needed
Interventions	Subjects diagnosed with a complex febrile seizure were identified with ICD-9 codes and through a free-text search through the electronic medical record. Logistic regression was developed to determine which demographic data and clinical parameters were associated with performing a lumbar puncture or head CT. <ul style="list-style-type: none">• Defined parameters: age, duration of fever prior to seizure, hospital length of stay, history of febrile seizure, focality of seizure, antiepileptic drugs given, prior antibiotic use, empiric antibiotics given in emergency department, admission to hospital, immunization history
Outcomes	Primary outcome: Variability of provider workup in a heterogeneous group of patients with complex febrile seizures (i.e. patient-specific predictors that are associated with the provider pursuing a lumbar puncture or head CT) Secondary outcome: Abnormal neuroimaging findings and rates of intracranial, blood, or urinary tract infections
Notes	Likelihood of a lumbar puncture after complex febrile seizure <ul style="list-style-type: none">• Empiric antibiotics given in the emergency department: OR 2.96 (CI 1.28-6.80)• History of febrile seizure: OR 0.29 (CI 0.12-0.69)• Age category (6-11 months, 1 year-23 months , 2-3 years, greater than 3 years): OR 0.53 (CI 0.31-0.91)- older subjects had lower odds of a lumbar puncture• Antiepileptic drugs given: OR 1.15 (CI 0.48-2.60)• Sex (female): OR 1.49 (CI 0.68-3.26)

- Prior antibiotic use: OR 1.18 (CI 0.38-3.60)
 - Focal seizure: OR 1.51 (CI 0.40-5.50)
- Likelihood of a head CT after complex febrile seizure
- Focal seizure: OR 4.89 (CI 1.41-16.9)
 - Antiepileptic drugs given: OR 3.50 (CI 1.50-8.60)
 - Age category (6-11 months, 1 y-23 months, 2-3 years, greater than 3 years): OR 2.03 (CI 0.95-3.60)
 - Sex (female): OR 0.89 (CI 0.39-2.05)
 - Empiric antibiotics given in the emergency department: OR 1.97 (CI 0.81-4.90)
 - Prior antibiotic use: OR 1010 (CI 0.33-3.70)
 - History of febrile seizure: OR 0.58 (CI 0.23-1.46)
- Lumbar puncture:
- 37% of subjects had a lumbar puncture
 - No positive cultures
 - 1 subjects had a CSF pleocytosis
- Blood culture:
- 88% of subjects had a blood culture
 - No positive cultures
- Urine culture:
- 47% of subjects had a urine culture
 - 4 patients diagnosed with a urinary tract infection
- Head CT:
- 29% of subjects had a head CT
 - No significant findings that guided therapy
 - 4 patients had a read of sinus opacification or mucosal thickening which was not thought to be the cause of the complex febrile seizure

Hardasmalani 2012

Methods

Participants

Retrospective review of a discharge log

Setting: Urban tertiary care pediatric ED , (unclear if it is in CA or NJ) Jan 2004-Oct 2007

Analyzed for study: 83 patients who met computer generated criteria;

Met study inclusion criteria: n=71

Inclusion criteria: age 6 months- 6 years with 1 or more than 1 of the following features: focal or prolonged durations (ie, seizure lasting >15 minutes) or occurring more than once during 24 hour period.

Exclusion criteria: Known seizure disorder, congenital central nervous system malformations, or hydrocephalus.

	Age: 6 mo - 6 years Gender: 59.2% male
Interventions	Lumbar puncture and/or neuroimaging (CT scan or MRI)
Outcomes	Positive findings
Notes	Number of lumbar punctures in the 71 patients: 67 (93%). There was one positive LP Number of CT scans in the 71 patients: 71 (100%). There was one positive CT scan* Number of MRIs in the 71 patients 14 (20%). There was one positive MRI scan* *The positive results on imaging were found in the subject with the positive LP result.
Kanemura 2011	
Methods	Retrospective cohort study-- for subsequent EEG
Participants	Participants: Children discharged with a diagnosis of febrile seizure between April 1, 1999 and March 31, 2006 Setting: Japan Number randomized: not randomized, but 128 subjects met criteria and received an EEG, 9 subjects were lost to follow-up (Total n= 119) Percent male subjects: not defined Inclusion criteria: Children (no specific age range) with a febrile seizure (defined as a seizure accompanied by a fever without an obvious specific central nervous system infection). Exclusion criteria: history of afebrile seizures prior to a febrile seizure, marked dehydration, seizures after immunizations, acute or remote neurologic insults Power analysis: no power analysis needed, cohort
Interventions	Electronic medical record was utilized to identify patients that had a diagnosis of febrile seizure <ul style="list-style-type: none">• Patients were referred to obtain an EEG within 7-20 days after the seizure• Neurologically normal children who received an EEG within 7 days of the febrile seizure were excluded Complex seizure was identified as a seizure that met one of these criteria: lasting longer than 15 min, focal, or occurring more than one time within a 24 hour period Development of epilepsy was considered when unprovoked seizure occurrence was documented. Each EEG was interpreted by two pediatric neurologists
Outcomes	Primary outcome: Abnormal EEG findings after a febrile seizure and the development of epilepsy
Notes	119 subjects with a febrile seizure <ul style="list-style-type: none">• 99 subjects had a simple febrile seizure• 20 subjects had a complex febrile seizure Simple febrile seizure

- 82/99 subjects without EEG abnormalities
- 17/99 subjects with EEG abnormalities

Complex febrile seizure

- 11 subjects without EEG abnormalities
- 9 subjects with EEG abnormalities

Nine patients with febrile seizures developed epilepsy

Patients with a complex febrile seizure had a significantly higher risk for development of epilepsy than those with simple febrile seizure ($p < 0.05$)- No specific data given

Development of epilepsy ($p < 0.01$)

- 3 subjects without an EEG abnormality
- 6 subjects with an EEG abnormality

Karimzadeh 2014

Methods

Participants

Cohort

Participants: children with a diagnosis of febrile seizure

Setting: Iran, Emergency Unit of a children's hospital

Number randomized: not randomized, but included 58 children who presented with a FS, defined as a convulsion associated with fever without a history or evidence of preexisting neurological abnormality, metabolic disorder or intracranial infection.

Number complete: 36 patients met the inclusion criteria

% male subjects: 67%

Inclusion criteria: age between 3 months and 6 years presenting with a FS as defined above, EEG recorded shortly after the febrile seizure and 2 weeks after the seizure

Exclusion criteria: children with previous nonfebrile seizure, patients with evidence of intracranial infections, patients with electrolyte imbalance, or those who were not referred for second EEG

Power analysis: cohort, not needed

Covariates identified: age, abnormal neurological examination, positive family history of febrile seizure and a 7 day postictal timing of the recording, location of paroxysmal discharge

Interventions

1. EEG was recorded in 2 phases: shortly after the febrile seizure and 2 weeks later

2. EEG was recorded during daytime sleep, 24-48 hours (early EEG) and 2 weeks (late EEG) after the febrile seizure with the administration of oral chloral hydrate (50-75mg/kg). The recording was performed during sleep for at least 20 minutes.

3. EEGs were interpreted by a pediatric neurologist who was unaware of the patient's previous EEG.

4. EEGs that showed generalized or focal spikes, sharp, spike wave discharge and slowing were considered as

Outcomes	abnormal Primary outcome: 1. Abnormality on early EEG 2. Abnormality on late EEG Secondary analysis: type of seizure, the type of abnormality seen on early and late EEGs
Notes	Results: 1. The most common seizure type was generalized tonic-clonic 2. Early EEG abnormality reported in 29 (80.6%) patients a. The most common abnormal discharges in early EEGs were slow waves (31%) and sharp waves (27.6%) 3. Late EEG abnormality reported in 25 (69.4%) patients a. The most common abnormal discharges in late EEGs were sharp waves (36%) and a combination of spike waves and sharp waves (28%) 4. The authors conclude that abnormal EEG findings are not influenced by the time of EEG recording.

Kuang 2014

Methods	Retrospective cohort study
Participants	378 children with febrile seizures Chengdu Military General Hospital, Chengdu, Sichuan, China Male: n = 218 Female: n = 160
Interventions	Inclusion criteria: Children with febrile seizure defined as associated with a body temperature >38 C in the absence of CNS infection, metabolic disturbance, or acute electrolyte imbalance. Exclusions: children with hepatic or renal failure, intoxication, trauma, known neurologic disorders, previous unprovoked seizures EEG: 32 channel digital EEG recorded for 30 minutes asleep and awake, classified as background abnormality or epileptiform activity. Also, classified by frontal, central, centrottemporal, parietal, temporal, and occipital areas. All recordings read by 2 experienced pediatric neurologists.
Outcomes	1. EEG results (normal vs. epileptiform discharge) 2. Clinical characteristics: gender, febrile seizure classification (simple vs complex), family history of febrile seizure, family history of epilepsy, EEG epileptiform discharge, seizure type (central, temporal, parietal, centrottemporal, frontal) 3. Number of febrile seizures

Notes

4. Prolonged seizure

The present study revealed that:

- prolonged seizure
- number of febrile seizures
- family history of epilepsy

comprised significant risk factors for subsequent epilepsy

The number of risk factors affects, increasing positively, the risk of subsequent epilepsy.

Complex febrile seizure with frontal localization is a very sensitive diagnostic marker for epilepsy.

Frontal paroxysmal abnormality is predictive of subsequent epilepsy.

Nordli 2012

Methods Cohort study

Participants

Participants: Children ages 1 month to 5 years who presented with febrile status epilepticus

Setting: USA, metropolitan children's hospitals

Number randomized: not randomized

Number complete: 191

Gender: 52.3% male

Inclusion criteria: children aged 1 month to 5 years who presented with febrile status epilepticus as defined as a single seizure or a series of seizures without full recovery in between lasting \geq that also met the definition of febrile seizure (provoked seizure in which the sole provocation was fever ($>38.4C$, $101F$) without history of a febrile seizure and with no evidence of an acute CNS infection or insult.

Exclusion criteria: children with a known severe neurologic disability before entry

Power analysis: cohort, not needed

Interventions EEGs were obtained within 72 hours of febrile status epilepticus. When not feasible, EEGs within 3 months of FSE were also included. EEGs were re-coded with the subjects awake and asleep, subjects were not sedated. The number and type of EEG abnormalities were recorded and then compared focal slowing or attenuation on EEG with acute MRI findings

Outcomes

Primary outcome: Describe the acute EEG findings of a cohort of children with febrile status epilepticus and their relationship to characteristics of the episode of febrile status epilepticus as well as to the acute imaging findings.

Notes

Results:

The odds of focal slowing were significantly increased by

- focal febrile status epilepticus OR= 5.08 95% CI

- hippocampal TS signal abnormality OR= 3.5
- The odds of focal slowing were significantly decreased with
- high peak temperature OR 0.18

Shah 2014**Methods**

Systematic Review (Cochrane) unable to do a meta analysis since no RCTs were identified

Participants

After an exhaustive search of the following databases: The Cochrane Epilepsy Group Specialised Register (search performed October 17, 2013); The Cochrane Central Register of Controlled Trials (CENTRAL, *The Cochrane Library*, Issue 9, 2013); MEDLINE (searched October 17, 2013); and Clinical Trial Registry (ClinicalTrials.gov (searched October 17 2013)) and two reviewers assessing the following criteria were met:

1. Is the study a randomized clinical trial or a quasi-experimental study?
2. Did the participants in the study have complex febrile seizure with the first episode?
3. Is a comparison made of no EEG and EEG (early EEG, late EEG, or any time) among children having complex febrile seizure with first episode? AND
4. Did the study report better epileptic management of assess risk of occurrence?

Outcomes

No studies were identified that met the above criteria. 33 studies were identified that did not meet the criteria 3 listed above. The studies did not make a comparison between EEG and no EEG or early EEG or late EEG

Notes

However the authors highlighted three papers:

- **Maytal et al. 2000** retrospective review of 33 neurologically normal subjects, EEGs within one week of a complex febrile seizure found none with abnormalities
- **Joshi 2005** reported children with complex febrile seizure are 3.5 times more likely to have EEG abnormalities within seven days post seizure compared to children who had an EEG performed greater than a week post seizure.
- **Yucel et al, 2004** found 71/159 (45%) abnormal EEGs in children with complex febrile seizures who were analyzed retrospectively over seven years. Of those with abnormal EEG, 16/159 (10%) showed abnormalities in the first week status post the complex febrile seizure and 51/71 (72%) of the children with abnormal EEGs were diagnosed with epilepsy.

The systematic review authors conclude the reports are conflicting. Studies published on this question do not provide guidance.

Shinnar 2012**Methods**

Prospective cohort study

Prospective multicenter study of children with FSE, design of the study is to address describe the acute imaging findings in the FEBSTAT cohort.

Participants	<p>Cohort:</p> <p>Control Group: is children aged 6 months to 5 years who presented with a first simple febrile seizure</p> <p>Setting: 5 recruiting sites: hospitals in New York City Chicago, Durham, NC, Richmond, VA, Norfolk, VA.</p> <p>Number of patients in study group: (191) children between 1 month and 5 years of age who presented with FSE defined as a single seizure or series of seizures without full recovery in between lasting ≥ 30 minutes, that also were febrile in origin, with a body temperature > 38.4 degrees C</p> <p>Number of patients in control group (n=96) children aged 6 months to 5 years who presented with a first simple febrile seizure</p> <p>Inclusion Criteria: Children 1 month-5 years who presented with FSE defined as a single seizure or a series of seizures without full recovery in between lasting ≥ 30 minutes that was provoked by a fever; without prior history of afebrile seizures, no evidence of an acute CNS infection or insult.</p> <p>Exclusion Criteria: known severe prior neurologic disability</p> <p>Gender: not specified</p>
Interventions	<p>MRI in both study group and control group that were performed within 72 hours of the FSE episode. MRI scans were read by neuroradiology readers who were blinded to the diagnoses.</p> <p>The control group had simple febrile seizures only.</p>
Outcomes	<p>Abnormalities on the MRI was reported as "normal", "suspect", or "abnormal"</p>
Notes	<p>For any abnormality in MRI finding and hippocampal abnormalities see figures.</p> <p>There was no difference in the following between the FSE and the Simple FS groups:</p> <ul style="list-style-type: none"> • Nonhippocampal abnormalities • Extratemporal

Table 5.
Summary of Consensus Survey

Survey Item	Prolonged Complex Febrile Seizure N=69	Focal Complex Febrile Seizure N=68;	Recurrent Complex Febrile Seizure N=68
Labs including CSF	Did not reach consensus, we believe due to the way the question was phrased. The primary yes to obtain lab or do a LP was look for underlying cause of fever. However if there are signs and symptoms of CNS injury,	Did not reach consensus, we believe due to the way the question was phrased. The primary yes to obtain lab or do a LP was look for underlying cause of fever. However if there are signs and symptoms CNS injury,	Did not reach consensus, we believe due to the way the question was phrased. The primary yes to obtain lab or do a LP was look for underlying cause of fever. However if there are signs and symptoms CNS injury,

	trauma, infection the patient is off guideline – this was not clearly explained in the survey	trauma, infection the patient is off guideline – this was not clearly explained in the survey	trauma, infection the patient is off guideline – this was not clearly explained in the survey
	<ul style="list-style-type: none"> • No if treatment with abortive or not 51% • Yes if treatment with abortive or not 13% • It depends 36% 	<ul style="list-style-type: none"> • No if treatment with abortive or not 51 • Yes if treatment with an abortive or not 22% • It depends 22% 	<ul style="list-style-type: none"> • No if treatment with abortive or not 35% • Yes if treatment with an abortive or not 33% • It depends 32%
Emergent CT	<p>Did reach consensus, and the all of the respondents from the Division of Neurology(n=7) responded "No" to obtaining an emergent CT scan</p> <ul style="list-style-type: none"> • No if treatment with abortive or not 87% • Yes if treatment with abortive or not 1% • It depends 12% 	<p>Did not reach consensus; clarifications to the "It Depends" response were related CNS infection or injury as a source of the seizure, or if it was focal seizure.</p> <ul style="list-style-type: none"> • No if treatment with abortive or not 53% • Yes if treatment with an abortive or not 33% • It depends 13% 	<p>Did meet consensus</p> <ul style="list-style-type: none"> • No if treated with an abortive or not 78% • Yes if treated with an abortive or not 12% • It depends 10%
Emergent MRI	<p>Did meet consensus</p> <ul style="list-style-type: none"> • No if treatment with abortive or not 94% • It depends 6% 	<p>Did not reach consensus; clarifications on the "It Depends" response were related to what the CT shows, if the Neurologist recommends a MRI. Some state an emergent MRI is not necessary, while one states, if obtaining an MRI is an option, "absolutely".</p> <ul style="list-style-type: none"> • No if treatment with abortive or not 53% • Yes if treatment with an abortive or not 33% • It depends 13% 	<p>Did meet consensus</p> <ul style="list-style-type: none"> • No if treatment with abortive or not 86% • Yes if treatment with an abortive or not 3% • It depends 9%
Benzodiazepine at D/C	<p>Did not reach consensus, major comment in the "It depends" response was to assess the comfort of the</p>	<p>Did not reach consensus, major comment in the "It depends" response was to assess the comfort of the</p>	<p>Did not reach consensus, major comment in the "It depends" response was to assess the comfort of</p>

<p>Abortive Medication (choice)</p>	<p>family.</p> <ul style="list-style-type: none"> No if treatment with abortive or not- 30% Yes if treatment with abortive or not 55% It depends 14% <p>Did not reach consensus on a specific abortive medication to use for a prolonged complex febrile seizure.</p> <ul style="list-style-type: none"> Any= 58% Diazepam= 9% Lorazepam= 16% Midazolam= 3% Other= 3% 	<p>family.</p> <ul style="list-style-type: none"> No if treatment with abortive or not 32% Yes if treatment with an abortive or not 63% It depends 15% <p>Did not reach consensus on a specific abortive medication to use for a complex febrile seizure with focal attributes.</p> <ul style="list-style-type: none"> Any= 57% Diazepam= 21% Lorazepam= 16% Midazolam= 3% None of the above= 3% Other= 3% 	<p>the family.</p> <ul style="list-style-type: none"> No if treatment with abortive or not 21% Yes if treatment with an abortive or not 65% It depends 16% <p>Did not reach consensus on a specific abortive medication to use for a recurrent complex febrile seizure.</p> <ul style="list-style-type: none"> Any= 59% Diazepam= 19% Lorazepam= 15% Midazolam= 3% None of the above= 3% Other= 3%
<p>Consult Neurology</p>	<ul style="list-style-type: none"> Did not reach consensus. The patient situation was not clearly described in the question. Did not differentiate between Neurology formal consult, phone call to Neurology, or see Neurology as an outpatient No if treatment with abortive or not- 41% Yes if treatment with abortive or not 42% It depends 17% 	<ul style="list-style-type: none"> Did not reach consensus. The patient situation was not clearly described in the question. Did not differentiate between Neurology formal consult, phone call to Neurology, or see Neurology as an outpatient No if treatment with abortive or not-16% Yes if treatment with abortive or not 68% It depends 16% 	<ul style="list-style-type: none"> Did not reach consensus. The patient situation was not clearly described in the question. Did not differentiate between Neurology formal consult, phone call to Neurology, or see Neurology as an outpatient Yes if treatment with an abortive or not 60% No if treatment with an abortive or not 28% It depends= 13%
<p>Admit to hospital?</p>	<p>Did not reach consensus on hospitalization admission for the child who had a prolonged febrile seizure and is now back to baseline.</p> <ul style="list-style-type: none"> No if treatment with abortive or not- 42% Yes if treatment with abortive 	<p>Did not reach consensus on hospitalization admission for the child who had a prolonged seizure with focal attributes is now back to baseline.</p> <ul style="list-style-type: none"> No if treatment with abortive or not-37% 	<p>Did not reach consensus on hospitalization admission for the child who had recurrent febrile seizures and is now back to baseline.</p> <ul style="list-style-type: none"> Yes if treatment with an abortive or not 46% No if treatment with an abortive

or not 17%
• It depends 40%

• Yes if treatment with abortive
or not 22%
• It depends 37%

or not 26%
• It depends= 26%

Table 6

Agree II scoring of the Complex Febrile Seizure Clinical Practice Guideline

Domain Name	Score (0-100) Higher is better
Domain 1 - SCOPE AND PURPOSE	94%
Domain 2 - STAKEHOLDER INVOLVEMENT	83%
Domain 3 - RIGOR OF DEVELOPMENT	86%
Domain 4 - CLARITY AND PRESENTIATION	86%
Domain 5 - APPLICABILITY	92%
Domain 6 - EDITORIAL INDEPENDENCE	83%

Note: Score is the mean percentage of two reviewers.

References

- Berzosa Lopez, R., Ramos Fernandez, J. M., Martinez Anton, J., Espinosa Fernandez, M. G., & Urda Cardona, A. (2014). [Complex febrile seizures: study of the associated pathology and practical use of complementary tests]. *An Pediatr (Barc)*, *80*(6), 365-369. doi:10.1016/j.anpedi.2013.06.038
- Boyle, D. A., & Sturm, J. J. (2013). Clinical factors associated with invasive testing and imaging in patients with complex febrile seizures. *Pediatr Emerg Care*, *29*(4), 430-434. doi:10.1097/PEC.0b013e318289e8f1
- Caron, E., Wheless, C. E., Patters, A. B., & Wheless, J. W. (2015). The charges for seizures in the pediatric emergency room: a single center study. *Pediatr Neurol*, *52*(5), 517-520. doi:10.1016/j.pediatrneurol.2015.02.010

- Dory, C. E., Coley, B. D., Karmazyn, B., M., C., Dempsey-Robertson, M. E., Dillman, J. R., . . . Wootton-Gorges, S. L. (2012). ACR Appropriateness Criteria Seizures - Child. Retrieved from <http://www.guideline.gov/content.aspx?id=43875&search=febrile+seizure>
- Hardasmalani, M. D., & Saber, M. (2012). Yield of diagnostic studies in children presenting with complex febrile seizures. *Pediatr Emerg Care, 28*(8), 789-791. doi:10.1097/PEC.0b013e3182627ed2
- Joshi, C., Wawrykow, T., Patrick, J., & Prasad, A. (2005). Do clinical variables predict an abnormal EEG in patients with complex febrile seizures? *Seizure, 14*(6), 429-434. doi:10.1016/j.seizure.2005.07.006
- Kanemura, H., Sano, F., Yamashiro, D., Sugita, K., & Aihara, M. (2011). EEG characteristics predict subsequent epilepsy in children with febrile seizure. *Epilepsia, 52*, 125-126. Retrieved from <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L70520290>
<http://dx.doi.org/10.1111/j.1528-1167.2011.03207.x>
- Karimzadeh, P., Rezayi, A., Togha, M., Ahmadabadi, F., Derakhshanfar, H., Azargashb, E., & Khodaei, F. (2013). The Best Time for EEG Recording in Febrile Seizure. *Iranian Journal of Child Neurology, 8*(1), 20-25.
- Kuang, Y. Q., Kong, B., Yang, T., Cheng, L., Gu, J. W., Zhou, H. T., . . . Dang, S. H. (2014). Epileptiform Discharges and Frontal Paroxysmal EEG Abnormality Act as Predictive Marker for Subsequent Epilepsy in Children with Complex Febrile Seizures. *Clin EEG Neurosci.* doi:10.1177/1550059413507568
- Maytal, J., Steele, R., Eviatar, L., & Novak, G. (2000). The value of early postictal EEG in children with complex febrile seizures. *Epilepsia, 41*(2), 219-221. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10691120>
- Nordli, D. R., Jr., Moshe, S. L., Shinnar, S., Hesdorffer, D. C., Sogawa, Y., Pellock, J. M., . . . Team, F. S. (2012). Acute EEG findings in children with febrile status epilepticus: results of the FEBSTAT study. *Neurology, 79*(22), 2180-2186. doi:10.1212/WNL.0b013e3182759766
- Shah, P. B., James, S., & Elayaraja, S. (2014). EEG for children with complex febrile seizures. *Cochrane Database Syst Rev, 1*, CD009196. doi:10.1002/14651858.CD009196.pub2
- Shinnar, S., Bello, J. A., Chan, S., Hesdorffer, D. C., Lewis, D. V., Macfall, J., . . . Team, F. S. (2012). MRI abnormalities following febrile status epilepticus in children: the FEBSTAT study. *Neurology, 79*(9), 871-877. doi:10.1212/WNL.0b013e318266fcc5
- Yucel, O., Aka, S., Yazicioglu, L., & Ceran, O. (2004). Role of early EEG and neuroimaging in determination of prognosis in children with complex febrile seizure. *Pediatr Int, 46*(4), 463-467. doi:10.1111/j.1328-8067.2003.01799.x

Appendix A

Power Plan

Unique Plan Description: EDP Complex Febrile Seizure**Plan Selection Display: EDP Complex Febrile Seizure****PlanType: ED/UCC****Version: 1****Begin Effective Date: 03/10/2016 13:04****End Effective Date: Current****Available at all facilities****EDP Complex Febrile Seizure****Vital Signs/Monitoring** Vital signs CR monitor

*Frequency: Continuous, RN to change limits Yes, Upper HR limit 185, Lower HR limit 95, Upper RR limit 70, Lower RR limit 20, Cardiorespiratory Leads 3 [Less Than 6 month(s)] (DEF)**

Frequency: Continuous, RN to change limits Yes, Upper HR limit 180, Lower HR limit 85, Upper RR limit 60, Lower RR limit 15, Cardiorespiratory Leads 3 [6 - 36 month(s)]

Frequency: Continuous, RN to change limits Yes, Upper HR limit 150, Lower HR limit 60, Upper RR limit 50, Lower RR limit 12, Cardiorespiratory Leads 3 [3 - 11 year(s)]

Frequency: Continuous, RN to change limits Yes, Upper HR limit 140, Lower HR limit 20, Upper RR limit 35, Lower RR limit 10, Cardiorespiratory Leads 3 [Greater Than or Equal To 11 year(s)]

Frequency: Continuous, RN to change limits Yes, Upper HR limit 200, Lower HR limit 100, Upper RR limit 70, Lower RR limit 20, Cardiorespiratory Leads 5, Cyanotic Cardiac

 BP

*Upper Systolic Limit: 110, Lower Systolic Limit: 60, Upper Diastolic Limit: 60, Lower Diastolic Limit: 30, Upper MAP Limit: 75, Lower MAP Limit: 40 [6 - 24 month(s)] (DEF)**

Upper Systolic Limit: 120, Lower Systolic Limit: 70, Upper Diastolic Limit: 80, Lower Diastolic Limit: 30, Upper MAP Limit: 90, Lower MAP Limit: 45 [3 - 10 year(s)]

Upper Systolic Limit: 140, Lower Systolic Limit: 80, Upper Diastolic Limit: 90, Lower Diastolic Limit: 40, Upper MAP Limit: 105, Lower MAP Limit: 50 [Greater Than or Equal To 11 year(s)]

Upper Systolic Limit: 95, Lower Systolic Limit: 55, Upper Diastolic Limit: 60, Lower Diastolic Limit: 35, Upper MAP Limit: 70, Lower MAP Limit: 40 [Less Than 6 month(s)]

Nutrition/Diet NPO diet Regular diet for age**Nursing** Suction by Nurse Lumbar puncture set up**Respiratory** Pulse oximetry/oxygen ED**Consults/Therapy** Clinic Referral Neurology Clinic

Neurology Clinic, Complex Febrile Seizure

-
- EEG Request

This patient was evaluated for a complex febrile seizure.

Laboratory

- CBCD
- Blood Culture
- Urinalysis & Microscopic if UA pos (No Culture)
- Urine Culture
- Blood glucose monitoring POC
- Urine dipstick POC
- Add on Test

CSF Labs

- Cell Count CSF
LP, Urgent collect, T;N
- CSF Culture & Gram Stain
CSF Lumbar Puncture, Urgent collect, T;N
- Glucose Level CSF
Cerebrospinal Fluid, Urgent collect, T;N
- Protein Level CSF
Puncture, Urgent collect, T;N
- HSV 1/2 PCR CSF
Cerebrospinal Fluid, Urgent collect, T;N

Radiology

-
- zzChest AP LAT

CT

If complex seizure and if history or exam is focal, consider CT Head w/o Contrast(NOTE)*

-
- CT Head or Brain w/o Contrast

Continuous Medications/Fluids

- IV placement
- NS fluid bolus
*20 mL/kg, IV, IV Soln, 1 time only (DEF)**
10 mL/kg, IV, IV Soln, 1 time only
- LR fluid bolus
*20 mL/kg, IV, 1 time only (DEF)**
Comments: Infuse Over:
10 mL/kg, IV, 1 time only
Comments: Infuse Over:
- D5W NS
IV

Medications

-
- acyclovir

Anti-pyretics

- acetaminophen
*10 mg/kg, PO, 1 time only [Less Than 100 kg] (DEF)**
Comments: Max Dose: 1 Gm /dose
12.5 mg/kg, PO, 1 time only [Less Than 80 kg]
Comments: Max Dose: 1 Gm /dose
15 mg/kg, PO, 1 time only [Less Than 66 kg]
Comments: Max Dose: 1 Gm /dose
- ibuprofen
*10 mg/kg, PO, 1 time only (DEF)**

Comments: Max Dose: 800 mg/ dose
 100 mg, PO, 1 time only
 200 mg, PO, 1 time only
 300 mg, PO, 1 time only
 400 mg, PO, 1 time only
 600 mg, PO, 1 time only
 800 mg, PO, 1 time only

Antibiotics

- cefTRIAxone
 50 mg/kg, IV, 1 time only
 Comments: Max dose: 2 grams
- cefTRIAxone / lidocaine for IM
 50 mg/kg, IM, 1 time only
 Comments: This entry is diluted with lidocaine 1% and contains less than 10 mg of lidocaine per mL in final dilution. Max dose: 2 grams
- vancomycin in D5W (standard)
 10 mg/kg, IV, 1 time only (DEF)*
 Comments: MAX DOSE: 1 gram/dose
 15 mg/kg, IV, 1 time only
 Comments: MAX DOSE: 1 gram/dose
 500 mg, IV, 1 time only
 1,000 mg, IV, 1 time only
- vancomycin in NS (for dextrose restricted patients)
 10 mg/kg, IV, 1 time only (DEF)*
 Comments: MAX DOSE: 1 gram/dose
 15 mg/kg, IV, 1 time only
 Comments: MAX DOSE: 1 gram/dose
 500 mg, IV, 1 time only
 1,000 mg, IV, 1 time only

Topicals

- J-Tip with buffered lidocaine 1%
 0.2 mL, Intradermal, Unscheduled, PRN Needle Sticks
- AneCream 4% topical cream
 1 application, Topical, Cream, Unscheduled, Needle Sticks

First Line Medications

- LORazepam
 0.1 mg/kg, IV Push, 1 time only
 Comments: (Maximum Dose: 4mg/dose) Must be diluted to 1mg/mL with normal saline for IV administration. Infuse over 2-5 minutes not exceeding 2 mg/minute. This medication requires an independent double check by a licensed provider. May repeat every 5 minutes to a max of 10 mg.
- diazepam
 0.1 mg/kg, IV Push, 1 time only (DEF)*
 Comments: Give product IV push at a rate not to exceed 1-2mg/minute.
 Do not dilute IV Diazepam as precipitation will occur immediately.
 Administer this product undiluted, and flush with NS. This medication requires an independent double check by a licensed provider.
 0.1 mg/kg, Per Rectum, 1 time only
- midazolam
 0.1 mg/kg, IV Push, 1 time only (DEF)*
 Comments: Administer slow I.V. push over 2-5 minutes
 0.2 mg/kg, Nasal, 1 time only, for intranasal use
 Comments: Administer 1/2 of dose in each nostril with intranasal

atomizer. Max Dose 10 mg

Second Line Medications

- <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"><HTML><HEAD><META content="text/html; charset=windows-1252" http-equiv=Content-Type><STYLE> BODY margin:0; P margin:0 </STYLE><META name=GENERATOR content="MSHTML 10.00.9200.17609"></HEAD><BODY>Child Off Clinical Practice Guideline</BODY></HTML>(NOTE)*
- levETIRAcetam
20 mg/kg, IV, 1 time only
Comments: MAX DOSE: 40mg/kg
 - fosphenytoin
20 mg/kg, IV, 1 time only
Comments: Over 3 mg/kg/min - The dose, concentration in solutions, and infusion rates for fosphenytoin are expressed as PHENYTOIN SODIUM EQUIVALENTS (PE)
MAX DOSE: 2 Grams
 - PHENobarbital
20 mg/kg, IV, 1 time only, loading dose
Comments: MAX DOSE: 2 Grams
 - valproic acid
20 mg/kg, IV, 1 time only
Comments: MAX DOSE: 2 Grams . Caution use in under 2 years of age
 - lacosamide
5 mg/kg, IV, 1 time only (DEF)*
Comments: Max Dose: 400 mg
400 mg, IV, 1 time only

Medical Supplies

- Manometer Disposable Pharmaceal Eac

***Report Legend:**

DEF - This order sentence is the default for the selected order

GOAL - This component is a goal

IND - This component is an indicator

INT - This component is an intervention

IVS - This component is an IV Set

NOTE - This component is a note

Rx - This component is a prescription

SUB - This component is a sub phase

Appendix B

Grading of CPG Recommendations

Grade of Recommendation	Confidence in Clarity of Benefits vs. Harms, Burden, and Cost	Quality of Supporting Evidence	Implications
Strong recommendation High quality evidence	Desirable effects clearly outweigh undesirable effects or vice versa	Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies	Recommendation can apply to most patients in most circumstances. Further research is unlikely to change our confidence in the estimate of effect
Strong recommendation Moderate-quality evidence	Desirable effects clearly outweigh undesirable effect or vice versa	Evidence from RCTs with important limitations (inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies	Recommendation can apply to most patients in most circumstances. Further research (if performed) is likely to have an important effect on our confidence in the estimate of effect and may change the estimate.
Strong recommendation Low-quality evidence	Desirable effects clearly outweigh undesirable effect or vice versa	Evidence for at least 1 critical outcome from observational studies, from RCTs with serious flaws or indirect evidence	Recommendation may change when higher-quality evidence becomes available. Further research (if performed) is likely to have an important influence on our confidence in the estimate of effect and is likely to change the estimate.
Strong recommendation Very-low-quality evidence (Very rarely applicable)	Desirable effects clearly outweigh undesirable effect or vice versa	Evidence for at least 1 of the critical outcomes from unsystematic clinical observations or very indirect evidence	Recommendation may change when higher-quality evidence becomes available; any estimate of effect, for at least 1 critical outcome, is uncertain.
Recommended High-quality evidence	Desirable effects closely balanced with undesirable effects	Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies	The best action may differ, depending on circumstances or patients or societal values. Further research is unlikely to change our confidence in the estimate of effect.
Recommended Moderate-quality evidence	Desirable effects closely balanced with undesirable effects	Evidence from RCTs with important limitations (inconsistent results, methodological flaws, indirect evidence,	Alternative approaches likely to be better for some patients under some circumstances. Further research (if performed) is likely to have

		or imprecise results) or unusually strong evidence from unbiased observational studies	an important influence on our confidence in the estimate of effect and may change the estimate.
Recommended Low-quality evidence	Desirable effects closely balanced with undesirable effects	Evidence for at least 1 critical outcome from observational studies, from RCTs with serious flaws or indirect evidence	Other alternatives may be equally reasonable. Further research is likely to have an important influence on our confidence in the estimate of effect and is likely to change the estimate.
Recommended Very-low-quality evidence	Desirable effects closely balanced with undesirable effects	Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence	Other alternatives may be equally reasonable. Any estimate of effect, for at least 1 critical outcome, is uncertain.

Adapted from: Schunemann, H. J., Vist, G. E., Jaeschke, R., Kunz, R., Cook, D. J., & Guyatt, G. (2002). Advanced topics in moving from evidence to action: Grading recommendations. In Guyatt, G., Rennie, D., Meade, M. O., & Cook, D. J.(Ed.), *Users' guides to the medical literature: A manual for evidence-based clinical practice* (pp 679-701). New York, NY:McGraw-Hill.