

Management of children presenting with suspected febrile seizures to the emergency department: analysis of practices at a national acute hospital

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Background: This audit aimed to assess adherence to best practices in the management of febrile seizures in children at Mater Dei Hospital's Paediatric Emergency Department, Malta's national acute teaching hospital.

Methods: A retrospective review of 54 patient charts diagnosed with febrile seizures in the Paediatric Emergency Department over a 3-month period was conducted. Data collected included demographics, seizure details, medical history, family history, physical examination findings, investigations performed, discharge education provided, and follow-up practices.

Results: A review of seizure documentation revealed inconsistencies in data capture. While core demographic information and seizure descriptions were consistently recorded, crucial details necessary for accurate seizure classification were discrepant. These discrepancies included information pertaining to past medical and family history, as well as thorough documentation of potential seizure risk factors. Physical examinations often demonstrated an incomplete picture, lacking a comprehensive neurological assessment. Furthermore, utilization of diagnostic investigations exceeded recommended international protocols for uncomplicated cases. Additionally, significant variability was observed in both discharge education practices and follow-up appointment scheduling. Inconsistencies in medical record terminology, potentially stemming from non-standardized clerking, may have contributed to underreporting of certain seizure details.

Conclusion: These findings suggest a need for improvement in managing febrile seizures in the Paediatric Emergency Department. Implementing standardized documentation based on the National Institute for Health and Care Excellence's Clinical Knowledge Summaries guidelines and developing a comprehensive febrile seizure information leaflet for parents are recommended. This would promote consistent, high-quality care, reduce parental anxiety, and enhance adherence to best practices for febrile seizure management.

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Febrile seizures represent a significant encounter within the Paediatric Emergency Department (PED) and are the most common form of convulsions seen in children, accounting for a substantial proportion of visits. 3-5% of children experience a febrile seizure in the first 5 years of life, with peak onset at 2 years of age.¹ Despite their frequent occurrence, febrile seizures can be a source of considerable anxiety for parents and caregivers witnessing their child experience a convulsive episode. Whilst most presentations are simple and self-limiting², a crucial aspect of emergency care lies in differentiating them from more concerning central nervous system infections that may manifest with similar clinical features. This distinction necessitates a meticulous approach, emphasizing a comprehensive history, a thorough physical examination, and the judicious use of ancillary investigations. By focusing on these core principles, physicians in the PED can ensure optimal patient outcomes, providing reassurance to families and initiating appropriate management strategies.

The National Institute for Health and Care Excellence (NICE) Clinical Knowledge Summaries (CKS) offer invaluable guidance in standardizing the approach to febrile seizures within the Emergency Department. By adhering to the CKS recommendations, healthcare professionals can ensure a consistent and evidence-based evaluation process. This includes employing a structured history-taking template to capture crucial details regarding the seizure characteristics, fever duration, and past medical, developmental, and family history. The CKS framework also promotes a targeted physical examination, focusing on neurological assessment to identify potential focal deficits or meningeal signs. Furthermore, the CKS guides the judicious use of investigations, advocating for selective laboratory testing and neuroimaging only when clinical suspicion of a more serious etiology warrants further workup. This standardized approach, informed by the NICE CKS, fosters efficient and effective management of febrile seizure cases in the PED.³

MATERIALS AND METHODS

Following the acquisition of data clearance approval from the institutional Data Protection Office, a

prospective observational audit design was utilised. This involved the extraction of data from clerking sheets utilized within the Paediatric Emergency Department for the period commencing on March 1st, 2023 and concluding on May 31st, 2023. All children under the age of 16 presenting with a suspected seizure in the context of fever as the primary complaint were included in the data collection.

Clerking sheets were then individually assessed for adequate documentation of child demographics, seizure characteristics, characteristics of the febrile illness, presence or absence of red flags, possible differentials, past medical and family history. The subsequent examination and disposition were also audited. Cases seen by the authors of this audit were excluded from data collection.

RESULTS

A total of 54 children were included in this audit, with ages ranging from 8 months up to 8 years of age. The mean age of presentation was 2.32 years, and the most common age of presentation was 2 years of age. 68.5% of the cases were male, with 31.5% female. Child demographics were documented in 100% of the cases reviewed. From the patients reviewed 79.63% were admitted and 20.37% discharged. Advice on discharge was also audited and seizure advice, antipyretic advice and immunisation advice were given in 45.45%, 72.73% and 0% respectively. Resources were offered in 36.36% and follow up given in 36.6%. From the patients discharged, 36.36% were given follow-up. 50% of these were referred for a Paediatric Neurology follow-up appointment, 25% for a Paediatric Emergency Review Clinic appointment and 25% arranged follow-up with their respective private paediatrician.

Results of documentation analysis of the history and examination are illustrated in the accompanying [Table 1](#), [Table 2](#) and [Table 3](#).

DISCUSSION

A febrile seizure is defined by the International League Against Epilepsy (ILAE) as "A seizure associated with a febrile illness not caused by an infection of the central nervous system, without previous neonatal seizures or a previous unprovoked

Table 1 *Percentage of complete documentation of seizure characteristics in children*

Feature	Percentage
Isolated / clustered	27.78
Generalised / focal	16.67
Tonic-clonic	85.19
Facial twitching	11.11
Rolling back of eyes	64.81
Staring	53.70
Loss of consciousness	70.37
Foaming at the mouth	59.26
Seizure duration	88.89
Pallor / cyanosis / difficulty breathing	55.56
Post-ictal drowsiness / irritability/ confusion	62.96
Duration of post-ictal drowsiness	25.93
Complete recovery within 1 hr	27.78
Recurrence within 24 hours / same illness	18.52
Simple/complex	7.41
Decreased level of consciousness prior to seizure	29.63

Table 2 *Percentage of complete documentation of red flag signs and symptoms elicited from the history in children presenting with febrile seizures*

Feature	Percentage
Irritability	50.00
Neck stiffness	1.85
Petechial rash	31.48
Photophobia	3.70
Bulging fontanelle	0.00
Decreased level of consciousness	31.48
Prolonged post-ictal period	16.67
Focal neurological deficit lasting >1 hr	7.41

Table 3 *Percentage of complete documentation of examination findings and further assessment in children presenting with febrile seizures*

Feature	Percentage
GCS score / AVPU assessment	68.52
Power	0.00
Documentation of temperature	94.44
Signs of dehydration	96.30
Assessment for cause of fever	96.30
Stigmata of neurocutaneous disorder	0.00
Documentation of all red flag signs on examination	5.56
Irritability	53.70
Neck stiffness	64.81
Petechial rash	87.04
Photophobia	11.11
Bulging fontanelle	1.85
Decreased level of consciousness	87.04
Focal neurological deficit	57.41
Blood investigations taken	75.93

seizure and not meeting the criteria for other acute symptomatic seizure, which occurs in children aged 6 months to 6 years".⁴ Despite variations in literature of the reported age range of children experiencing febrile seizures, the ILAE definition was utilized for the purpose of this study.^{2,4-6}

The majority (80%) of febrile seizures present as 'simple'; characterized by generalized involvement and brevity (<15 minutes) or singular occurrence within a 24-hour period. These simple febrile seizures carry a low risk of complications and boast both excellent short and long-term prognoses. Conversely, seizures exhibiting focal features, exceeding 15 minutes in duration, or recurring within a 24-hour timeframe are classified as complex, potentially necessitating further evaluation.¹ Despite most episodes being self-limiting; febrile seizures are often a source of significant parental distress and represent one of the leading causes for paediatric emergency department presentations.^{5,6}

This audit reveals an increase in the number of febrile seizure cases presenting at the local Paediatric Emergency Department. The data shows 54 patients presented between March 1st, 2023, and May 31st, 2023. This compares to a previous study at the same department involving 51 patients presenting with febrile seizures between January 2013 and June 2013.⁶ The demographic data shows a preponderance of male patients with the average age of presentation being 2 years of age. This compares well to other similar studies showing a median age of onset between 19 to 23 months of age, with two-thirds of the patients being male.⁷ These demographics were documented in 100% of cases reviewed with name, identification number, age and gender all appropriately recorded.

The National Institute for Health and Care Excellence's (NICE) Clinical Knowledge Summaries (CKS) provide an evidence-based framework for the management of febrile seizures.³ Adherence to these recommendations serves as a vital tool for standardizing care and ensuring patients receive appropriate management. The following sections will evaluate the documentation of these key elements within the study population, divided into the framework recommendations.

Seizure characteristics

Accurate identification of seizure characteristics and the underlying symptoms of the febrile illness is crucial for appropriate management and determining the necessity for follow-up care. A comprehensive history and subsequent physical examination are essential to achieve this. During the examination, relevant positive and negative findings should be meticulously documented to ensure proper management and consistent care delivery. Seizure characteristics such as the presence of tonic-clonic movements, eye rolling, staring, loss of consciousness, pallor or cyanosis, foaming at the mouth, duration of seizure and presence of post-ictal drowsiness were documented in more than 50% of cases. Conversely, poor documentation was noted in reference to whether the seizures were isolated or clustered, generalised or focal, simple or complex, the presence of facial twitching, recurrence of seizures within 24 hours or within the same illness, decreased level of consciousness prior to the seizure, duration of post-

ictal drowsiness, and whether there was complete recovery within 1 hour. The above characteristics are all essential questions as recommended by NICE as they guide further management, with certain characteristics important in helping the classification of seizures into 'simple' or 'complex'.³ The terminology used in the NICE CKS was applied for this audit, however it should be noted that use of different jargon for seizure characteristics was used in some of the clerking sheets which did not fit into the terminology as explained by NICE, this led to possible underrepresentation of data to ensure a standardized approach in this data collection. This limitation could also be applied to other aspects of data collection in this audit, however using specific terms remains crucial for our history-taking practices and should be prioritized whenever possible. Based on the data analysis, it's worth noting that some details like 'seizure recurrence within 24 hours or same illness', 'post-ictal drowsiness duration', and 'presence of a full recovery within an hour' may be missing due to the rapid arrival at the emergency department. This is evident as over 50% of cases were brought by ambulance upon immediate symptom onset.

Fever characteristics

A defining feature of these seizures is the presence of a fever and its specific characteristics. Documentation was satisfactory for many fever history hallmarks as recommended by NICE; such as fever onset, duration, source, peak temperature, and relationship to the seizure. According to the NICE CKS; "reported parental perception of fever should be accepted as a valid indicator of fever", and consistent with this, when no quantitative temperature reading was present, parental perception of fever was documented in 61.54% of these cases.³ Lacking in the clinical histories reviewed was documentation related to recent antibiotic use or recent immunizations. NICE emphasizes the significance of inquiring about recent antibiotic use. This is because antibiotics can mask signs of a central nervous system infection, thus potentially leading to a misdiagnosis and altered treatment plan.³

Red flags

Similarly, inaccurate identification of red flags suggestive of central nervous system infection can also lead to misdiagnosis.³ Red flags suggestive of

central nervous system infections, like meningitis and encephalitis, include physical signs such as irritability, neck stiffness, petechial rash, photophobia, and bulging fontanelles. Additionally, the NICE CKS highlights other crucial red flags: decreased level of consciousness before the seizure, a prolonged period of post-ictal drowsiness, and a focal neurological deficit lasting over an hour.³ Documentation of red flag signs in the history taking section was not comprehensive during the audit, conversely these were well documented in the examination section. Nevertheless, the history taking section offers a critical window for early detection of red flags and prompt intervention, so this area requires further development to achieve optimal standards.

Differential diagnoses

The NICE CKS guidelines identify other conditions that can mimic febrile seizures.³ While the reviewed clerking sheets showed insufficient consideration of these differential diagnoses, some factors may have contributed to this finding. Firstly, vague criteria for certain differentials, like shivering and rigors, pose challenges in documenting their absence. Secondly, differentials readily identifiable during emergency triage, such as head injury, might not be explicitly documented in the clerking sheets. Whilst the consideration of 'hypoglycemia' was only explicitly documented once in the history taking section, over 80% of cases involved investigations for low blood sugar, either through capillary blood glucose or serum glucose testing.

Past history

An essential criterion dictating management in patients presenting after a febrile seizure is the past medical history, specifically whether the episode is the first of its kind in the patient's history. As per local guidelines, patients presenting after their first febrile seizure are admitted to hospital for overnight observation, whilst readily available international guidelines from the U.K., Australia, and the U.S. recommend an observation period (ranging from 2 to 6 hours) with close follow-up within 24 hours cases of the first episode of simple febrile seizures.^{8,9,10} Despite this, documentation of history of past febrile seizures was documented in 40.74% and further attention is necessary to address this issue and improve standards. Poor documentation of neurodevelopmental history and presence/absence of a neurocutaneous syndrome was noted, which is crucial, given the association of

increased risk of developing unprovoked seizures in patients with such a history.¹¹

Poor documentation was also noted with reference to questions regarding family history, specifically absence of specific documentation of family history of febrile seizures or epilepsy in first-degree relative (18.52%). This is imperative as there is a known risk of febrile seizures and their recurrence when there is a history of febrile seizures in first-degree relatives.^{1,12,13} Epidemiological studies have shown that a family history of febrile seizures is present in 30% to 50% of affected children.^{12,13} The potential underrepresentation of data concerning personal and family history of febrile seizures warrants consideration. Due to the lack of standardized documentation practices in the reviewed sheets, it is unclear whether the absence of documented family history signifies that the question about first degree relatives with a history of febrile seizures was not asked explicitly, or if the question was posed more generally regarding family history of any kind. Similarly, documentation may not explicitly state whether the question of a first-time seizure was asked. However, the high number of admissions for first-time febrile seizures suggests that the question was likely raised but not clearly documented. Regardless, clearly documenting this information is paramount, not solely as a diagnosis, but as a critical component of the patient's past medical history.

Examination

A comprehensive examination holds paramount importance in the post-ictal evaluation of patients presenting with febrile seizures. This serves a dual purpose: firstly, to ascertain complete clinical and neurological resolution, ensuring a return to the patient's baseline neurological status. Secondly, it aims to identify potential etiologies for the seizure and the underlying febrile illness. This entails an evaluation for meningeal signs suggestive of intracranial infection, as well as an assessment for signs and symptoms of elevated intracranial pressure. Additionally, a thorough dermatological examination is crucial, as specific cutaneous markers like port-wine stains in Sturge-Weber syndrome, neurofibromas or cafe-au-lait macules in Neurofibromatosis type 1, and hypopigmented macules in tuberous sclerosis can offer valuable diagnostic clues. Lastly, a targeted

physical examination is essential to identify the source of the febrile episode, potentially including pharyngitis, otitis media, chest auscultation for pulmonary pathology, and other relevant investigations.^{10,14}

The referenced NICE CKS provides a comprehensive framework for the clinical examination of patients experiencing febrile seizures. This framework encompasses all the crucial elements outlined above, ensuring a thorough and standardized approach to patient evaluation.³ Documentation of assessment of consciousness, signs of dehydration, irritability, presence of neck stiffness or petechiae, and presence of any focal neurological signs was appropriate. Conversely, the presence of a full neurological examination was lacking, with poor documentation of power during examination. Similarly, there was no documentation of the presence of stigmata of neurocutaneous conditions as mentioned previously. The documentation of the presence or absence of two critical signs in the examination; photophobia and bulging fontanelles, was concerning inconsistent. While examining young children for photophobia, which they cannot verbally express, can be challenging, its potential association with meningitis necessitates heightened attention and improved documentation practices. With regards to fontanelles, although the average presentation age of 2 years often coincides with their closure, younger patients necessitate documentation of this crucial examination point.

Recommended investigations

The NICE CKS does not refer to any specific recommended investigations, however it highlights the importance of measuring blood glucose for unresponsive patients and recommends urine analysis or culture if a clear source of infection remains unidentified. Investigations were taken in over 75% of patients reviewed, coinciding with the patients who were admitted. These were most commonly blood investigations including a complete blood count, renal function tests and electrolytes, inflammatory markers such as C-reactive protein, random blood glucose, venous blood gas, and blood culture tests. Within the Emergency department, a chest x-ray and urine testing were taken in 16.66% and 7.41% respectively. Notably, most urine tests were ultimately performed as part of inpatient care upon admission. Prior studies

investigating febrile seizure management generally advise against routine blood tests, such as those previously listed, for simple, uncomplicated febrile seizures. However, these investigations may be warranted when concerning clinical features are present, such as prolonged post-ictal drowsiness or suspicion of bacteraemia.¹⁵ This finding highlights a significant discrepancy between current research and local practices. The extended observation periods and inpatient admissions observed locally may require further evaluation.

Patient disposition

In line with what was previously discussed, the majority of those admitted presented with their first occurrence of a febrile seizure. No reason for admission was documented in 34.88%, whilst the first febrile seizure and complex febrile seizure were documented as reasons for admission in 55.81% and 9.30% of cases respectively. Inpatient lumbar punctures were performed in 100% of patients presenting under 1 year of age, as per local guidance and an EEG performed in 6.97%.

Discharge advice

While a relatively small percentage of patients with febrile seizures (those being recurring) were discharged directly from the Emergency Department during the study period, significant lapses were observed. Notably, documentation of seizure education for discharged patients was present in less than 50% of cases. As previously mentioned, febrile seizures can be a frightening experience for parents. Research suggests that fear and lack of knowledge about febrile seizures can negatively impact family life, parent-child relationships, and parental behaviour.^{16,17} The importance of educating parents with accurate information about fever and seizure management has been crucial in reducing their anxiety and concerns.^{18,19}

The documented discharge advice regarding febrile seizures varied in scope. It primarily focused on advising parents to seek medical attention for changes in seizure duration or character, or for the occurrence of two or more seizures within a 24-hour period. Notably, a seizure information leaflet was only offered on one occasion. However, it is crucial to highlight that the currently available leaflet at PED pertains to

SUMMARY BOX

This study aimed to assess current practices in managing febrile seizures in children at Malta's national Paediatric Emergency Department, aligning with the valuable guidance provided by the National Institute for Health and Care Excellence's Clinical Knowledge Summaries. The findings identified areas for potential improvement to ensure optimal care. The audit revealed consistent documentation of basic seizure details and demographics. However, opportunities were identified to enhance documentation in specific areas. This included capturing crucial details for seizure classification, obtaining more comprehensive medical and family histories to assess potential risk factors, and ensuring thorough physical examinations are documented.

Additionally, standardizing discharge education and follow-up practices would further optimize patient care.

epileptic seizures in general and associated Basic Life Support (BLS) recommendations, rather than specifically addressing febrile seizures. This represents an area for improvement, as providing a readily available, febrile seizure-specific leaflet would equip parents with accurate information and resources during such encounters. Along the same vein, anti-pyretic advice was noted to be better with 72.73% documentation, however immunization advice was never documented to have been given on discharge. The NICE CKS specifically address immunization following febrile seizures. They advise to counsel the parents to ensure that the child completes all childhood immunizations, even if the febrile seizure follows an immunization. Additionally, the NICE CKS discourages the use of prophylactic antipyretics before vaccination. It is equally important to emphasize during discharge counselling that antipyretic medication does not decrease or prevent the recurrence of febrile seizures. Equipping parents with this knowledge can further alleviate their anxiety regarding the risk of future seizures.³

International guidelines on follow-up for febrile seizures demonstrate some variation. Generally, these guidelines recommend follow-up as dictated by the underlying cause of the fever, but also in instances of complex or recurrent febrile seizures, or for patients identified with risk factors for developing epilepsy.^{9,10} It is important to note that specific recommendations for follow-up differ according to individual hospital protocols. Furthermore, providing standardized and clear parental education regarding red flags and features of complex seizures, along with recommendations on when follow-up is necessary, could significantly contribute to a more consistent approach to post-discharge care.^{9,10}

CONCLUSION

Febrile seizures are a common presenting complaint to the emergency department. These presentations are often accompanied by significant parental anxiety due to a lack of understanding surrounding this condition. The management approach for febrile seizures varies depending on the specific details obtained through a thorough history and physical examination, showing the importance of diligent history taking and meticulous, standardized examination. Unfortunately, deficiencies in these areas have been identified within local practices.

Therefore, it may be necessary to implement standardized pathways based on established guidelines and international best practices to ensure consistent and optimal care for these patients.

In addition to identifying shortcomings in documentation, another area requiring improvement pertains to parental counselling. The development and implementation of a standardized febrile seizure information leaflet would be highly beneficial. This resource should equip parents with crucial details encompassing necessary background information, basic life support (BLS) procedures, warning signs associated with febrile seizures, and clear guidance on when to seek emergency medical attention. Additionally, the leaflet should provide advice on the appropriate use of antipyretic medications. Equipping parents with this comprehensive resource would aim to empower them to manage future occurrences of febrile seizures in their children.

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Abbreviations

NICE:	National Institute for Health and Care Excellence
CKS:	Clinical Knowledge Summaries
PED:	Paediatric Emergency Department

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