An evidence-based approach to evaluation and management of the febrile child in Indian emergency department

Prerna Batra, Neha Thakur1, Prashant Mahajan2, Reena Patel3, Narendra Rai4, Nitin Trivedi4, Bernhard Fassl5, Binita Shah6, Abhijeet Saha7, Marie Lozon8, Rockefeller A. Oteng9, Dheeraj Shah10, Sagar Galwankar11

ABSTRACT

Fever is the most common complaint for a child to visit hospital. Under the aegis of INDO-US Emergency and Trauma Collaborative, Pediatric Emergency Medicine chapter of Academic College of Emergency Experts in India developed evidence-based consensus for evaluation and management of febrile child in emergency department. An extensive literature search and further online communication of the group led to the development of a detailed approach for the evaluation and management of individual conditions associated with fever. To develop an approach to individual conditions presenting with fever, that is, best suited to the epidemiology prevalent in India. The algorithmic approach given by the group describes in details the evaluation and management of specialized and individual conditions like fever and immunocompromised state, fever with localizing signs that include fever with seizures, cough, ear discharge, loose stools, rash and dysuria; fever without localization with epidemiological evidence supporting diagnosis such as malaria, enteric fever and dengue; and fever without any localization and no epidemiological evidence supporting the diagnosis.

Key Words: Children, consensus, fever, guidelines

INTRODUCTION

Fever is one of the most common reasons for children to attend the emergency department (ED) all over the world. In developed countries like USA, comprehensive guidelines for evaluation and management of fever has been advocated.[1] Pediatric Emergency Medicine (PEM) chapter of Academic College of Emergency Experts in India (ACEE-INDIA), under the aegis of INDO-US Emergency and Trauma Collaborative has made the first attempt to develop an evidence-based consensus for evaluation and management of the febrile child in ED.[2] The approach starts with triaging of the febrile child and stabilization. The initial step in triage is categorized based on the immune status subsequently on the presence of localizing signs, epidemiological evidence of any specific tropical disease such as malaria, dengue, or enteric, and then, age of the child. Evaluation and management...
of fever without focus is also specified [Figure 1]. As an addendum to this previous document in Indian Pediatrics, the college presents a detailed approach to the individual conditions.

**PROCESS**

PEM chapter of ACEE-INDIA held its first consensus meeting on Evaluation and Management of Fever in Pediatric ED at All India Institute of Medical Sciences, New Delhi on October 3, 2015 during 11th World Congress of Emergency Medicine. The meeting had invitees who were national and international specialists with expertise in different fields. It was a 1 day in-person meeting, where presentations were made and an elaborate discussion was held. Key concerns were identified and a writing committee was also formulated. Multiple electronic communications were then made that led to the formulation of a consensus. The second meeting was conducted on March 20, 2016 at Pune with the initial draft, which was discussed at length. With the help of further communications over e-mails, final algorithm [Figures 1 and 2] was drafted keeping in mind the objectives identified. This algorithm was published in Indian Pediatrics in the year 2017.2

As the ongoing process, approach for detailed evaluation and management of individual conditions in purview of the etiologies specific to the country like India were developed. Fever in immunocompromised children, fever with localization, fever without localization, and fever with epidemiological evidence supporting tropical conditions such as malaria, typhoid, and enteric fever were the main focus areas.

**RECOMMENDATIONS**

**Fever and immunocompromised state**

Immunocompromised children are at risk of rapid deterioration of illness and have high morbidity and mortality hence early identification of this group is vital. Children on chemotherapy, or those on long-term oral steroids, suffering from human immunodeficiency virus (HIV) with low-CD4 counts and primary immunodeficiency states are the ones who need early and extensive evaluation and treatment.3

**Diagnosis**

A detailed history related to the primary condition, along with the previous treatment records should be sought. Fever may even be caused by an array of therapeutics received by these patients such as antibiotic, antiretroviral, antifungal, chemotherapeutic drugs, platelets and other blood products, interleukins, and interferon therapies.

Complete examination taking notice of skin, intraoral mucosa (necrotizing gingivitis or ulcerative lesions), central in-dwelling devices (entrance, subcutaneous reservoirs, exit sites), finger and toenails, and rectal external examination with superficial palpation is required.4 Neutropenia prevents local signs of inflammation, making major infections go unseen. The internal rectal examination should not be done as

![Figure 1: Algorithm for evaluation and management for the febrile child presenting to Emergency Department within the context of health care in India](image-url)
it increases the risk of bacteremia. Some clues while examining an immunosuppressed febrile child are

- Vesicles on erythematous base are indicative of Varicella zoster infection
- Nonpruritic nasal discharge, pale areas of mucosa, and patches of mucosal hyperesthesia may be seen in sinusitis
- Black eschars on the palate or nasal mucosa are seen in mucormycosis, a serious fungal infection
- Ecthyma gangrenosum in the axillae or on the perineum is indicative of Pseudomonas or other Gram-negative bacteremia.

Febrile immunocompromised child should be investigated with a battery of tests that include complete blood count (CBC) with differential count and blood culture from all lines (before administering first dose of antibiotic), serum chemistries to assess hydration and renal/hepatic function, clean-catch urine culture (only if without delay in antibiotic treatment), coagulation studies, lactic acid (if concern for typhlitis/bowel necrosis), and stool for Clostridium difficile toxin (if abdominal pain and diarrhea with or without abdominal distention). In addition, if it is clinically pertinent, anaerobic culture, abdominal X-ray, chest X-ray, sputum for Gram-stain and culture if productive cough, urine catheterization if history suggestive of urinary tract infection (UTI), and cultures from catheter tips also need to be sent. Computed tomography (CT) scan of the paranasal sinuses or thorax for fungal infection may be needed. Lumbar puncture (LP) and cerebrospinal fluid (CSF) analysis should not be done routinely unless there is a clinical concern for meningitis.

Management
Fever in a neutropenic patient is always an emergency, regardless of triage status and should be categorized as a life-threatening event (E). Risk stratification should be done to determine appropriate treatment strategy.\textsuperscript{[5]}
**High-risk patients**

Patients with anticipated prolonged (7 days) neutropenia, profound neutropenia (absolute neutrophil count <100 cells/mm³), and/or significant medical comorbid conditions (hypotension, pneumonia, new-onset abdominal pain, or neurologic changes) are stratified as high-risk patients. Such patients should be admitted, stabilized, and started on appropriate antibiotics.

**Parenteral antibiotics with Gram-negative coverage, especially Pseudomonas** such as cefepime, carbapenem (meropenem or imipenem-cilastatin), or piperacillin-tazobactam makes a good choice. In case, the patient is allergic to cephalosporins, ciprofloxacin and clindamycin or aztreonam, and vancomycin can be given.

Vancomycin is started when clinical suspicion or known history of methicillin-resistant *Staphylococcus aureus* or *Streptococcus viridans* or known Gram-positive blood culture is there. Staphylococcal infection is clinically suspected if there is hypotension, skin infection, pneumonia, clinically apparent serious catheter-related infection in the form of tenderness or erythema around central line insertion site, Gram-positive isolate in catheter culture, or substantial mucosal damage. Vancomycin is also added if there is no resolution of fever after 48 h.

Antifungals are often considered in patients if there is no response after 3–5 days of antibiotic therapy.

**Specific conditions**

**Typhlitis**: Carbapenem alone or a combination regimen (piperacillin/tazobactam with gentamicin or ceftazidime with metronidazole).

Clostridium difficile colitis: First-line metronidazole (parenteral or oral), second-line vancomycin (oral).

Varicella zoster skin infection: Acyclovir parenteral.

*Mycoplasma* and *Legionella*: Macrolides, fluoroquinolone, or doxycycline in older age group.

*Pneumocystis jirovecii* pneumonia: Trimethoprim sulfamethoxazole or pentamidine (for sulfa-allergic patients) for patients at high risk.

Influenza season: Rimantadine or amantadine.

Low-risk patients: These are the patients with anticipated brief (<7 days duration) neutropenic periods or no or limited comorbidities. These children could be managed with oral empirical antibiotic therapy alone. Ciprofloxacin and amoxicillin-clavulanate are recommended for oral empirical treatment.

Granulocyte colony-stimulating factor is not recommended for routine use in emergent fever presentation but can be considered if there is the presence of poor prognostic factors, high-risk stratification, or severe anemia. Stress-dose steroids should be considered in patients with recent prolonged steroids use.

**Fever with localization**

These children will present with some localizing sign and hence easy to manage.

---

**FEVER WITH SEIZURES**

**Diagnosis**

Evaluating and securing airway patency, breathing, and circulatory status becomes the priority in any seizing child. Vital signs should be taken every 15–20 min. A thorough history, including duration of fever, onset and progression of seizures, any other focal symptoms, drug history, and history of trauma should be taken. Physical examination includes astute observation of mental function changes, pupil size and equality (normal 3–5 mm), signs of focal neurological deficits, signs of raised intracranial pressure, meningeal signs, deep tendon reflexes, and fundus examination for papilledema.

CBC and C-reactive protein (CRP) can be done to gauge baseline disease process; however, these studies are not recommended for simple febrile seizures. LP should be performed in all infants between 6 and 12 months of age and those with complex febrile seizures. The presence of any positive meningeal signs, concern for intracranial infection, pretreatment with antibiotics, or unimmunized or incomplete immunization status of *Haemophilus influenzae* and *Pneumococcus* becomes the indication of LP between 12 and 18 months of age in the presence of simple febrile seizures. If pretreated with antibiotics, interpret CSF carefully, as it could be a case of partially treated bacterial meningitis. Drug levels can be sent (aspirin, paracetamol) if clinical suspicion is there. Contrast CT scan should be performed if focal signs are present. No imaging is required for simple febrile seizure.

**Management**

Priority remains maintenance of airway, breathing, and circulation. If hypoxic (SpO₂ <90%), start oxygen without delay as hypoxia during seizures negatively affects neuronal function of the brain. Indications for intubation are as listed in Box 1.

Once seizures are controlled, these patients need observation in ER, or admission in the pediatric floor or Intensive Care Unit (ICU). Children with simple febrile seizures can be sent home after 6 h of observation, after explaining prophylaxis and ensuring follow-up. Box 2 gives indications for hospitalization to floor and to ICU.
FEVER WITH COUGH

Cough is one of the most common associated symptoms with fever. Both upper and lower respiratory conditions of infective etiologies should be kept as differential diagnosis.

Diagnosis
Focused history is the key to diagnosis and to determine appropriate next steps in management. Severity of disease can be assessed by the parameters shown in Table 1.

Three most commonly encountered diagnoses in the presence of fever and cough are Croup, Pneumonia, and Bronchiolitis.

Croup
The term croup encompasses laryngitis and laryngotraheobronchitis. There are signs of upper airway obstruction in the form of stridor.

Pneumonia
Pneumonia is diagnosed in any child with cough or difficult breathing if they exhibit “fast breathing.” Cutoffs for respiratory rate should be as determined by the WHO.

Bronchiolitis: It is a lower respiratory tract infection in children below 2 years resulting from viral etiology. Following an upper respiratory tract infection, child develops marked respiratory distress with rhonchi on auscultation.

CBC, blood culture, and CRP protein should be done in suspected severe infections. Chest X-ray should be taken in all hospitalized patients and in those with unexplained cough, persistent pulmonary involvement, refractory pneumonia, associated with HIV, or foreign body suspicion. A viral nasopharyngeal swab for rapid assay or bacterial sputum Gram-stain and culture can be done for specific diagnosis if available. If a patient requires intubation, a tracheal aspirate should be done for viral/bacterial testing. Tuberculin test and/or CXR is done, if concerned about recent TB exposure.

Management
Indications for hospitalization and ICU admission in these patients are given in Box 3.

Management
The principle of therapy should be to have an early diagnosis and treat the primary condition, rather than alleviating cough. Physicians are expected to ensure early diagnosis and rationalize the use of antibiotics. Cough and cold medicines are ineffective and have unknown safety profile. Antibiotics should be used rationally as majority

| Box 1: Indications for intubation |
|----------------------------------|
| GCS 8 or less                    |
| Persistent hypoxemia             |
| Signs of raised intracranial pressure (hypertension, bradycardia, irregular breathing, irritability) |
| Status epileptics without improvement |
| Impending respiratory failure or respiratory failure |
| GCS: Granulocyte colony stimulating |

| Box 2: Indications for hospitalization and Intensive Care Unit |
|----------------------------------------------------------------|
| Indications for hospitalization |
| Prolonged seizure             |
| Complex febrile seizure       |
| Serious infection or unknown source of infection: Encephalitis/ meningitis, intracranial abscess |
| Electrolyte imbalance         |
| Unknown or undetermined cause |
| Continued altered mental status |
| Drug toxicity or drug reaction |
| Indications for ICU admission |
| Status epileptics, need for airway stabilization, ventilation, or continued O2 requirement |
| ICU: Intensive Care Unit      |

| Box 3: Indications for hospital and Intensive Care Unit admission in fever with cough |
|-------------------------------------------------------------------------------------|
| Indications for hospitalization |
| Severe or very severe distress, as defined previously |
| Sustained pulse oximetry < 90% |
| Signs of moderate-to-severe dehydration |
| Not feeding or self-hydrating |
| Age < 2 months with presumed pneumonia |
| Treatment failure on appropriate antibiotics therapy |
| Concern for noncompliance or inability to follow-up |
| Indications for ICU admission |
| Need for invasive ventilation or noninvasive positive pressure ventilation |
| Concern for impending respiratory failure or SpO2 < or = 92% on FiO2 0.5 |
| Hypotension, sustained tachycardia, or requiring vasopressor support |
| Altered mental status from hypercarbia or hypoxia |
| Convulsions |
| ICU: Intensive Care Unit |

| Table 1: Clinical markers determining severity of fever with cough |
|---------------------------------------------------------------|
| Severity classification                                    | Clinical markers                                          |
| URTI- common cold                                           | No fast breathing                                        |
| Upper or Lower Respiratory involvement                     | No chest in-drawings                                     |
| Severe Lower respiratory distress                           | Fast breathing (> age specific threshold)                 |
| Or                                                          | None to mild chest in-drawings                           |
| Severe Upper respiratory distress                           | Moderate to severe chest in-drawing                       |
| Very Severe Lower Respiratory Distress                      | Grunting, Nasal flaring, or head-bobbing                 |
| Or                                                          | Peripheral Cyanosis, O2 sat < 90%                         |
| Very Severe Upper Respiratory Distress                      | Not able to drink                                        |
| Or                                                          | Altered mental status                                    |
| Central cyanosis                                            |
| Apnea                                                       |
| Convulsion                                                  |
| Severe malnutrition                                         |
| Immune compromised (including post-measles)                  |
of these patients have viral etiology, for example, croup, bronchiolitis, and viral upper respiratory tract infection. Table 2 summarizes the ED management of common clinical conditions presenting with fever and cough.

**FEVER WITH EAR DISCHARGE**

Most common differential diagnosis of ear discharge in a febrile child is acute secretory otitis media (ASOM) and otitis media with effusion (OME).

**Acute secretory otitis media**

**Diagnosis**

Clinically, a febrile child with ear discharge or ear ache or a young infant with excessive crying should be suspected of having ASOM. The presence of bulging opaque tympanic membrane associated with middle ear effusion gives the diagnosis. Retracted or translucent tympanic membrane rules out ASOM. ASOM is the most common result of Eustachian tube dysfunction following viral or bacterial infection. *H. influenzae* and *Pneumococcus* are important bacterial causes. Respiratory syncytial virus, influenza, and parainfluenza are important viral causes.[11]

Investigations are not routinely required once a diagnosis of ASOM is suspected.

**Management**

Antibiotics are recommended for children <2 years of age. For children above 2 years, antibiotics are recommended only in severe illness, defined as bilateral OM, severe otalgia or fever ≥39°C. Table 3 enlists the first- and second-line antibiotics with dosages and duration for treatment of ASOM.

Besides antibiotics, pain control is to be achieved with oral paracetamol (15 mg/kg) or ibugesic (10 mg/kg). Topical benzocaine can also be used in severe otalgia.

**Otitis media with effusion**

Most cases of OME occur following ASOM and generally resolve spontaneously. Treatment is done with antimicrobials, antihistamine decongestants, intranasal and systemic steroids, and nonsteroidal anti-inflammatory drugs. In refractory cases, patients may require tympanocentesis.[12]

**FEVER WITH LOOSE STOOLS/DIARRHEA**

Diarrhea is defined as the change in consistency and frequency of stools, that is, liquid or watery stools that occur >3 times a day. If there is the presence of blood or mucus in the stool, it is termed as dysentery.[13]

**Diagnosis**

Fever with loose stools is one of the most common presenting complaints in developing countries. Due to inappropriate management, delayed referral, and irrational use of antibiotics, many children present in the emergency with complications such as sepsis, severe dehydration, and dyselectrolytemia. Quick pertinent history and examination as outlined in Box 4 help in identification of complications and immediate management in ED.

| Table 2: ED management of common conditions presenting with fever and cough |
|---------------------------------|---------------------------------|---------------------------------|
| **Diagnosis**                  | **Supportive care**              | **Antibiotics**                  |
| Upper Common cold              | Nasal saline drops, scheduled antipyretics, cool mist humidifiers | **Penicillin sensitive** |
| Laryngitis                     | Racemic epinephrine nebulized for mod/severe. Dexamethasone 0.3-0.6mg/kg PO/IM/IV OD x 2 d | Oral amoxicillin (80-90 mg/kg/day) for 7-10 days in 2 div doses |
| Laryngotracheitis              |                                | Oral amoxicillin-clauvulante (90 mg/kg/day amoxicillin and 8.4 mg/kg/day clavulanate in 2 div doses OR Cefdinir (14 mg/kg/day in 1 or 2 div doses) OR Cefuroxime (30 mg/kg/day in 2 div doses) OR Cefpodoxime (10 mg/kg/day in 2 div doses) |
| Lower Pneumonia                | Outpatient Management           | Add cloxacillin 50 mg/kg QDS for suspected staphylococcus, clinically or on chest X-ray |
| Severe and Very severe         | Amoxicillin (40 mg/kg/day) in 2-3 divided doses. Amoxicillin for 3-5 days OR Co-trimoxazole (15-7mg/kg/day of Trimephoprim and 25-35mg/kg/day of Sulfamethoxazole) div BD for 5 days. | In HIV positive or suspected Cotrimoxazole for Pneumocystis jurevici coverage |
| Pneumonia                      | Follow up after 48 h            | Add dexamethasone 4 mg/kg for mod/severe. Dexamethasone 0.3-0.6mg/kg PO/IM/IV OD x 2 d |
| Bronchiolitis                  | Hospitalization                 | Moderate to severe cases: Maintain hydration, oxygenation, nebulized hypertonic saline, inhaled bronchodilators |
|                               |                                 | Severe cases: CPAP or mechanical ventilation as required |

| Table 3: Antibiotic therapy for management of ASOM |
|---------------------------------|---------------------------------|---------------------------------|
| **Antibiotics**                 | **1st Line**                    | **2nd Line**                    |
| Penicillin sensitive            | Oral amoxicillin (80-90 mg/kg/day) for 7-10 days in 2 div doses | Oral amoxicillin-clauvulante (90 mg/kg/day amoxicillin and 8.4 mg/kg/day clavulanate in 2 div doses OR Cefdinir (14 mg/kg/day in 1 or 2 div doses) OR Cefuroxime (30 mg/kg/day in 2 div doses) OR Cefpodoxime (10 mg/kg/day in 2 div doses) |
| Allergic to penicillin          | Oral Azithromycin 10 mg/kg/dose on day 1 followed by 5 mg/kg once a day for 4 days OR Oral clarithromycin 15 mg/kg/day in 2 div doses for 5 days | |
The patient should be assessed for degree of dehydration, presence of malnutrition, and other signs suggestive of systemic infection.

Investigations are not routinely required in large majority of acute diarrheal cases. Stool microscopy is not much helpful in acute diarrheal cases except for giardiasis and cholera. Stool culture is also helpful only in cases of Shigella dysentery not responding to usual antibiotics. A CBC, CRP, serum electrolytes, and renal function tests are recommended in sick children with associated symptoms such as seizures, altered sensorium, and oliguria.

**Management**

**Indications for admission**
Admission is indicated in the presence of severe dehydration, malnutrition, poor oral intake, very high purge rate, and dyselectrolytemia.

**Rehydration therapy**
Reduced osmolarity WHO oral rehydration solution (ORS) should be prescribed to all patients with acute gastroenteritis.[13]

**No dehydration**
These children are treated at home after explaining danger signs to parents and ORS replacement.

**Some dehydration**
These children are managed in the hospital. Deficit replacement is calculated as 75 ml/kg of ORS to be given over 4 h. In addition, ORS is administered to replace the ongoing stool loss at a volume of 10 ml/kg.

**Severe**
These children are given intravenous fluid replacement at the rate of 100 ml/kg over 6 h in children <1 year and over 3 h in children >1 year choice of rehydration fluid is normal saline or Ringer lactate.

**Rehydration in malnourished children**
Slow correction of dehydration is recommended.

---

**Box 4: History in febrile child with diarrhea**

Quick history in ED
- Onset duration and number of loose stools per day-acute versus chronic
- Blood or mucus in stool-presence indicates dysentery warrants antibiotic use
- Other associated symptoms such as cough and running nose-suggestive of viral etiology
- Feeding practices-faulty feeding practices may predispose to sepsis in young children
- Immunization history-rotavirus vaccine
- Presence of fever, vomiting, seizures-underlying sepsis
- Urine output, seizures, decreased oral intake-warrants admission

ED: Emergency department

Intravenous fluid is to be used only for severe dehydration and shock. ORS is given orally or by nasogastric tube at the rate of 5 ml/kg every 30 min for first 2 h and then 5–10 ml/kg every hour for next 4–10 h.

**Drugs**

**Zinc**
Zinc supplementation at a dose of 20 mg/day in children >6 months and at a dose of 10 mg/day in children <6 months for 14 days helps to reduce the severity as well as duration of episode.[14]

**Antibiotics**
Antibiotics are recommended only in dysentery, cholera, or when we are suspecting sepsis. Ciprofloxacin and cefixime is the drug of choice in the management of dysentery. Most of the diarrheal episodes are of viral etiology, and hence, antibiotics are not required.

**Antiemetics**
A single dose of oral ondansetron can be given in ED if vomiting leads to poor ORS intake in children between 3 months to 5 years of age.[13]

---

**FEVER WITH RASH**

**Diagnosis**
Most of the febrile rashes are benign viral exanthems.[16] However, there are serious illnesses with skin rash as their presenting symptom, for example, Kawasaki Disease. Early and appropriate diagnosis is crucial in these patients. Important clues in diagnosis are the morphological appearance of rash, their pattern of distribution, temporal association with fever, and associated sign and symptoms as shown in Table 4.

Drug-induced rash also comes as close differential for viral exanthematous rash, and in many cases, the history is missing. The absence of prodromal symptoms and intensely pruritic rash which worsens with drug intake is some differentiating features. Two important ones that lead to significant morbidity are Stevens–Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN). SJS is a serious mucocutaneous illness with systemic symptoms characterized by the presence of flat, atypical target lesions, epidermal detachment comprising <10% of the total body surface area (BSA) with the involvement of two or more mucosal sites. In TEN, skin percentage involved is more than 30% of BSA. There is an exhaustive list of drugs causing SJS and TEN. Common ones are penicillin, sulfa drugs, antiepileptics, fluoroquinolones, analgesics, etc.[16] Management depends on the specific etiology.
Table 4: Clinical clues to differential diagnosis of fever with rash of infective etiology

| Diagnosis             | Appearance of rash                   | Type of rash                     | Other characteristic features                                                                 |
|-----------------------|-------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------|
| Measles               | On fourth day of rise of fever      | Macular or maculopapular rash    | Conjunctival congestion, rhinorrhea, koplik’s spots, pityriasis rosea (PR), has been associated with HHV6 and HHV7 |
| HHV 6                 | After fever disappears              | Macular or maculopapular rash    |                                                                                                 |
| Ricketsial fever      | With Fever                          | Macular or maculopapular rash occasionally petechial; involves palms and soles | Fever, headache, myalgia, hepatosplenomegaly, lymphadenopathy and painless eschar at the site of vector bite |
| Meningococcemia       | With Fever                          | Macular or maculopapular rash petechial rash | Gangrenous changes in the extremities with multiorgan dysfunction |
| Kawasaki              | With Fever                          | Macular or maculopapular rash    | High grade continuous fever, non-exudative conjunctival injection, strawberry tongue, non-suppurative cervical lymphadenopathy |
| Infectious mononucleosis | Appearance of rash following oral ampicillin or amoxicillin | Maculopapular rash | Fever, tonsillar enlargement, hepatosplenomegaly, lymphadenopathy anemia etc. |
| Parvovirus B19        | Following fever                     | “Slapped cheek” appearance on face | Reticulate maculo-urticarial exanthem over the proximal extremities and occasionally over distal extremities and trunk |
| Rubella               | Within 24 hrs of onset of fever     | Maculopapular rash               | Rash disappears by third day                                                                    |
| Dengue                | Rash on day 2 of fever              | Maculopapular rash               | Posterior cervical and posterior auricular lymphadenopathy present                              |
| Chikungunya           | 48 days after fever and arthritis  | Pruritic maculopapular rash petechial rash | Characteristically absent respiratory symptoms                                                  |
| Varicella             | 24-48 h after fever                 | Vesicular                       | Presence of high grade fever, reticulo-bullous pain, Joint pain                                |

Table 5: Antibiotics for treatment of UTI

| Antibiotics       | Dose (mg/kg/day) | Duration |
|-------------------|------------------|----------|
| Parenteral        |                  |          |
| Ceftriaxone       | 75-100           | BD       |
| Cefotaxime        | 100-150          | TDS      |
| Amikacin          | 10-15            | OD       |
| Gentamicin        | 5                | OD       |
| Oral              |                  |          |
| Cefixime          | 8-10             | BD       |
| Ciprofloxacin     | 10-20            | BD       |
| Cephalexin        | 50-70            | TDS      |
| Co-amoxyclovulanate | 30-35          | BD       |

FEVER WITH DYSURIA (URINARY TRACT INFECTIONS)

Diagnosis

UTI is suspected when there is fever associated with other urinary symptoms such as dysuria, urgency, frequency, and abdominal pain. Patients with features of systemic toxicity are considered as having complicated UTI, while those without these features are referred to as simple UTI. It should also be suspected in any infant who has fever with other nonspecific symptoms such as excessive crying, diarrhea, vomiting, and poor weight gain. It is important to know about any such previous episode, history of catheterization, or urinary retention.

Whenever suspecting UTI, clean catch midstream specimen should be collected for microscopic examination and for urine culture, before starting antibiotics. CBC, CRP, blood culture, serum electrolytes, and renal function tests are recommended in sick child with complications.

Treatment

For infants <3 months of age, or children with complicated UTI, intravenous antibiotics preferably third-generation cephalosporin or aminoglycoside are to be started. For children more than 3 months of age, oral antibiotics and those with simple UTI, oral antibiotics are to be started. Choice of antibiotics, with dosages and duration, is shown in Table 5.

Fever without localization and epidemiological evidence supporting the diagnosis

The common tropical illness in our country such as malaria, dengue, and typhoid virtually needs to be excluded in all cases of fever with prolonged duration with or without localizing signs.

MALARIA

If a child has fever, without any obvious cause, and resides in high or low endemic zones for malaria, should be investigated for malaria. Efforts should be made to diagnose malaria with all possible means before commencing treatment. However, in severe complicated malaria or malaria with danger signs, presumptive treatment may be started in the ED even before confirmation after collecting blood for investigation.

Diagnosis

Light microscopy with well-stained thick and thin films remains the gold standard for diagnosis of malaria. In ED, however, rapid diagnostic tests (RDTs) should be used as point of care investigation. In case of strong
clinical suspicion, negative RDTs are to be confirmed by microscopy.²⁰

**Treatment**
Severe malaria and complicated malaria – Children with cerebral malaria, severe anemia, respiratory distress (acidosis), and hypoglycemia should be started on parenteral artesunate for at least 24 h. As soon as child is able to tolerate, should be switched to artemisinin-based combination therapy oral therapy. If parenteral artesunate is not available, intramuscular artemether should be used in preference to quinine for treating children with severe malaria.

**ENTERIC FEVER**

**Diagnosis**
Typhidot tests should be done additionally in any child suspected to be having enteric in ER. Blood culture should be taken before starting antibiotics as in any other case of fever without focus.²¹ The sensitivity of blood culture is highest in the 1st week of the illness and reduces with advancing illness, but still, it establishes the diagnosis and also gives a sensitivity pattern.²²

**Treatment**
ER management is suspected enteric children start with stabilization and supportive management as these children may land up with complications. Third-generation cephalosporins, both oral (cefixime) and injectable (ceftriaxone and cefotaxime), are recommended first-line antibiotics for uncomplicated and complicated enteric fever, respectively.²³ Azithromycin is a safe and efficacious alternative being used for the treatment of uncomplicated enteric fever, not responding to first-line therapy.²⁴

**DENGUE**
The new WHO classification for dengue severity is divided into Dengue without Warning Signs, Dengue with Warning Signs, and Severe Dengue.²⁵ Any child with residence or travel to dengue-endemic zone, presenting with fever and any two of the features that include nausea, vomiting, rashes, aches, positive tourniquet test, leukopenia, or any other warning sign should be suspected of having dengue. Signs of severe plasma leakage, severe bleeding, and/or severe organ impairment suggest severe dengue.

**Diagnosis**
Early confirmation of the dengue is critical to management. As the clinical features are non-specific, mimicking other viral illnesses, confirmatory laboratory diagnosis is essential for timely intervention to reduce mortality. Before day 5 of illness, during the febrile period, dengue infections may be diagnosed by detection of viral antigens by ELISA or rapid tests. NS1 antigen, a non-structural protein 1, is a marker of acute dengue infection. Both ELISA and rapid commercial tests kits are available for NS1 Ag detection with results available within minutes to hours.²⁶ IgM is positive after day 5 of illness and hence can be sent in suspected cases after the 5th day of onset of symptoms. A rapid decrease in platelet count, concomitant with a rising hematocrit compared to the baseline, is suggestive of progress to the plasma leakage/critical phase of the disease. These changes are usually preceded by leukopenia (≤5000 cells/mm²).²⁷

**Management**

**Home management and monitoring**
Children who are able to take orally and do not have any warning signs should be reviewed daily with a clinical and laboratory assessment. They should be encouraged to take ORS and fruit juice to replace losses from fever and vomiting. Paracetamol is the preferred antipyretic. NSAIDs may aggravate gastritis and/or bleeding and are to be avoided. Follow-up should be ensured in case there is no clinical improvement, deterioration around the time of defervescence, severe abdominal pain, persistent vomiting, cold and clammy extremities, lethargy or irritability/restlessness, and bleeding or failure to pass urine for more than 4–6 h.

**Hospital management**
Children with warning signs, comorbid conditions, or social situations where adequate home care cannot be ensured should be admitted. Baseline hematocrit should be done before beginning any fluid therapy. Isotonic crystalloids, namely, normal saline, Ringer’s lactate, or Hartmann’s solution should be started at a rate of 5–7 ml/kg/h for 1–2 h, and then, gradually tapered according to the clinical response, keeping a watch on perfusion, urine output, and hematocrit.

If the child has evidence of shock, fluids are started at a higher rate of 5–10 mL/kg/h and titrated accordingly. Colloids can be used to prevent fluid overload.²⁷ These children should be managed in intensive care units if resources permit.

A watch should be kept on any bleeding episode. Platelets should not be transfused prophylactically and should be restricted to children with severe bleeding.

**Fever without localization**
Fever without localization is defined as an illness where the cause of fever has not been ascertained.²⁸⁻³⁰ ACEE has given its recommendations for evaluation and management of these children in its consensus
statement [Figure 2]. These guidelines are based on the clinical status of the child and the age cutoffs.

**Diagnosis**

Any child with fever who is toxic looking needs emergent admission and complete physical and laboratory evaluation, namely, glucose, capillary blood gas, lactate, calcium, CBC, CRP, urinalysis, blood culture, and LP (if age <28 days) to rule out a serious bacterial etiology.

**Management**

Initial stabilization to achieve hemodynamic stability and early initiation of empiric antibiotics is the key to management. Choice of antibiotics includes ampicillin and gentamicin is recommended in sick neonates and young infants. Ceftriaxone is given on clinical suspicion of meningeval involvement.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

REFERENCES

1. American College of Emergency Physicians Clinical Policies Committee, American College of Emergency Physicians Clinical Policies Subcommittee on Pediatric Fever. Clinical policy for children younger than three years presenting to the emergency department with fever. Ann Emerg Med 2003;42:530-45.
2. F o r A c a d e m i c C o l l e g e o f E m e r g e n c y E x p e r t s in India (ACEE-INDIA) – INDO US Emergency and Trauma Collaborative, Mahajan P, Bata P, Thakur N, Patel R, Rai N, et al. Consensus guidelines on evaluation and management of the febrile child presenting to the emergency department in India. Indian Pediatr 2017;54:652-60.
3. Holtzclaw BJ. Managing fever and febrile symptoms in HIV: Evidenced-based approaches. J Assoc Nurses AIDS Care 2013;24:586-102.
4. Lakshmaiah KC, Abhayakumar SM, Shetty R, Loknath D, Jayashree BS, Govindababu K, et al. Management of febrile neutropenia in solid organ malignancies following chemotherapy. J Cancer Res Ther 2014;10:540-3.
5. Freifeld AG, Bow EJ, Sepkowitz KA, Boechkl MJ, Ito JJ, Mullen CA, et al. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 update by the infectious diseases society of America. Clin Infect Dis 2011;52:e56-93.
6. Gulati S, Kaushik JS. How I treat a first single seizure in a child. Ann Indian Acad Neurol 2016;19:29-36.
7. Subcommittee on Febrile Seizures, American Academy of Pediatrics. Neurodiagnostic evaluation of the child with a simple febrile seizure. Pediatrics 2011;127:389-94.
8. India Clinical Epidemiology Network (IndiaCLEN) Task Force on Pneumonia. Rational use of antibiotics for Pneumonia. Indian Pediatr 2010;47:11-8.
9. World Health Organization. Pocketbook of Hospital Care for Children: Guidelines for the Management of Common Childhood Illnesses. 2nd ed. World Health Organization; 2013. Available from: http://www.who.int/iris/bitstream/10665/81170/1/9789241548373_eng.pdf. [Last accessed on 2016 Dec 21].
10. Chandelia S, Dhankar M, Salhan M. Pediatrician's cough and cold medication prescription for hypothetical cases – A cross-sectional multi-centric study. Saudi Pharm J 2016;24:176-81.
11. Pettigrew MM, Gent JF, Pyles RB, Miller AL, Nokso-Koivisto J, Chonnaitree T, et al. Viral-bacterial interactions and risk of acute otitis media complicating upper respiratory tract infection. J Clin Microbiol 2011;49:3750-5.
12. Tanjea MK, Tanjea V. Drug therapy for otitis media. Ind J Otol 2014;20:1-3.
13. Bhattacharya S, Lodha R, Choudhury P, Sachdev HP, Shah N, Narayan S, et al. IAP Guidelines 2006 on management of acute diarrhea. Indian Pediatr 2007;44:380-9.
14. Shah D, Sachdev HS, Gera T, De-Regil LM, Peña-Rosas JP. Fortification of staple foods with zinc for improving zinc status and other health outcomes in the general population. Cochrane Database Syst Rev 2016;9:CD010697.
15. Danewa AS, Shah D, Bata P, Bhattacharya SK, Gupta P. Oral ondansetron in management of dehydration diarrhea with vomiting in children aged 3 months to 5 years: A randomized controlled trial. J Pediatr 2016;169:105-9.
16. Sarkar R, Mishra K, Garg VK. Fever with rash in a child in India. Indian J Dermatol Venereol Leprol 2012;78:251-62.
17. Indian Pediatric Nephrology Group, Vijayakumar M, Kanitkar M, Nammalwar BR, Bagga A. Consensus statement management of urinary tract infections. Indian Pediatr 2011;48:709-17.
18. Bloland PB. Drug Resistance in Malaria. Available from: http://www.who.int/csr/resources/publications/drugresist/malaria.pdf. [Last accessed on 2016 Dec 12].
19. From: The Indian Society of Critical Care Medicine Tropical fever Group, Singh S, Chaudhary D, Varghese GM, Bhalia A, Karthi N, et al. Tropical fevers: Management guidelines. Indian J Crit Care Med 2014;18:62-9.
20. World Health Organization. Guidelines for the Treatment of Malaria. 3rd ed. Geneva: World Health Organization; 2015. p. 72.
21. Parry CM, Hoa NT, Diep TS, Wain J, Chinh NT, Vinh H, et al. Value of a single-tube widal test in diagnosis of typhoid fever in Vietnam. J Clin Microbiol 1999;37:2882-6.
22. Rodrigues C. The widal test – More than 100 years old: Abused but still used. J Assoc Physicians India 2003;51:7-8.
23. Kundu R, Ganguly N, Ghosh TK, Yewale VN, Shah RC, Shah NK, et al. IAP task force report: Management of enteric fever in children. Indian Pediatr 2006;43:884-7.
24. Aggarwal A, Ghosh A, Gomber S, Mitra M, Parikh AO. Efficacy and safety of azithromycin for uncomplicated typhoid fever: An open label non-comparative study. Indian Pediatr 2011;48:553-6.
25. World Health Organization. Dengue. Guidelines for Diagnosis, Treatment Prevention and Control. Geneva: World Health Organization; 2009. Available from: http://www.who.int/dtr/publications/documents/dengue-diagnosis.pdf?ua=1. [Last accessed on 2016 Dec 21].
26. Hsieh CT, Chen MJ. The commercial dengue NS1 antigen-capture ELISA may be superior to IgM detection, virus isolation and RT-PCR for rapid laboratory diagnosis of acute dengue infection based on a single serum sample. J Clin Virol 2009;49:102.
27. World Health Organization. Handbook for Clinical Management of Dengue. Geneva: World Health Organization. Available from: http://www.wpro.who.int/mvp/documents/handbook_for_clinical_management_of_dengue.pdf. [Last accessed on 2016 Dec 12].
28. Jha R, Byington CL, Klein JO, Shapiro ED. Management of the non-toxic-appearing acutely febrile child: A 21st century approach. J Pediatr 2011;159:181-5.
29. Brown L, Shaw T, Moynihan JA, Denmark TK, Mody A, Wittlake WA, et al. Investigation of afebrile neonates with a history of fever. CJEM 2004;6:343-8.
30. Ishimine P. Fever without source in children 0 to 36 months of age. Pediatr Clin North Am 2006;53:167-94.