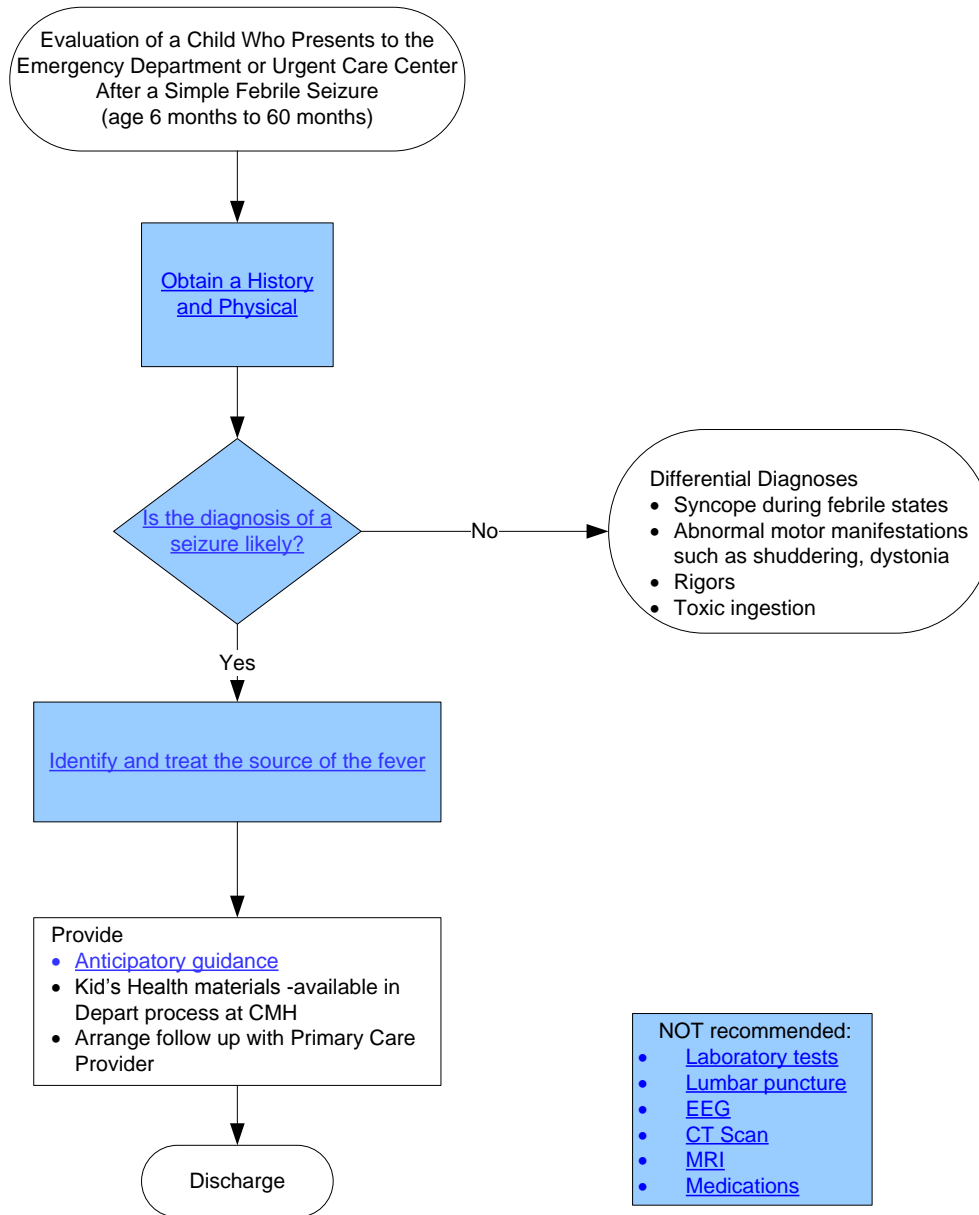


**Algorithm:**



**Epidemiology:**

Febrile seizures are seizures that happen during a febrile illness in 6 month olds to 60 months. Simple febrile seizures represent those that are brief, singular, and generalized, occurring in otherwise neurodevelopmentally healthy children, without any other infection that affects the brain, such as meningitis or abscess. These are common, occurring in 1/25 children, and represent the most common neurological disorder of childhood.

The primary goal is to determine the cause of the fever and treat it appropriately, and therefore medications for the seizure are not recommended, but medications to treat the causative infection are recommended.

**Objective of the Guideline:** The objective of this guideline is to standardize care of the child with a simple febrile seizure in the Emergency Department/ Urgent Care (ED ED/UCC) setting.

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

**Guideline Inclusion Criteria:**

- Children 6 months to 60 months
- Neurodevelopmentally normal
- Seizures are less than 5 minutes
- Seizures occur once within a 24 hour period

**Guideline Exclusion Criteria:**

- Presence of:
  - Intracranial infection
  - Known underlying condition, such as and inborn error of metabolism
  - History of afebrile seizures
  - Recent history of head trauma

**Differential Diagnosis:**

- Includes:
  - Syncope during febrile states
  - Abnormal motor manifestations such as shuddering, dystonic seizures
  - Rigors
  - Toxic ingestion

**Clinical Questions Answered by Guideline:**

1. Should a child seen in the ED/UCC with a simple febrile seizure:
  - a) Have laboratory tests performed?
  - b) Have radiological imaging (CT)?
  - c) Have an EEG performed?
  - d) Be treated with medications?
  - e) Be sent home with medications?
  - f) Have a neurology consult?
  - g) Be admitted to the hospital?
1. Should a lumbar puncture and laboratory testing of CFS be done for children with a simple febrile seizure?

**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 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><b>#3 #1 AND #2</b></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 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/kun	9	<b>#3 #1 AND #2</b>	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 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/kun	9										
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EEG	<table border="1"> <thead> <tr> <th>EMBASE Terms</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td><b>#9 #8</b> AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND (<b>2010</b>:py OR <b>2011</b>:py OR <b>2012</b>:py OR <b>2013</b>:py OR <b>2014</b>:py OR<b>2015</b>:py) AND [embase]/lim NOT [medline]/lim</td> <td>35</td> </tr> <tr> <td># 8 'febrile convulsion/exp/mj AND "electroencephalogram"/exp</td> <td>224</td> </tr> </tbody> </table>	EMBASE Terms	Results	<b>#9 #8</b> AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim) AND ( <b>2010</b> :py OR <b>2011</b> :py OR <b>2012</b> :py OR <b>2013</b> :py OR <b>2014</b> :py OR <b>2015</b> :py) AND [embase]/lim NOT [medline]/lim	35	# 8 'febrile convulsion/exp/mj AND "electroencephalogram"/exp	224				
EMBASE Terms	Results										
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# 8 'febrile convulsion/exp/mj AND "electroencephalogram"/exp	224										
Treated with meds in the ED and discharged with medications	<p>PubMed:</p> <p>("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</p>										

Neuro No results  
consult

Be No results  
admitted to  
the hospital

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
	<b>#5</b>	
LP	<b>#4</b> AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py) AND [embase]/lim NOT [medline]/lim	
	<b>#2</b> AND <b>#3</b>	24
	<b>#3</b> 'febrile convulsion'/exp	6004
	<b>#2</b> 'lumbar puncture'/exp AND 'cerebrospinal fluid'/exp	2985

An ancestry search of the AAP Taskforce statement yielded two additional papers

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**Practice Recommendations:*****Diagnostic evaluation:***

1. **History:** Include (a) characteristics of the seizure, (b) duration, (c) focal attributes such as sidedness, (d) recent immunizations, and if immunization status is current, (e) family history of seizure and or developmental delay, (f) loss of consciousness.
2. **Physical Exam (PE)/Monitoring:** General physical exam and neurological exam, status of fontanelle (age dependent), muscle tone and or strength.

***Diagnostics:***

1. Only to diagnosis the cause of the fever
2. Neurodiagnostic evaluation is not indicated in the routine evaluation of a simple febrile seizure aside from identifying the source of the fever.

***Treatment:***

1. Only to treat the cause of the fever
2. Neurological treatment is not indicated after a simple febrile seizure aside from treating the underlying cause of fever.

**Discharge Criteria:**

1. The patient is back to baseline with a non-focal neurological examination
2. The likely source of the fever has been identified and treated
3. A treatment plan with appropriate follow up has been devised

**Outcome Measures:**

1. PowerPlan Use
2. Length of Stay in the ED
3. CT with or without contrast

**Potential Cost Implications:** The goal of the Simple Febrile Seizure Management CPG is to reduce cost by decreasing unnecessary interventions for this population.

**Potential Organizational Barriers:** Education of staff and parental anxiety and expectations

**Supporting Documentation**

**PowerPlan-** See Appendix A

**Team Recommendations:**

**Question 1a:** Should the child with a simple febrile seizure have laboratory tests performed?

**Simple Febrile Seizure CPG Team recommendation:**

The Simple Febrile Seizure CPG team concurs with the recommendation of the AAP not be performed as part of a routine evaluation of a simple febrile seizure (Duffner et al., 2011). Specifically the AAP guideline states serum electrolytes, calcium, phosphorus, magnesium, blood glucose or a complete blood cell count “should not be performed in the routine evaluation of the child with a simple febrile seizure”. The recommendation is based on evidence from observational studies. Teran, Medows, Wong, Rodriguez, & Varghese (2012) evaluated the usefulness of obtaining a CBC in children with a simple febrile seizure. They report 134/182 (73%) had a normal CBC, 42/182 (23%) had leukocytosis, and 6/182 (4%) had leucopenia. We value identifying the source of the fever, and treating the cause of the fever appropriately.

**Literature supporting this recommendation**

Duffner et al. (2008)

Teran et al. (2012)

The Office of Evidence Based Practice, 2016

Center of Clinical Effectiveness

Contact information [bzuccarelli@cmh.edu](mailto:bzuccarelli@cmh.edu) or [jmichael@cmh.edu](mailto:jmichael@cmh.edu)

**Question 1b:** Should the child with a simple febrile seizure have radiological imaging (CT, MRI)?

**Simple Febrile Seizure CPG Team recommendation:**

The Simple Febrile Seizure CPG team concurs with the recommendation of the AAP (Patricia K Duffner et al., 2008) that states neuroimaging “should not be performed in the routine evaluation of the child with a simple febrile seizure”. Observational studies are the basis of the recommendation. Furthermore, the American College of Radiology (ACR Guideline, 2012) states there is no indication for imaging in simple febrile seizures. No additional studies have been found since the search completed for the AAP Guideline was performed. We value identifying the source of the fever, and treating the cause of the fever appropriately. We also value decreasing radiation exposure that occurs with CT scanning, and the risk from sedation and cost associated with MRI.

**Literature supporting this recommendation**

Duffner et al. (2008)

Milla et al., (2012)

**Question 1c:** Should the child with a simple febrile seizure have an EEG?

**Simple Febrile Seizure CPG Team recommendation:**

The Simple Febrile Seizure CPG team concurs with the recommendation of the AAP Guideline (Duffner et al. 2008) that an EEG should not be performed in the child who is neurologically healthy and has had a simple febrile seizure. Two additional studies have been found since the search completed for the AAP Guideline was performed and included here. They are both are of retrospective cohort studies and do not provide additional information that supports obtaining an EEG for children after a simple febrile seizure. Both studies look at the prognostic value of obtaining an EEG and neither study separates simple from complex febrile seizures to answer this question. Kanemura, Sano, Yamashiro, Sugita, & Aihara (2011) reported on 119 subjects (99 subjects had simple febrile seizures) Those with simple febrile seizures were significantly less likely to develop epilepsy ( $p < 0.05$ ). However the EEG was performed 7-20 days after the index event, not the population we are including in this CPG. (Karimzadeh et al., 2013) did not differentiate simple from complex seizures.

**Literature supporting this recommendation** (See Tables 2 and 4)

Duffner et al. (2008)

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

Karmzadeh et al. (2012)

**Question 1d:** Should the child be treated with medications for seizure?

**Simple Febrile Seizure CPG Team recommendation:**

The Simple Febrile Seizure CPG team concurs with the statement made in AAP Guideline (Duffner et al. 2008) that simple febrile seizures are benign events, and not associated with neurological consequences. Therefore, seizure medications are not recommended for the child who presents after a simple febrile seizure.

**Question 1 e:** Should the child be sent home with medications for seizure recurrence?

**Simple Febrile Seizure CPG Team recommendation:**

The Simple Febrile Seizure CPG team concurs with the statement made in AAP Guideline (Duffner et al. 2008) that simple febrile seizures are benign events, and not associated with neurological consequences. Seizure medications are not recommended at the time of discharge for community use as abortive therapy for potential recurrence of a simple febrile seizure.

**Question 1f:** For the child with a simple febrile seizure should neurology be consulted?

**Simple Febrile Seizure CPG Team recommendation**

No literature was found to answer this question. However, the Clinical Practice Guideline published by the AAP (Patricia K Duffner et al., 2008) states that a simple febrile seizure does not usually require further evaluation, other than finding the source of the fever and treating the cause of the fever appropriately.

**Literature supporting this recommendation**

Duffner, et al. (2008)

**Question 1g:** Should the child with a simple febrile be admitted to the hospital?

**Simple Febrile Seizure CPG Team recommendation**

The Clinical Practice Guideline published by the American Academy of Pediatrics (Duffner et al., 2008) states one of the goals of the Guideline is to "reduce the costs of physician and emergency department visits, hospitalization and unnecessary testing." An objective of the Seattle Children's Febrile Seizure Guideline is to reduce the admission rate from the ED by 10% within one year of Guideline implementation.

The Seattle Children's Guideline ("Febrile Seizure v.1.1: ED Management," 2011), the British Columbia Guideline (GPAC, 2010) state indications for admission include (a) infections that require treatment with IV antibiotics, (b) significant caregiver anxiety, and (c) barriers to transportation to home.

We did not identify studies that used Hospital Admission as an outcome when reporting on the care of the child with a simple febrile seizure.

We recommend that the neurologically healthy child should not be admitted to the hospital, unless caregiver anxiety is a barrier to providing care to the child, or transportation home from or back to the hospital is not available.

**Literature supporting this recommendation**

Duffner, et al (2011)

Seattle 2011

GPAC 2010

Should a lumbar puncture and laboratory testing of CFS be done for children not up to date with HiB and Streptococcus pneumoniae immunizations?

We concur with the AAP (Duffner 2011) Clinical Practice Guideline do not recommend the routine performance of a lumbar puncture and laboratory testing of CSF for children who present to the ED following a simple febrile seizure. When considering the source of the infection that caused the fever, if meningitis is on the differential diagnosis list, a LP is warranted. We have included four retrospective cohort studies that reinforce the low yield of positive results from an examination of CSF in this population.

Literature supporting this recommendation (see Table 4)

Saeed (2011)

Tavasoli, Afsharkhas, & Edraki (2014)

The Office of Evidence Based Practice, 2016

Center of Clinical Effectiveness

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**Guideline Preparation:** This guideline was prepared by The Office of Evidence Based Practice (EBP) in collaboration with content experts at Children's Mercy Hospitals and Clinics. Development of this guideline supports the initiative of the Department of Clinical Effectiveness 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 member's name. The Hospital Medicine team member was the source of input from the General Pediatrics

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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:

Review of existing internal and external guidelines and standards. 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. Application of the scores are user dependent.



Table 2

*Agree II Scoring of the AAP Guidelines for Neurodiagnostic Evaluation and Long Term Management of Simple Febrile Seizures*

	AAP Duffner Long- term management 2008	AAP Duffner 2011 Neuro- diagnostic
Domain 1 – SCOPE AND PURPOSE	93%	100%
Domain 2 - STAKEHOLDER INVOLVEMENT	76%	44%
Domain 3 – RIGOR OF DEVELOPMENT	72%	98%
Domain 4 – CLARITY AND PRESENTATION	92%	100%
Domain 5 - APPLICABILITY	38%	88%
Domain 6 – EDITORIAL INDEPENDENCE	20%	83%
Overall Guideline Assessment (range 1-7, higher better)	5.5	7

*Note:* Based on the AGREE Scores for the AAP Guidelines for Neurodiagnostics (Duffner, et al. 2011) and long term management (Duffner 2008) these two guidelines were selected as the basis for this guideline. The score is the mean percentage of four reviewers.

1. Review preparation
  - a. PICOT (**P**atient, **I**ntervention, **C**omparison, **O**utcome, **T**ype of question) questions established
  - b. Team leaders confirmed search terms employed by the Health Science Medical Librarians, reviewed article titles and abstracts from the search, and identified articles to be read and synthesized by the Evidence Based Practice Scholars.
2. Databases searched
  - a. AHRQ National Guideline Clearinghouse
  - b. Cochrane
  - c. Medline
  - d. CINAHL

- e. EMBASE
- 3. Critically analyze the evidence
  - a. Guidelines
    - AGREE criteria were used to analyze published clinical guidelines. (Table 2)
  - b. Single studies
    - i. The EBP Scholars used the Cochrane Collaborative's electronic software, Review Manager 5 (RevMan), to produce systematic reviews of the evidence of the effects of healthcare and delivered these documents to the team for review. RevMan allowed the EBP Scholars to build the tables of study characteristics, tables of study biases, and analyze study data in a meta-analysis
    - ii. When meta-analyses were found in the literature search, or created in RevMan, the GRADE criteria evaluated the literature using the Cochrane Collaborative's electronic software known as GRADEprofiler (GRADEpro). GRADEpro assesses the meta-analysis for:
      - 1. Limitations in study design and execution
      - 2. Inconsistency between studies
      - 3. Indirectness of study outcomes
      - 4. Imprecision
      - 5. Publication bias
    - iii. The Appendix B defines how the quality of the evidence is rated and how the recommendation is established based on the type of evidence.
- 4. Recommendations for the guideline that were developed by a consensus process incorporated the three principles of EBP (current literature, content experts [CPG Team], and patient and family preference [when possible]).

**Approval Process:** Guidelines are reviewed and approved by an internal reviewer, Grant Latta, DO and an external reviewer, Dr. Michelle K. Hughes, DO. The reviewers each completed the AGREE II Tool on the guideline and the result is in Table 3.

Table 3.  
*Agree II Scoring for the Simple Febrile Seizure Clinical Practice Guideline*

<b>Simple Febrile Seizure Clinical Practice Guideline</b>	
<b>Domain 1 – SCOPE AND PURPOSE</b>	94%
<b>Domain 2 - STAKEHOLDER INVOLVEMENT</b>	86%
<b>Domain 3 – RIGOR OF DEVELOPMENT</b>	88%
<b>Domain 4 – CLARITY AND PRESENTATION</b>	89%
<b>Domain 5 - APPLICABILITY</b>	90%
<b>Domain 6 – EDITORIAL INDEPENDENCE</b>	79%

Note: the score is the mean percentage of two reviewers

The CPG Team comprised of content expert clinicians, the Office of EBP, Medical Executive Committee and other appropriate hospital committees as deemed suitable for the guideline's intended use. Guidelines are reviewed and updated as necessary every 3 years within the Office of EBP at CMH&C. The CPG Team will be involved with every review and update.

**Disclaimer:**

The content experts and the Office of EBP are aware of the controversies surrounding the management of the pediatric patient in xxx. 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, although a discussion with an Endocrinologist is recommended prior to this occurring

**Table 4:**

***Characteristics of included studies :***

**Kanemura 2011**

<b>Methods</b>	Retrospective cohort study, Japan Their question was if EEG characteristics, especially localization of paroxysmal discharges predict subsequent epilepsy.
<b>Participants</b>	<p><b>Number of subjects:</b> 128 subjects met the criteria; Nine were excluded because they did not meet the criteria for follow-up. (N= 119)</p> <p>Patients were referred by on outpatient department 1-3 weeks after the febrile seizure.</p> <p><b>Inclusion criteria:</b> Definition of a febrile seizure for this study is a seizure accompanied by fever without an obvious central nervous system invasive infection in child including neonatal seizures only</p> <p><b>Exclusion criteria:</b> history of afebrile seizures, marked dehydration, or seizures after immunizations. Children with acute or remote neurologic insults</p> <p>Definition of complex seizure: one or more of the following: the seizure lasted &gt; or = 15 minutes, focal seizure, more than one seizure with a 24 hour time period</p>
<b>Interventions</b>	EEG on a 12- or 16- channel instrument 7-20 days after the index illness, when the subject was afebrile..The EEG lasted at least 20 minutes. The EEG included intermittent photic activation and hyperventilation was used when the subject could perform the tasks. Two pediatric neurologists interpreted the EEGs; a third opinion was sought when there was disagreement. All subjects were followed for more than four years.
<b>Outcomes</b>	<p>Diagnosis of Febrile Seizure: 26 (21.8%) subjects showed a paroxysmal abnormality on EEG and 9 (7.6%) developed epilepsy.</p> <p>Subjects with simple febrile seizures were significantly less likely to develop epilepsy than those with complex febrile seizures <i>OR</i>= 0.29 95% CI [0.11, 0.80] <i>p</i>&lt; 0.05</p>

**Karimzadeh 2013**

<b>Participants</b>	<p><b>Methods:</b> Before/After study. participants had an EEG done shortly after a febrile seizure, then again 2 weeks later</p> <p><b>Setting:</b> Mofid Children's Hospital ED in Iran</p> <p><b>Number of participants:</b> Not randomized, 58 patients presented with possible febrile seizure</p> <p><b>Completed:</b> 36, further broken down into 23 with simple febrile seizure and 13 with complex febrile seizure</p> <p><b>Gender:</b> 66% male</p> <p><b>Inclusion Criteria:</b> age 6 months-6 years, presenting with febrile seizure</p> <p><b>Exclusion criteria:</b> children with previous nonfebrile seizure, patients with evidence of intracranial infection, patients with electrolyte imbalance, patients who were not referred for second EEG</p> <p><b>Power analysis:</b> not mentioned</p>
<b>Interventions</b>	<p>Two EEGs were done on each patient while under sedation with 50-75mg/kg oral chloral hydrate: 1) 24-48 hours after febrile seizure and 2) two weeks after seizure.</p>
<b>Outcomes</b>	<p>EEG abnormality immediately after seizure</p> <p>EEG abnormality two weeks after seizure</p>

January 20, 2016

**Notes**

All patients were sedated with chloral hydrate for both EEGs.

This study had no control (in other words, no participants were studied that were seizure-free)

All participants participated in both EEGs.

Some patients were not counted as participants for this study because they were not referred for a second EEG, it is unclear whether these participants had a normal EEG the first time and were therefore not referred.

This study was "focused on the timing of the EEG recording after seizure" and "concluded no association between abnormal eliptiform discharge and early-late EEG recording".

the study further breaks down the types of EEG abnormalities, which show some differences between early and late EEGs.

**Results:** 29/36 (80.6%) of early EEGs showed abnormalities. This result does not differentiate between patients with simple febrile seizures and those with complex febrile seizures.

25/36 (69.4%) of late EEGs showed abnormalities. This result does not differentiate between patients with simple febrile seizures and those with complex febrile seizures.

For the 13 patients with complex febrile seizure, 3 had a normal early EEG.

Information is given linking family history of febrile seizure and early EEG abnormality at 100%

The study showed a 7/10 correlation between early EEG abnormality and complex febrile seizure in age < 3 years and a 100% correlation between early EEG abnormality for age 3+. No mention is made of correlation between late EEG abnormality and age.

### Saeed 2014

<b>Methods</b>	Retrospective cohort record review
<b>Participants</b>	<p><b>Setting:</b> Pediatric neurology department at Children's Hospital Taif in Saudi Arabia</p> <p><b>Age:</b> 272 children between 6 months and 5 years of age</p> <p><b>Completed:</b> 272 pediatric charts were reviewed.</p> <p><b>Gender:</b> 39% male</p> <p><b>Inclusion criteria:</b> Children who presented with first febrile seizure as identified by reviewing the admission registers</p> <p><b>Exclusion criteria:</b> Children with other neurological diseases like cerebral palsy, mental retardation, past history of meningitis with sequel, other neurological diseases, and fever after occurrence of seizures or antibiotics for more than 48 hours.</p> <p><b>Power analysis:</b> not provided</p>
<b>Interventions</b>	Reviewed charts of those children admitted to the ED with a seizure and had an LP. Fever defined as a temperature of $\geq 38$ C (recorded in emergency, OPD or in the ward).
<b>Outcomes</b>	6 children out of 272 (2%) were diagnosed to have meningitis.
<b>Notes</b>	The findings of this retrospective review confirms previously reported probability of bacterial meningitis is 0.45-1.25 (Carroll & Brookfield, 2002).

### Tavasoli 2014

<b>Methods</b>	Retrospective Cohort
<b>Participants</b>	<p><b>Participants:</b> Charts of all patients meeting inclusion criteria from October 2000-2010 were reviewed.</p> <p><b>Setting:</b> Ali-Asghar Children's Hospital, Iran.</p> <p><b>Randomized:</b> not randomized, cohort study</p> <p><b>Age:</b> 26 months (SD=2.7months)</p> <p><b>Completed:</b> 681 patients with febrile seizure were identified, 422 had lumbar puncture.</p> <p><b>Gender:</b> 4% male</p> <p><b>Inclusion Criteria:</b> Patients 1 month -6 years of age presenting to the hospital with complaint of fever and seizure.</p> <p><b>Exclusion Criteria:</b> Patients with a history of previous non-febrile seizures, or a previously diagnosed underlying illness associated with seizures, an immune compromised state, or the presence of a ventriculoperitoneal shunt or trauma.</p>
<b>Interventions</b>	Charts were reviewed to evaluate use of lumbar puncture and results to determine presence of bacterial meningitis

<b>Outcomes</b>	<p><b>Outcomes evaluated:</b> Meningitis, bacterial or aseptic</p> <p><b>Results:</b></p> <ul style="list-style-type: none"> <li>• A total of 681 patients with a diagnosis of FS were identified.</li> <li>• An LP was performed in 422 patients (62%).</li> <li>• Diagnosis of meningitis (bacterial or aseptic) was identified in 19 cases (4.5%, 95% CI 2.9–6.9). The mean age of the patients with meningitis was 10±3.2 months including 11 males (58%).</li> <li>• Seven patient met the study criteria for bacterial meningitis (1.65%, 95% CI 0.8–3.3).</li> <li>• All patients with bacterial meningitis had complex febrile seizures. Impaired consciousness was seen in 15 cases with meningitis (78.9%) and 6 cases with bacterial meningitis (85.7%) compared with 26 cases with a normal LP (6.5%) and this was statistically significant.</li> </ul>
<b>Notes</b>	<p>The findings of this retrospective review confirms previously reported probability of bacterial meningitis is 0.45-1.25 (Carroll &amp; Brookfield, 2002).</p>

## Teran 2012

<b>Methods</b>	Retrospective cohort study
<b>Participants</b>	<p><b>Setting:</b> cared for in a the ED or admitted to the inpatient unit of a community hospital in a urban location. Records were retrieved from Jan 2004 to Dec 2009 (6 years) US</p> <p><b>Number included:</b> 219 subjects 182 with simple febrile seizure and 37 with complex febrile seizure</p> <p><b>Gender:</b> 62.1% male</p> <p><b>Age:</b> mean age 22.9 +/- 13.2 months</p> <p>Inclusion criteria: diagnosed with simple of complex febrile seizure in the ED</p> <p>Exclusion criteria: if the discharge diagnosis changed from the admission diagnosis</p>
<b>Outcomes</b>	<p>For the Simple Febrile Seizure Group</p> <p>Radiology</p> <ul style="list-style-type: none"> <li>• 156/182 (92%) had a normal chest x-ray</li> </ul> <p>CBC</p> <ul style="list-style-type: none"> <li>• 134/182 (73%) had a normal CBC</li> <li>• 42/182 (23%) had leukocytosis</li> <li>• 6/182 (4%) had leukopenia</li> </ul>



### Excluded Studies and Reason for Exclusion

Study	Reason for exclusion
Carapetian et al. (2015)	Survey of US Emergency Departments and their compliance to the AAP guidelines
Frank et al. (2012)	Complex febrile seizure
Gamirova (2013)	Abstract only
Kimia et al. (2010)	Complex febrile seizure
Kuang et al. (2014)	Complex febrile seizure
Lee (2012)	Abstract only
Schreiber et al. (2012)	Abstract
Vazquez and Fenton (2011)	Abstract only

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Appendix A

Power Plan

**Unique Plan Description: EDP Simple Febrile Seizure**

**Plan Selection Display: EDP Simple Febrile Seizure**

**PlanType: ED/UCC**

**Version: 1**

**Begin Effective Date: 03/14/2016 09:13**

**End Effective Date: Current**

**Available at all facilities**

**EDP Simple 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

**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*

**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

<b>Grade of Recommendation</b>	<b>Confidence in Clarity of Benefits vs. Harms, Burden, and Cost</b>	<b>Quality of Supporting Evidence</b>	<b>Implications</b>
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, or imprecise results) or unusually strong evidence from unbiased observational studies	Alternative approaches likely to be better for some patients under some circumstances. Further research (if performed) is likely to have 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.