JOHNS HOPKINS ALL CHILDREN'S HOSPITAL

Febrile Seizures Clinical Pathway

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All Children's Hospital

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Owners: Leslie Carroll, MD; Lisa Odendal, MD

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Febrile Seizure Clinical Pathway

Rationale:

This clinical pathway was developed by a consensus group of JHACH physicians and advanced practice providers to standardize the management of children presenting to the hospital with a febrile seizure. It addresses the following clinical questions or problems:

1. How to define simple and complex febrile seizures?
2. Which patients presenting with febrile seizures are at higher risk and how to evaluate them?
3. When to consider a neurology consult?
4. Which patients can be discharged home and when is it recommended to admit?

Simple Febrile Seizures

Background

Definition: A febrile seizure is defined as a patient age 6 months to 60 months with seizure and fever >38 degrees C or parental report of fever within 24 hours. Criteria for simple febrile seizures includes a generalized tonic-clonic seizure lasting less than 15 minutes without recurrence in 24 hours.

Exclusion Criteria: Known afebrile seizure disorder, probable intracranial infection, intracranial shunt, immunodeficiency, cardiac right to left shunt, oncology patients.

Epidemiology: 2-5% of children are affected. Peak incidence is at age 18 months. 85-90% of initial febrile seizures occur in children under the age of three. 5% of initial febrile seizures occur before the age of six months, and 5% occur after the age of six.

Risk of future febrile seizure: After the first febrile seizure, 33-50% of patients will have a second, and 10% will have 3 febrile seizures (low evidence level).

Diagnosis

The following guidelines for febrile seizure work up were developed by the American Academy of Pediatrics in 1996 and were updated as recently as 2011:

1A: A lumbar puncture should be performed in any child who presents with a seizure, a fever, and has meningeal signs and symptoms (e.g. neck stiffness, Kernig and/or Brudzinski signs), or in any child whose history or examination suggests the presence of meningitis or intracranial infection.

1B: In any infant between 6 and 12 months of age who presents with a seizure and fever, a lumbar puncture is an option when the child is considered deficient in *Haemophilus influenzae* type b (Hib), *Streptococcus pneumoniae* immunizations (i.e., has not received scheduled immunizations as recommended), or when immunization status cannot be determined because of an increased risk of bacterial meningitis.

1C: A lumbar puncture is an option in the child who presents with a seizure, fever, and is pretreated with antibiotics because antibiotic treatment can mask the signs and symptoms of meningitis.
2: An electroencephalogram (EEG) should **not** be performed in the evaluation of a neurologically healthy child with a simple febrile seizure.
3: The following tests should **not** be performed routinely for the sole purpose of identifying the cause of a simple febrile seizure: measurement of serum electrolytes, calcium, phosphorus, magnesium, blood glucose, or complete blood cell count.
4: Neuroimaging should **not** be performed in the routine evaluation of the child with a simple febrile seizure.

Conclusions

Clinicians evaluating infants or young children after a simple febrile seizure should direct their attention toward identifying the cause of the child's fever. Meningitis should be considered in the differential diagnosis for any febrile child, and lumbar puncture should be performed if the child is ill-appearing or if there are clinical signs or symptoms of concern. A lumbar puncture is an option in a child 6 to 12 months of age who is deficient in Hib and S. pneumoniae immunizations or for whom immunization status is unknown. A lumbar puncture is an option in children who have been pretreated with antibiotics. In general, a simple febrile seizure does not require further evaluation, specifically EEGs, blood studies, or neuroimaging.

Discharge Criteria

Typically, patients presenting with simple febrile seizures who are otherwise well appearing can be discharged home. Discharge criteria includes:

-Patient appears non-toxic and returns to neurological baseline.
-Parental anxiety addressed.
-Parental education provided.
-Appropriate outpatient follow-up with PCP is identified.
-Safe transport home is arranged.

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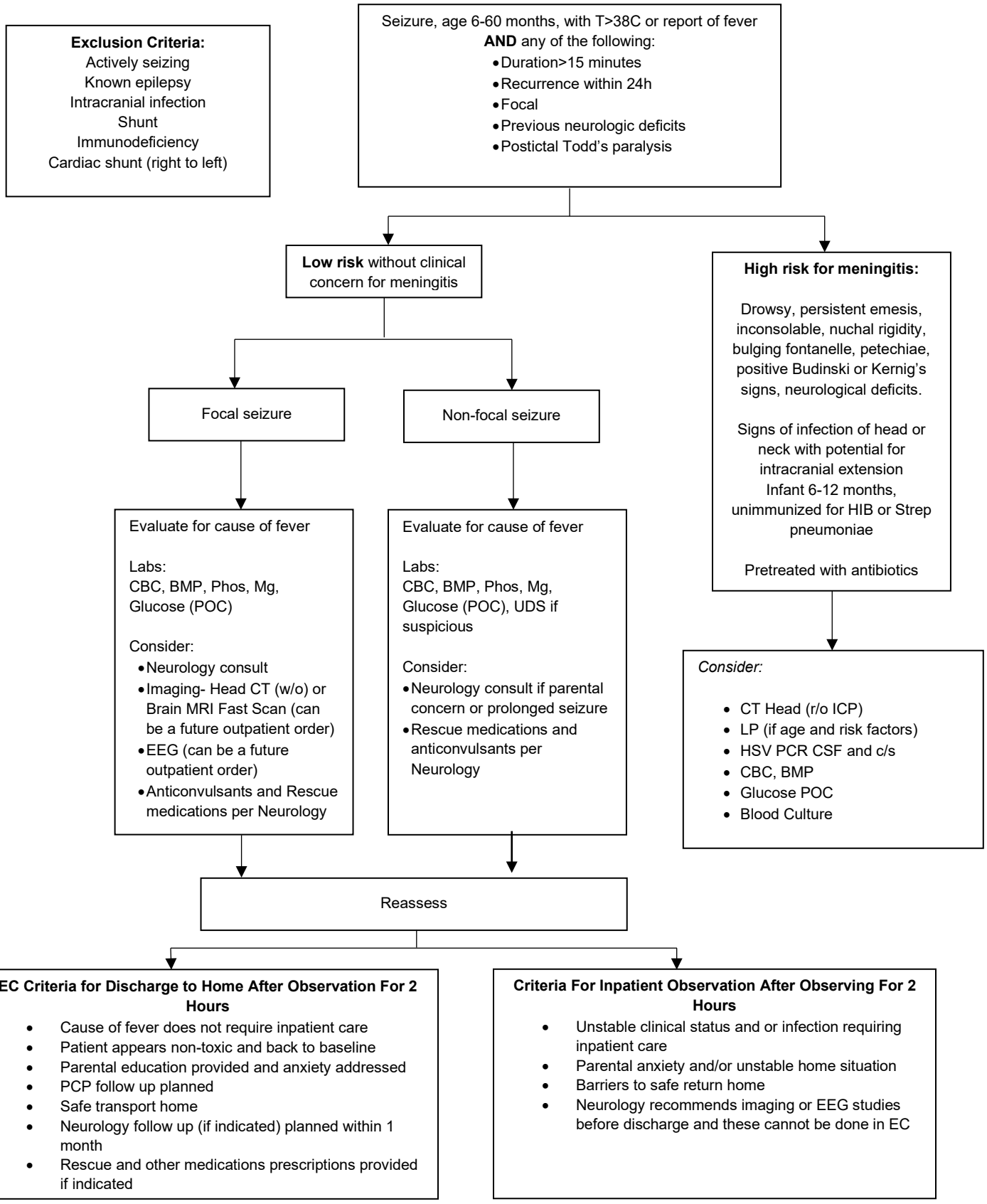
Complex Febrile Seizure Algorithm



Complex Febrile Seizures

Background and Clinical Diagnosis

Criteria for complex febrile seizures (CFS) include febrile seizures lasting greater than 15 minutes, seizures that recur within 24 hours, seizures with resulting postictal Todd's paralysis, and focal seizures. Complex febrile seizures represent 20-30% of all febrile seizures. Risk factors for complex febrile seizures include age < 12 months, history of febrile or unprovoked seizures in first degree relatives, low temperature at the onset of febrile seizure, and a focal initial febrile seizure.

The risk of having a future unprovoked seizure after a simple febrile seizure is 2.5%. (versus 0.4% risk in general population of 2-5 yr olds). Risk of future unprovoked seizures after a complex febrile seizure is 6-8% with one feature of CFS, 17-20% with two features (eg. prolonged and focal) and 49% with three features. Children with complex febrile seizures have a fivefold increased risk of developing epilepsy.

Evaluation

In patients with complex febrile seizures, cerebrospinal fluid infection must be considered. Meningitis is less likely in patients who have had prior febrile seizures or have pre-existing neurological findings. Meningitis is more likely in patients with illness > 3 days, infants 6-12 months who are unimmunized for HiB or Strep pneumoniae, patients pretreated with antibiotics, patients with nuchal rigidity, lethargy, active convulsions, neurological deficits, or bulging fontanel. Patients are also at risk if there are signs of infection in the head or neck with the potential for intercranial extension. Recommended work up includes Lumbar Puncture (LP), Herpes Simplex Virus (HSV), Complete Blood Count (CBC), blood culture, Urinalysis (UA), urine culture, stat glucose, CMP, Mg, and pH levels. If there is any concern for increased intracranial pressure, a CT head should be obtained. If there is any concern for ingestion, Urine Drug Screen (UDS) should be obtained.

Recommendations for routine lumbar puncture in patients with complex febrile seizures are inconsistent in the literature: two guidelines state that LP should be **considered** in children with complex febrile seizures. (Baumer, 2004; Fetveit, 2008) (low evidence level). One guideline **recommends** lumbar puncture for all patients with complex febrile seizures. (Expert opinion. Low evidence level) (Boyle, 2011). One guideline makes no distinction between children with complex febrile seizures and children with simple febrile seizures when assessing their risk of meningitis/intracranial infection. Recent studies in the age of Hib and pneumococcal vaccines have shown the rate of meningitis in CFS to be very low at <1%, (Selz, 2009; Kimia, 2010) (low evidence level) and similar to the rate for simple febrile seizures. Since the data from retrospective studies suggest that the incidence of acute bacterial meningitis in children presenting with complex febrile seizures is low, routine lumbar puncture is likely unnecessary. The need for a lumbar puncture should be based on clinical suspicion and signs and symptoms suggestive of meningitis or encephalitis with a lower threshold to perform lumbar puncture if the patient has any other risk factors for meningitis. Factors such as patient age, details of presentation, immunization status, and pretreatment with antibiotics are especially important in these cases. (Emergency Department Management of Seizures in Pediatric Patients. Santillanes, Luc. EB Medicine March 2015; Vol 12: 1-27)

Imaging

Emergent/urgent neuroimaging is not recommended for well-appearing children because the likelihood of discovering a lesion that would change treatment emergently is very low. (AAP, 2011, Boyl, 2011, Millchap, 2008, Hesdorfer, 2008) (medium evidence level). However, high-resolution brain MRI should be considered in children with abnormally large heads, focal and prolonged febrile seizures, or signs and symptoms of increased intracranial pressure due to the possible association between prolonged febrile seizures and mesial temporal sclerosis. (Practice parameter: long-term treatment of the child with simple febrile seizures. American Academy of Pediatrics. Committee on Quality Improvement, Subcommittee on Febrile Seizures. Pediatrics 1999; 103:1307.Teng D, Dayan P, Tyler S, et al. Risk of intracranial pathologic conditions requiring emergency intervention after a first complex febrile seizure episode among children. Pediatrics 2006; 117:304. Sadleir LG, Scheffer IE. Febrile seizures. BMJ 2007; 334:307.) (medium evidence level)

These studies and others suggest that routine neuroimaging is not necessarily indicated in otherwise *healthy, neurologically normal, and well-appearing children who present with prolonged or multiple* febrile seizures. However, there are no clinical guidelines and only limited evidence on this topic. Consider emergent/urgent CT or Fast MRI for children with new prolonged focal seizures, focal neurological deficits, patients who are obtunded, first complex febrile seizure AND one of the following: concern for increased intracranial pressure, concern for localized intracranial infection, concern for intracranial mass, or trauma (Local expert opinion, our neurologists) (low evidence level) (Emergency Department Management of Seizures in Pediatric Patients. Santillanes, Luc. EB Medicine March 2015; Vol 12: 1-27)

Electroencephalography (EEG)

EEGs are not typically indicated following a first episode single simple or complex febrile seizure. (low quality evidence) (AAP, 2011). An abnormal EEG following a single simple or complex febrile seizure is unlikely to change management (low evidence level) (Maytal, 2000; Joshi, 2005). Performing EEG within 24 hours of presentation can show generalized background slowing which could make identifying possible epileptiform abnormalities difficult. Generalized slowing on EEG can be present up to 7 days after a child presents with febrile status epilepticus. If interictal epileptiform abnormalities are present on routine sleep-deprived EEG, the patient has a higher risk for developing seizures without fever or epilepsy with the febrile illness lowering the seizure threshold. This situation would result in closer outpatient observation for these patients. (Patel, 2013) (low evidence level)

There is no convincing evidence for an emergent EEG in an otherwise healthy appearing child presenting with a complex febrile seizure. A prolonged seizure, or one that has focal features (unilateral or affecting one body part such as an arm, leg, head or lips) may warrant an EEG since the risk of future epilepsy after status epilepticus suggests this may be a useful timeframe for prognostic purpose. Therefore, it is strongly recommended to get a routine EEG on patients with a complex febrile seizure who have a focal seizure, a new prolonged seizure or prolonged neurological deficits and patients who are encephalopathic. The optimal timing of EEG is not well defined, but a study utilizing recordings was performed within 72 hours of febrile seizure. (Local expert opinion, our neurologists) (low evidence level) Nordli DR Jr, Moshé SL, Shinnar

S, et al. Acute EEG findings in children with febrile status epilepticus: results of the FEBSTAT study. Neurology 2012; 79:2180.

Treatment

Patients who are febrile on presentation should receive antipyretics. For patients who are actively seizing, rescue medications should be given. If the patient has IV access, they should be treated with IV lorazepam 0.1 mg/kg q ten min for seizure activity >5 minutes or clusters, with a maximum dose of 4mg. Other options for rescue medications include rectal Diazepam (Diastat Rectal Gel, Acudial): 0.5 mg/kg PR PRN for seizure activity >5 minutes with a max dose of 20 mg. Doses should be rounded to the nearest 2.5mg. Safety and efficacy of this medication have not been studied in patients under two years of age. Consult neurology for further recommendations for loading anti-seizure medications. Home intermittent anti-epileptic medications can be considered if the patient is having frequent febrile seizures (more than three in six months or four in one year) or a history of prolonged febrile seizures lasting greater than 15 minutes. Consider 0.5mg – 1mg rectal or oral valium at the onset of fever and an additional dose if the patient continues to have fever after eight hours (low evidence level).

Disposition

Criteria for Inpatient Admission:

-Unstable clinical status and/or clinical infection: not returning to baseline, very somnolent following doses of anti-seizure medications (low evidence level)
-Presenting with an underlying infection requiring inpatient stay (e.g. severe pneumonia, infection requiring intravenous antibiotics)
-Disabling parental anxiety**:** admit for further parental education and reassurance. [Expert opinion] Fetveit, 2008) (low evidence level)
-Uncertain home situation and/or inadequate follow up: may require social work consultation. (Fetveit, 2008) (low evidence level)

Discharge Criteria (ED and inpatient):

-Patient appears non-toxic and returns to neurological baseline
-Parental anxiety addressed
-Parental education provided
-Safe transport home arranged
-Appropriate outpatient follow-up with PCP is identified

If presenting with a complex febrile seizure, observe ≥ 2 hours after seizure.

Children diagnosed with complex febrile seizures, epilepsy, or status epilepticus should follow up with a Neurologist within 14 days.

Summary of Recommendations for Diagnostic Studies for Complex Febrile Seizures

Lumbar Puncture:

Lumbar puncture should be performed if there are signs and symptoms of meningitis or encephalitis. Maintain a lower threshold for lumbar puncture in children pretreated with antibiotics or with incomplete vaccination history.

Other testing for serious bacterial illness:

- CBC, blood culture if indicated by history and physical examination
- Urinalysis, urine culture, and/or viral PCR may be helpful in determining the cause of fever
- CXR should be ordered based on signs and symptoms of lower respiratory tract infection

Neuroimaging:

Consider neuroimaging for focal or prolonged complex febrile seizures or persistent altered mental status and perform for signs and symptoms of brain abscess, increased intracranial pressure, or hemorrhage.

Electroencephalography:

Not recommended.

Please place in patient room on or near white board and instruct parent/patient on its use during hospitalization

Pathway To Home-Febrile Seizures

Anticipated Discharge Date:_____

Steps that need to be completed by your nurse and respiratory therapist before your child is ready to be discharged (go home)

- ☐ Complete Febrile seizure and fever management education (/ /time:)
- ☐ Rescue medications for seizures explained and medications delivered to room or sent to patient's pharmacy (/ /time:)
- ☐ Patient is back to neurological baseline, non-toxic, afebrile, tolerating po

Steps that need to be completed by your hospital doctor before your child is ready to be discharged (go home)

- ☐ Dr. _____ has seen your child and on the day of discharge reviewed the home plan of care & what problems to call your child's clinic doctor for (/ /)

Things you and your family can do to help us get you home sooner

- ☐ Obtain prescriptions and ask about: All Children's Concierge Prescription. Have rescue medications in hand, if possible. Delivery Service (/ /)
- ☐ Schedule follow-up with your regular home doctor and neurologist, if recommended
- ☐ Review & understand Home seizure instructions
- ☐ Teach back what to do in case of seizure (/ /)
- ☐ Tell us how you are getting home: _____ Do you need us to help you: Yes/No

*(/ /) indicates a date and time be included in this step

Pt Sticker:

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Outcome Measures:

Rationale for guideline:

- Safety: fewer unnecessary tests.
- Costs: reduced LOS and standardization of care.
- Delivery of care: expedite and improve patient flow, especially in ED.
- Quality of care: standardized patient education, clinical evaluations and treatment.

Clinical Pathway Team

Febrile Seizures Clinical Pathway

Johns Hopkins All Children's Hospital

Owner(s): Leslie Carroll, MD; Lisa Odendal, MD

Also Reviewed by:

Neurologist: Dr. Casadonte
Hospitalist: Leslie Carroll, MD
Emergency Center: Lisa Odendal, MD

Clinical Pathway Management Team: Joseph Perno, MD; Courtney Titus, PA-C

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