



## Practice Parameters for Managing Children with Febrile Convulsion

Author

**Dr Anwar T Elgasseir**

Department of Paediatric, Misurata Teaching Hospital, Faculty of Medicine, Misurata University  
Misurata, Libya, Tel: 0925443430.  
Email: [Gasseir@yahoo.com](mailto:Gasseir@yahoo.com)

### Abstract

**Objectives:** *This study intended to determine and evaluate the care of children with Febrile Convulsion seen at Misurata Teaching Hospital, using some of the measures regarding the appropriate documentation of hospital records, adverse outcome, inappropriate investigations and the unnecessary treatment.*

**Patients and Methods:** *Descriptive study (Longitudinal hospital based study) in paediatric department Misurata Teaching Hospital where hospital records of patients admitted for febrile convulsion, from January 2012-December 2012 were prospectively reviewed. All hospital admissions, of children presented with febrile convulsion aged 6 months to 5 years are included in the study. We define basic standards practice parameters in management of children of febrile convulsion to which our clinical practice can be compared and we evaluate our care using these standards.*

**Results:** *91 patients were admitted for febrile convulsion during January 2012-December 2012 (7.7 % from the total hospital admission). 71 (78%) had simple febrile convulsion (Complex febrile convulsion 22% and 3.2% with Status febrile convulsion) and 23 patients (25.3%) had family history of febrile convulsion in first-degree relatives. Accurate description of seizure was observed in 72%, while only 63% of records had complete information about the presence/absence of signs of meningitis. Routine blood investigations, complete blood count, blood glucose, electrolytes, and urea were completed for over 90% of cases. We have just one patient in the study group require computed tomography scan but no child with simple febrile convulsion required neuro-imaging studies. 74 patients (81%) were given regular antipyretics every 4 to 6 hours, regardless of body temperature. 9 patients (10%) of children received antibiotics for their underlying febrile illness.*

**Conclusion:** *This study shows clear gap between our hospital practice parameters and the recommended basic standards Practice parameters in terms of appropriate information in hospital records, and concerning the use of unnecessary investigations and treatment which remain common in our practice.*

**Keywords:** *Febrile Convulsion; Hospital Practice Parameters; Hospital Records; Clinical Practice; Basic Standards.*

## Febrile convulsion

### Introduction

A febrile convulsion (FC) is a seizure occurring in a child aged 6 months to 5 years, associated with fever arising from infection or inflammation outside the central nervous system in a child who is otherwise neurologically normal <sup>[1]</sup>.

The temperature associated with the febrile illness usually greater than 38°C, although the temperature may not be evident until after the seizure. The consensus was that fever should be assumed to be present if the 'history and examination were indicative' <sup>[2]</sup>. Viral illnesses are the predominant cause of febrile illness that causes seizures. Prior epidemiological studies have used either one month <sup>[3-9]</sup> or 3 months <sup>[10,11]</sup> as the youngest age of occurrence, while no specific upper age limit was employed. The mean age of onset of FC is 17-23 months and they rarely occur before the age of 9 months or after the age of 5 years <sup>[12]</sup>.

Population studies in Western Europe and the USA report a cumulative incidence of 2-5% <sup>[13,14]</sup> but the incidence worldwide varies from 5-10% in India, 8.8% in Japan and 14% in Guam <sup>[15]</sup>. FC are divided into 2 types, simple FC (which are generalized and last <15 min) and complex FC. Among those who would develop FC, up to 20 - 35% of them would have complex FC <sup>[16,17]</sup>. A complex FC is defined as a febrile seizure having one or more of the following: 15 minutes or more in duration, more than one seizure in 24 hours or focal features <sup>[18]</sup>. Complex FC may indicate a more serious disease process, such as meningitis,

abscess, or encephalitis and had been shown to be related to subsequent epilepsy <sup>[19]</sup>.

Ideal Practice parameters for managing children with FC not fully established in our hospital. Concerning this aspect the present study was aimed to evaluate the care of children with FC seen at Misurata Teaching Hospital (MTH) using some measures suggested in the literature.

### Patients and Methods

Design: Descriptive study (Longitudinal hospital based study) in Paediatric Department Misurata Teaching Hospital where hospital records of patients admitted for FC, from January 2012-December 2012 were prospectively reviewed.

**Study Sample:** All hospital admissions, of children presented with FC aged 6 months to 5 years are included in the study. Prospectively collected data on admitted cases include; Demographic data, history ( including characters of convulsion and family history of FC and epilepsy in first-degree relatives), clinical examination, investigations performed, treatment and subsequent outcome were collected on a data collecting form from the hospital records.

We define basic standards practice parameters in management of children of FC to which our clinical practice can be compared. We evaluate our care using these standards. These standards (Appendix) which considered being important to be used is identified as elements of good practice in the management of children with FC.

**The practice parameters which employed as standards of practice are:**

- *Practice parameters of the American Academy of Pediatrics (AAP).*
- Measures suggested by the *Joint Working Group of the Research Unit of the Royal College of Physicians and the British Paediatric Association.*
- The Guidelines Commission by *Italian league against epilepsy: Recommendations for the management of ‘febrile seizures’* [20-24].

#### **Participants - inclusion criteria:**

Eligible children are presented with history of convulsion occurring in a child, aged 6 months to 5 years, associated with fever ( $>38^{\circ}\text{C}$ ) but without evidence of intracranial infection, electrolyte imbalance or metabolic dysfunction, who is otherwise neurologically normal.

#### **Participants - exclusion criteria:**

Convulsions with fever in children with pre-existing neurological deficits or developmental delay or previous afebrile convulsion were excluded.

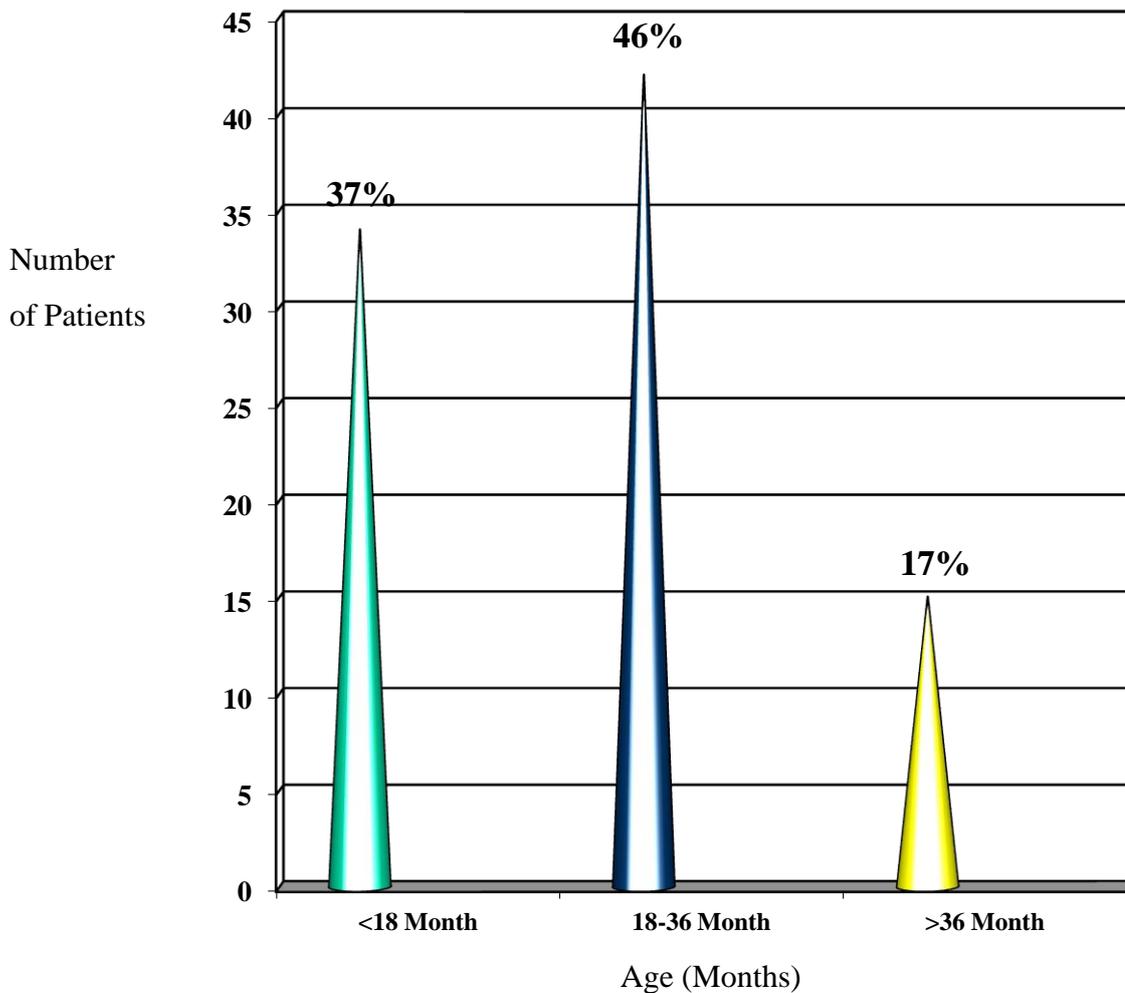
In our study the following *definitions were adapted:*

- FC is a seizure occurring in a child aged 6 months to 5 years, associated with fever arising from infection or inflammation outside the central nervous system in a child who is otherwise neurologically normal [1].

- Simple FC is defined as generalised convulsion lasting less than 15 minutes and not recurring within 24 hours occurring during a febrile episode [24].
- Complex FC is defined as focal or prolonged convulsion ( $>15$  minutes), or more than one convulsion in 24 hours [24]. If the patient did not regain consciousness in between clinical seizures, he is considered to have a single seizure
- Fever any increase of the body's external temperature over  $38^{\circ}\text{C}$  [24].

#### **Results**

Ninety one patients were admitted with FC during January 2012-December 2012 (7.7 % from the total hospital admission) with the mean age of seizure onset is 23.6 month. Seventy one patients (78%) had simple FC (Complex FC 22% and 3.2% with Status FC) and 23 patients (25.3%) had family history of FC in first-degree relatives. Recurrent FC was seen in 13 patients (14%), where 6 (46%) of these patients had family history of FC. Family history of epilepsy was reported in 11patient (12%). Distribution of age of seizure onset is described in Figure 1.



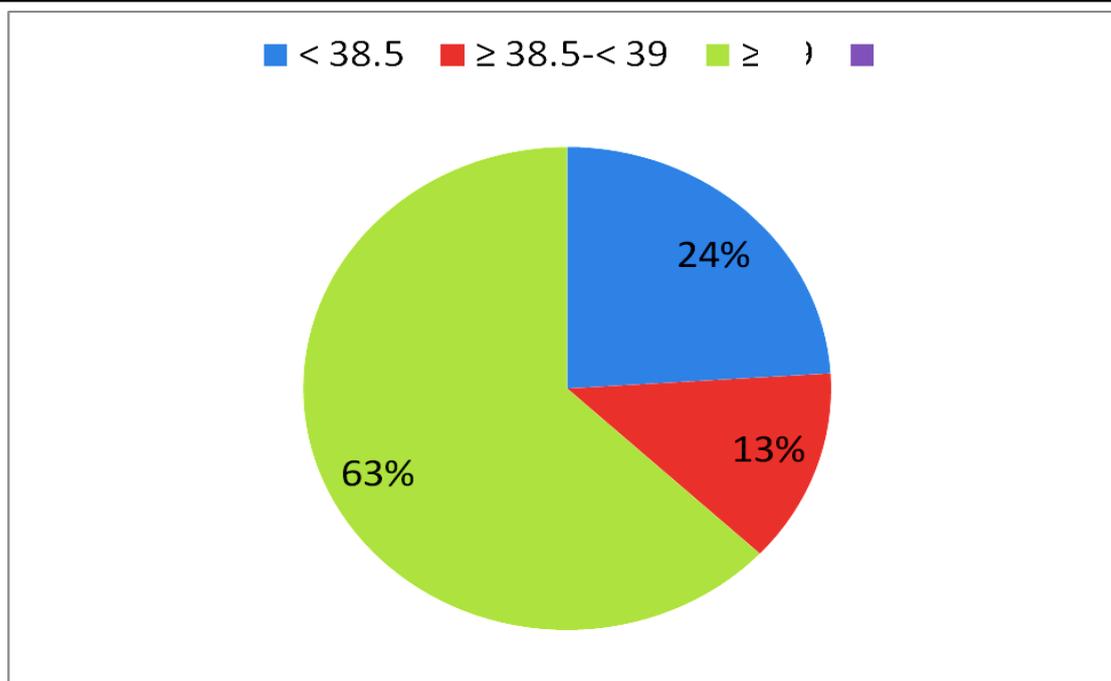
**Figure1:** Age of Febrile convulsion

In this figure we see 34 patients (37.3%) had seizure onset below 18 month and 57 patients are older than 18 month . 42 patients (46.2%) in the group of 18-36 months and just 15 patients

(16.5%) are above 36 month. 70 patients (77%) duration of hospital admission is  $\leq 24$  hours (Table1).

**Table1:** Duration of Hospital Admission in Children with Febrile convulsion

Duration of Admission (Hours)	No.	%
$\leq 24$ hr	70	77
$>24-\leq 48$ hr	16	17.5
$>48$ hr	5	5.5



**Figure 2:** Fever at Presentation

At presentation 57 patients (63%) had temperature  $\geq 39^{\circ}\text{C}$  (Figure 2) and 7 patients (54%) of Recurrent FC had temperature  $< 38.5^{\circ}\text{C}$

The FC was common in male than female (59% was male) with M:F ratio 3:2. The commonest cause of fever was upper respiratory tract

infection (85%). Other identified causes of fever e.g. acute gastroenteritis, Pneumonia, otitis media and urinary tract infection.

The summary of hospital file records and case notes are described in Table 2 (A&B).

**Table 2:** Contents of the cases records & notes regarding:

A. History and Examination and

B. Investigation and treatment

History and Examination	(%)
Accurate description of the convulsion	72
Age at first seizure	54
A record about the family history with regard to febrile and afebrile seizures	90
Whether signs of meningitis were present or absent	63
Complete child's developmental state	32
Documentation about what information the parents were told at admission and before discharge.	0
Temperature at presentation	100

B. Investigation and treatment	(%)
EEG	2
CT brain scan	1
MRI brain	0
Urea and electrolyte estimation	100
Serum calcium	45
Blood sugar	100
CBC	95
Blood culture	2
Lumbar puncture	33
Regular antipyretics regardless of body temperature	81
Benzodiazepines used	15
Use of Antibiotics	10
Delay of diagnosis and treatment of meningitis or encephalitis	0

Accurate description of seizure was observed in 72%, while only 63% of records had complete information about the presence/absence of signs of meningitis. All case records contained body temperature on admission, but only 32% of the case notes had complete child's developmental state and no documentation about what information the parents were told at admission and before discharge. There were no occurrences of delayed diagnosis of meningitis / encephalitis / encephalopathy.

Regarding investigations (routine blood investigations), complete blood count (CBC), blood glucose, electrolytes, and urea, were completed for over 90% of cases (Table 2). 2 of patients (2.2%) with FC had Electroencephalograms (EEG), 1 had computed tomography scan (CT scan) (1.1%), none had Magnetic resonance imaging (MRI), 30 patients (33%) with FC had lumbar puncture (LP) and just 2 of them had blood culture for their underlying febrile illness. 74 patients (81%) were given regular antipyretics every 4 to 6 hours, regardless of body temperature. 9 patients (10%) of children received

antibiotics for their underlying febrile illness, but no patients diagnosed as URTI received antibiotics. Benzodiazepine was given to 14 (15%) of children to stop the convulsion, while three children required additional phenobarbitone and phenytoin. No documentation in the case notes about what the parents were told at admission and before discharge.

### Discussion

Febrile seizures are the most common form of childhood seizures. Most febrile seizures are simple. In a study of 428 children with febrile seizure at least one complex feature was noted in 35% of children and five percent of the total group experienced a seizure lasting more than 30 minutes (i.e., febrile status epilepticus) [25]. Our study report less complex FC convulsion (22%) but 3.2% develops febrile status epilepticus.

Overall, approximately one-third of children with a first febrile seizure will experience a recurrence; 10% will have three or more febrile seizures [26,27]. In our patients recurrent FC was seen 14% and just 5% have three or more attacks. The most

consistent risk factors reported in our study with patients with recurrent FC is positive family history of febrile seizures which seen also in other studies [20,28]. 6 patients from our study group who had recurrent FC (46% from this group) also had family history of FC. Two other definite risk factors for recurrence of febrile seizures are peak temperature and the duration of the fever prior to the seizure [29]. In general the higher the temperature the lower the chance of recurrence. In one study, those with peak temperatures of 38.3°C had a 42% recurrence risk at one year, compared with 29% for those with peak temperature of 39.4°C and only 12% for those with a peak temperature  $\geq 40.6^\circ\text{C}$  [30]. 54% of our patients with recurrent FC show temperature  $<38.5^\circ\text{C}$  at presentation.

A comprehensive review of the literature identified the conditions usually associated with FC [2]. In decreasing order of frequency they are: Viral infections, Otitis media, Tonsillitis, Urinary tract infection, Acute Gastroenteritis, Lower respiratory tract infection, Meningitis, and Post-immunization. The commonest cause of fever in our patients with FC is upper respiratory tract infection (85%).

Smith, (1994) show that 90% of FC occur between 6 months and 3 years, and 6% after 3 years of age [31]. In our study 83% of patients are between 6 months and 3 year (37%  $<18$  months, and 46% between 18-36 months) and just 17% older than 3 year of age (Figure 1).

The initial evaluation is essential in any child presented with FC (Meningitis, encephalitis, serious electrolyte imbalance, and other acute

neurological illnesses must be excluded) in order to make the diagnosis of a febrile seizure. A detailed history and physical and neurological examinations are essential and can eliminate many of those neurological conditions. In our hospital records poor documentation is clear in certain area in the history and examination, for example just 32% of the case notes had complete child's developmental state, no documentation about what information the parents were told at admission and before discharge and only 63% of records had complete information about the presence/absence of signs of meningitis. I suggest we can improve patient management by better documentation in admitting files and case notes.

Routine serum electrolytes, calcium, phosphorus, magnesium, complete blood count (CBC), and blood glucose are of limited value in the evaluation of a child with a simple FC in the absence of a suspicious history (e.g., vomiting, diarrhea) or physical findings as mentioned in American Academy of Pediatrics (Committee on Quality Improvement) and other studies [2,20,32].

In our hospital routine blood investigations, CBC, blood glucose, electrolytes, and urea (Table 2) were completed for over 90% of cases which seems of no benefit in the evaluation of patients with simple FC.

Trainor et al, 2001 show that only 9% of patients had bacterial infection in 455 children admitted to hospital with a diagnosis of febrile FC where 135 Cerebrospinal fluid (CSF) cultures were done no child had positive culture [33]. Our study show similar results where no one of our patients had abnormalities in CSF examination.

A main concern when assessing children who have had a FC is to detect and manage bacterial meningitis. Bacterial meningitis can be effectively treated, and the consequences of delayed treatment can be devastating. The risk of bacterial meningitis is low in children with FC [2, 33]. In general, few number of children in our hospital, a firm diagnosis of bacterial meningitis is frequently not possible, either because of a traumatic LP or because the CSF culture and microscopy result was not definitive.

A LP should be strongly considered in infants less than 12 months of age [20,22]. Children between 12 and 18 months of age need careful assessment, because the signs of meningitis may be subtle. In the absence of suspicious findings on history or examination, a LP is not necessary in children above 18 months of age. A recent practice parameter of the American Academy of Neurology also recommends that a LP should be done in children with status epilepticus and fever [34].

The neurodiagnostic [CT& MRI scans] evaluation of a child with a simple FC between 6 months and 5 years of age are of limited benefit in this clinical setting and are used when there is concern about increased intracranial pressure [20]. We have just one patient in the study group require CT scan (child with status FC) but no child with simple FC required neuroimaging studies.

Electroencephalograms (EEG) are of limited value in the evaluation of the child with febrile seizures [20, 35]. Although preliminary data from one study suggest a high rate of significant EEG

abnormalities in children with very prolonged FC [36]. Two patients require EEG in our hospital and both of them had recurrent FC.

The most recent approach in treatment of FC is based on the epidemiological data that FC is benign; the only concern focuses on aborting febrile seizures to prevent status epilepticus [24]. Intravenous diazepam (ID) and antipyretics is the most effective treatment required in simple FC cases. About 15% and 81% of FC patients admitted to our department receive ID and antipyretics respectively. Despite the logical assumption that aggressive treatment with antipyretic medication would reduce the risk of having a FC, and the finding of case control studies that the risk of a FC is directly related to the height of the fever [37], there is little evidence to suggest that antipyretics reduce the risk of a recurrent FC [38]. A Finnish study randomised 180 children with a first FC to receive acetaminophen or placebo to test this hypothesis. The recurrence rate was identical for both groups [39]. Another randomised placebo-controlled trial conducted in the Netherlands demonstrated that the 2-year FC recurrence rate was similar in children who received placebo or ibuprofen [40]. The common practice at our hospital of scheduled intermittent antipyretic use, irrespective of body temperature, appears unjustified (Table 2). However, antipyretics are useful in decreasing patients' discomfort and can be considered on an individual basis.

The American Academy of Pediatrics 2008 practice parameter recommends no treatment required particularly to those with simple FC [23].

In many cases, just reassurance and education about the benign nature of the condition are all that is needed. In our hospital records (files and case notes) no documentation confirms what information the parents were told at admission and before discharge. Counseling and education will be the sole treatment for the majority of children with FC. If we focus on reassurance to the parents and provide appropriate counseling will probably avoiding unnecessary diagnostic and therapeutic interventions.

### **Limitations and constraints of the study**

Our data are collected from the hospital records where the information of the clinical history and physical examination is sometimes incomplete which probably affect our research results. In addition lacking of certain investigation e.g. neuroimaging is limited and MRI capacity is even more limited, can magnify the problem. On the other hand cultural beliefs influence individuals' health-seeking strategies. For example parent may refuse admission because they believe it may lead to degree of stigmatization of children with convulsion especially girls. These factors outlined above with presence of inadequate health system, poor economic situation, and political issues lead to more constrains affecting our hospital research and our practical parameters guidelines in children with febrile convulsion.

### **Conclusion and Recommendations**

This study shows clear gap between our hospital practice parameters and the recommended basic standards Practice parameters in terms of

appropriate information in hospital records, and concerning the use of unnecessary investigations which remain common. FC is a major cause of admissions in our hospital, and a large savings to the healthcare system are possible if it can be evaluated probably.

No currently available treatment that has been shown to be safe, effective and will change the outcome of FC. The need for antipyretics and an overnight stay is questioned for this benign condition, so the best treatment for simple FC is reassurance of the parents in addition to a handout information to focuses on parent education regarding home management of FC, the procedures to control fever and dosing of antipyretics and when the child should be taken to the emergency department is essential in our hospital.

In my opinion, the ongoing need to disseminate accurate recommended guidelines to different health care level regarding assessing and accurately treating cases of FC, at the national level are required in our community.

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## APPENDIX

Suggested measures for hospital practice parameters which identified as elements of good practice in the management of children with FC:

### I. Information given to parents should include:

- An explanation of the nature of febrile convulsions, including information about the prevalence and prognosis
- Instructions about the management of fever, the management of a convulsion, and the use of rectal diazepam
- Reassurance.
- This advice should be given verbally, and a supplemental leaflet may also be helpful.

### II. Hospital Records of the Individual Case

#### Do the case notes contain:

- An accurate description of the convulsion, including its duration?
- Information about the nature of the episode?
- A record about the family history with regard to febrile and non-febrile seizures?
- The age at first seizure?
- The temperature on admission?
- Whether signs of meningitis were present or absent?
- An assessment of the cause of the fever?
- The child's neuro-developmental state when recovered (estimated as far as practical)?
- The blood glucose concentration, if the child was seen during a convulsion?
- An estimate of the likely prognosis?

- What the parents were told at admission and before discharge?
- Discharge summary-Does the discharge summary contain information on the above points?

### **III. Adverse outcomes**

- Have there been cases of meningitis diagnosed after an inappropriate delay?
- Has there been undue delay in the child receiving treatment for a prolonged convulsion?

### **IV. Inappropriate investigation and treatment**

Have the following been performed on or given to more than a small minority of patients:

- Neurodiagnostic-imaging (CT& MRI)
- Electroencephalography?
- CBC
- Lumbar puncture.
- Blood urea and serum electrolyte estimations?
- Serum calcium estimation?
- Maintenance anticonvulsant treatment?