

**Consensus Guidelines on Evaluation and Management of the Febrile Child Presenting to the  
Emergency Department in India**

**\*PRASHANT MAHAJAN, #PRERNA BATRA, §NEHA THAKUR, †REENA PATEL, ^NARENDRA RAI, ‡NITIN  
TRIVEDI, @BERNHARD FASSL, \*\*BINITA SHAH, ###MARIE LOZON, \$\$ROCKERFELLER A. OTENG,  
‡‡ABHIJEET SAHA, #DHEERAJ SHAH AND @@SAGAR GALWANKAR**

*From \*Departments of Pediatrics and Emergency Medicine, CS Motts Children's Hospital, University of Michigan (Ann Arbor, MI, USA); #Department of Pediatrics, University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi; §Department of Pediatrics, Hind Institute of Medical Sciences, Lucknow; †Department of Pediatrics, Division of Inpatient Medicine, University of Utah, (Salt Lake City, UT, USA); ^Department of Pediatrics, Hind Institute of Medical Sciences, Lucknow; ‡Department of Pediatrics, Mahatma Gandhi Medical College and Hospital, Jaipur; @Department of Pediatrics; Division of Inpatient Medicine and Department of Epidemiology and Biostatistics, University of Utah, (Salt Lake City, UT, USA); \*\*Departments of Emergency Medicine and Pediatrics, SUNY Downstate Medical Center, Kings County Hospital Center (Brooklyn, NY, USA); ###Department of Emergency Medicine, University of Michigan, (Ann Arbor, MI, USA); \$\$Department of Emergency Medicine, University of Michigan (Ann Arbor, MI, USA) and Directorate of Emergency Medicine, KomfoAnokye Teaching Hospital, Kumasi, Ghana; ‡‡Department of Pediatrics, Lady Hardinge Medical College, New Delhi, India; and @@ Department of Emergency Medicine, University of Florida, (Jacksonville, FL, USA).*

*Correspondence to: Dr Prashant Mahajan, CS Mott Children's Hospital, University of Michigan  
1540 East Hospital drive, Room 2-737, SPC 4260, Ann Arbor, MI 48109-4260, USA.  
pmahajan@med.umich.edu*

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**ABSTRACT**

**Justification:** No country-specific, evidence-based, consensus approach for the emergency department (ED) evaluation and management of the febrile child exist in India.

**Process:** We held two consensus meetings, performed an exhaustive literature review, and held ongoing web-based discussions to arrive at a formal consensus on the proposed evaluation and management algorithm. The first meeting was held in Delhi in October 2015, under the auspices of Pediatric Emergency Medicine (PEM) Section of Academic College of Emergency Experts in India (ACEE-INDIA); and the second meeting was conducted at Pune during Emergency Medical Pediatrics and Recent Trends (EMPART 2016) in March 2016.

**Objectives:** To develop an algorithmic approach for the evaluation and management of the febrile child that can be easily applied in the context of emergency care and modified based on local epidemiology and practice standards.

**Recommendations:** We created an algorithm that can assist the clinician in the evaluation and management of the febrile child presenting to the ED, contextualized to the healthcare scenario in India. This guideline includes the following key components: triage and the timely assessment; evaluation; and patient disposition from the ED. We urge the development and creation of a robust data repository of minimal standard data elements. This would provide a systematic measurement of the care processes and patient outcomes, and a better understanding of various etiologies of febrile illnesses in India; both of which can be used to further modify the proposed approach and algorithm.

**Keywords:** *Diagnosis, Fever, Infection, Sepsis.*

All over the world, fever in children is one of the most common reasons for parents to seek medical care. It is estimated that approximately 20% of all pediatric emergency department (ED) visits in the United States (US) are for evaluation of fever [1]. In recent decades, an extensive amount of literature and evidence has led to a consensus approach to the evaluation and management of febrile children; which has evolved secondary to its changing epidemiology. The change in epidemiology of the febrile child is the result of the substantial impact of conjugate vaccines against capsulated bacterial pathogens including *H. influenzae* and *S.pneumoniae* [1].

To reduce variation, multiple guidelines have been proposed including those from academic societies such as the American Academy of Pediatrics (AAP) and American College of Emergency Physicians (ACEP) [2]. Despite some differences, most guidelines advocate a comprehensive evaluation of the very young febrile infant (28 days and younger) and a less conservative approach for older infants.

Febrile infants undergo invasive procedures such as lumbar puncture, complete blood counts and urinalysis. Most febrile infants, especially those less than 28 days of age, are routinely hospitalized and treated empirically with broad spectrum antibiotics such as third generation cephalosporins along with ampicillin.

There continues to be practice variation also, when applying evidence and consensus-based guidelines [3-5]. Depending upon clinician suspicion, clinicians may evaluate for etiologies as variable as bacterial pneumonia and bacterial enteritis. Currently available “standardized” approaches, regardless of practice variation, remain problematic for various reasons: (i) prediction rules and/or guidelines have not been validated across cultural, geographic, socio-economic environments and may not be applicable in all clinical settings; (ii) the epidemiology of pathogens causing SBIs has changed due to the impact of conjugate vaccines; (iii) clinicians are not confident about the test characteristics of various screening tools, especially the discriminatory abilities of the complete blood counts, and finally; (iv) newer screening tools such as procalcitonin have not been studied or integrated into clinical decision making in a robust manner.

*Evaluation and management of the febrile child in India:* Children may present with fever as an initial/isolated symptom of a yet undifferentiated illness or with localizing signs that suggest an etiology such as pneumonia. A majority of children with fever without localizing signs will have a viral etiology which does not warrant laboratory evaluation and can often be managed with instructions for ensuring adequate hydration and use of antipyretics [6]. In one study it is estimated that up to 10% of febrile children, especially those 3 months of age and younger will have bacterial illnesses in the form of occult bacteremia, septicemia, bacterial meningitis, pneumonia, UTI, bacterial gastroenteritis, osteomyelitis, septic arthritis, and other general endemic tropical diseases [7]. However, etiologies of fever in the Indian ED context could vary from benign viral illnesses, commonly reported in US and Europe (*e.g.* respiratory syncytial virus (RSV), Enterovirus infections) to illnesses by organisms uncommon in industrialized countries: bacteria (*e.g.* *S. typhi*), viruses (*e.g.* measles, dengue, chikungunya) and parasites (*e.g.* malaria, kala azar) as well as endemic illness outbreaks due to meningococci and leptospira.

India is a tropical country with a distinct spectrum of common tropical illnesses particularly seen in post-monsoon season such as dengue, rickettsial infections, scrub typhus, malaria (usually due to *Plasmodium falciparum*), typhoid and leptospirosis [8]. Thus, the algorithmic approach utilized in the US and Europe is not applicable in Indian EDs, especially when evaluating a child with fever without source.

Emergency medicine is a growing medical specialty as evidenced by the rising number of publications appearing in the peer-reviewed literature demonstrating its growth and influence on healthcare delivery in India [9]. In conjunction with emergency medicine, as well as independently, pediatric emergency medicine is rapidly evolving as a sub-specialty and efforts are underway for its

formal specialty status recognition [10]. Development of a consensus statement that is relevant to the epidemiology of illness in the Indian context will help reduce practice pattern variation, optimize resource allocation as well as education, training and decision-making by both policy makers and health care administrators in the federal, public and private sectors. Moreover, evaluation and management of the febrile child, continues to remain a clinical challenge in the Indian ED context and the development of a consensus based practice guideline will serve as a valuable resource.

## PROCESS

We held two consensus meetings during Pediatric Emergency Medicine (PEM) Section of Academic College of Emergency Experts in India (ACEE-INDIA) in Delhi (October 2015) and in Pune (March 2016). An exhaustive literature review was performed and ongoing web-based discussions were held to arrive at a consensus on the proposed evaluation and treatment algorithm. We provide a pragmatic and simple to use algorithm that will *assist*, but not replace, clinician decision making for the ED evaluation and management of the febrile child.

We have identified the key concerns regarding a standardized approach to the evaluation and care of the febrile child in an ED in India (**Box 1**):

### **BOX 1. KEY CONCERNS IN CASE OF THE FEBRILE CHILD IN AN INDIAN EMERGENCY DEPARTMENT**

- Epidemiology of the febrile child in India is different from that of the Western Countries; published guidelines will require further modification for them to be applicable to the Indian ED context.
- The ill-appearing febrile child will need a separate approach with the goal of early recognition of impending cardiovascular and respiratory compromise regardless of underlying etiology.
- Other aspects such as ongoing epidemics (e.g., dengue) or co-existing co-morbid conditions (e.g., malnutrition) should be part of the approach.
- There is no wide-spread, comprehensive data available to systematically report the epidemiology of febrile illnesses that present to the EDs across the country.
- Approach considerations for resource-replete vs. resource-constrained settings is important. Consensus among experts was that with respect to medical interventions, clinical practice guidelines should ideally be applicable in all settings.

*Literature Review:* Following the initial consensus meeting, an exhaustive review of available literature pertaining to each component was identified. We used structured queries including terms such as fever, febrile child, febrile infant, fever without source, serious bacterial infection, bacteremia, to search databases including Pubmed, Google scholar to develop a comprehensive database of peer reviewed literature in an Endnote file. These manuscripts along with textbook chapters on the febrile child in commonly accepted textbooks of pediatrics and pediatric emergency medicine were reviewed. The literature review included topics unique to the India based ED setting: fever in immunocompromised and/or severely malnourished children, fever with localization, fever without localization and etiologies specific to our country like malaria, dengue, and enteric infections. A drafting committee was selected to synthesize the literature and key concerns outlined at the initial in-person meeting. Drafts were circulated electronically to engage and further solicit input. This process resulted in specific evaluation and management recommendations for each condition.

## RECOMMENDATIONS

Considering the available literature and the needs identified by the expert panel, we created an algorithm for the evaluation and management for a febrile child presenting to the ED within the context of healthcare in India (**Fig. 1**). This algorithmic approach incorporated the following: localizing symptoms, epidemiologic evidence, physiologic state (*i.e.* immunocompromised or not; well appearing or ill appearing), duration of fever, and age of the child. For the purposes of algorithm application, we have outlined terms, definitions and categories below.

*Definition of fever:* Fever is defined as a rectal temperature  $\geq 38.0^{\circ}$  C or  $\geq 100.4^{\circ}$  F [1, 11]. Axillary temperature is 0.3-0.6<sup>0</sup>C lower than the rectal temperature. Patients often present to the ED with subjective fever at home, felt by tactile assessment only. In this scenario, we suggest that clinicians obtain a detailed history including association with lethargy, perspiration, irritability or other concerning symptoms for ascertainment of clinically relevant fever and before providing a disposition.

*Method of temperature assessment:* Axillary thermometry is the most widely used method in clinical practice; however, axillary thermometers are not reliable with regards to measuring body temperature in infants and children [12]. Rectal temperature was identified as the most accurate measurement as it is closest to the core body temperature [1,13] and is the preferred method of temperature determination in very young children. Temporal artery and tympanic membrane thermometers can be used for quick assessment of temperature [14], provided the clinician is aware of the limitations and performance characteristics of each method. Further, based on the clinical situation, one must confirm the core

temperature by the rectal route. No definite cut-offs have been given for defining fever using tympanic and temporal thermometers.

*Triage:* A prompt and rapid clinical assessment by trained providers should be performed at triage [15,16]. Vitals signs (temperature, heart rate, respiratory rate, blood pressure, and pulse oximetry) measurement along with the use of pediatric assessment triangle and/or Pediatric Early Warning Scores (PEWS) to quantify severity of illness is highly recommended to help categorize the febrile child as well-appearing or ill-appearing [17]. Providers (health workers, nurses and physicians) should be trained in performance of these assessments reliably and perform them in a timely manner. All febrile children who appear to be at risk for cardio-pulmonary compromise and septic shock should have life-saving resuscitative procedures performed regardless of etiology of fever. These include obtaining vascular access (either intravenous or intraosseous), managing the airway with provision of oxygenation and placing the child on a cardiac monitor. If such resources are available, a bedside glucose test along with a capillary blood gas, point-of-care serum electrolytes, ionized calcium and lactate levels should be performed to guide resuscitation. Provision of broad-spectrum antibiotics to treat suspected bacterial pathogens should also be provided as rapidly as possible. If patient is in shock, management with rapid and adequate amounts of isotonic fluids should be initiated. **Table I** summarizes the identification and immediate management of emergent patients. Immediate treatment steps should be initiated by healthcare personnel and often can be initiated at triage.

*Evaluation of the febrile child:* After initial stabilization, patient's evaluation and management should be done as per the algorithm described in **Fig. 1**.

### **Immunocompromised Children**

Immune-compromised children are at high risk of serious infections, with grave prognosis. Thus, it becomes important to identify this group in ED at triage itself and have an aggressive approach. Children with neutropenia, with malignancy on chemotherapy, those on long term oral steroids like nephrotic syndrome, with human immunodeficiency virus (HIV infection), and with primary immunodeficiency states are the children at high risk and need extensive evaluation in febrile state [18]. Fever in a neutropenic patient is always an emergency, regardless of triage status and should be categorized as a life-threatening event (E).

### **Fever With Focus or Localization**

When a child presents to ED with fever and a localizing symptom/sign, specific management becomes easier. Some of the common localizing signs are seizures, cough, ear discharge, loose stools, dysuria and rashes. History and evaluation in the ED to determine the focus should be done after triage and initial

stabilization. Management depends upon the common organisms that prevail in that particular age group. Many of these infections have viral etiologies, which need only supportive treatment and a follow up. Emerging antimicrobial resistance is a global health problem and rational use of antibiotics in ED will go a long way in ameliorating this issue.

### **Fever Without Localization**

In a tropical country like India, it is not uncommon to have febrile children without any localization, with epidemiological evidence suggestive of a particular infectious etiology. These include conditions like malaria, dengue, and enteric fever. Due to the overlapping clinical presentation, it becomes difficult to pin point the diagnosis in ED itself. Such children should be investigated for the conditions with high index of suspicion and supportive therapy should be provided.

Fever without localization is a short duration febrile illness of 5 to 7 days without an identifiable cause after performance of history and examination [19-21]. ACEE recommends child to be categorized into well- or ill-/toxic-appearing. Emergent hospitalization and comprehensive evaluation is recommended in such a child at any age (**Fig. 2**). Further, evaluation and management of a well-looking child is based on the defined age groups i.e., neonates (28 days and less), young infant (29-90 days); older infant and young children (91 days – 2 years), and children more than 2 years (**Fig. 2**). There is no consensus among experts regarding optimal cut-offs for evaluation of fever without focus. Most have either used anecdotal or observational data as well as empiric data to arrive at cut-offs. Furthermore, the physiologic rationale is often missing. We chose the cut-offs as listed below:

*28 days and less* – most algorithms use this as a cut-off and is a category of the febrile infants that probably has the most consensus in the evaluation and management.

*29-90 day cut-off* – because this age group has probably been the least studied as well has the most variation with regards to a comprehensive evaluation, especially with relation to performance of lumbar punctures. In addition, this is also the age cut-off that is used in some febrile infant management algorithms.

*91 days to 2 years* – this is because most febrile infants beyond 90 days will have a positive impact of vaccinations as well as have a clinical examination that will allow the clinician to selectively evaluate for fever instead of a comprehensive evaluation that includes blood, urine and CSF studies. Specifically, the consensus chose to limit the upper age to 2 years because UTI risk drops substantially after the age of 2 years in female children.

These cut-offs are provided as a guide and also as a basis to collect data in the Indian context. As more evidence is generated, these may be modified further.

## Evaluation

Evaluation should include a complete history and physical examination. In a tropical country like India, dehydration fever may be seen in newborns and young infants. Vaccination history could avoid unnecessary investigation. Signs like irritability; poor feeding, poor activity, and child not appearing well are subtle markers for serious underlying illness [22]. Pulse rate and volume, pulse oximetry, temperature, capillary refill time, respiratory rate (RR) and type should be documented. A complete head to toe exam with all clothes removed will help to find an occult cause of fever.

*Newborns (less than 28 days):* All newborns with fever should be admitted. A complete investigative workup which includes complete blood count (CBC), C- reactive protein (CRP), peripheral blood smear (PBS) (band form, toxic granules, vacuolization, immature / total ratio ), blood and urine culture, urine analysis (UA), lumbar puncture (LP), and chest X- ray (CXR) is mandatory. Stool should be examined for pus cell and red blood cell (RBC) only if change in frequency of stool is present. First negative septic screen in an active febrile newborn is not the indication for discharge.

*Young infants (29 to 90 days):* Active young infant between 29-90 days of age with fever should be observed in the ED with vital sign measurement. Complete blood count (CBC), peripheral blood smear (PBS), urine analysis (UA), and blood and urine culture is necessary. Chest radiography is indicated if temperature  $\geq 102.2^{\circ}\text{F}$  ( $39^{\circ}\text{C}$ ), leucocyte count  $\geq 20,000$  per  $\text{mm}^3$  or respiratory signs are present [23]. Urine tests recommended are microscopy and culture from urine obtained by catheterisation.

*Ninety-one days to 2 years:* Partial evaluation for severe sepsis is recommended. Investigative workup which include complete blood count (CBC), C-reactive protein (CRP), peripheral blood smear (PBS) (band form, toxic granules, vacuolization, immature/total ratio), blood and urine culture, and urinalysis.

*Children above two years:* If temperature  $< 39^{\circ}\text{C}$ , only observation is recommended. If temperature is  $39^{\circ}\text{C}$  or more, investigative workup, which includes CBC, CRP, PBS (band form, toxic granules, vacuolization, immature / total ratio), blood and urine culture, Urinalysis needs to be done [23]. PBS and rapid tests for malaria, dengue and enteric may be done in endemic areas. Blood culture may be taken in typhoid-endemic areas.

### ***Sepsis screen parameters and serious bacterial infection***

Various sepsis screen parameters have been used with different permutations and combinations to rule in and rule out serious bacterial infections (SBI). Markic J, *et al.* [24] observed CBC , PCT, CRP and lab score  $\geq 3$  as useful markers for serious bacterial infections. Sensitivity and specificity was better in age group of  $\leq 90$  days when compared with age group of  $\leq 180$  days. In another large study, both CRP (area under the receiver operating curve - ROC 0.77, 95% CI 0.69-0.85) and PCT (ROC area 0.75, CI 0.67-0.83) were found to be strong predictors of serious bacterial infection[24]. Absolute band cells and PCT were reported as the best markers of SBI in children less than 36 months of age in another study, with

PCT having the largest ROC (0.80, 95% CI 0.71-0.89) [25, 26]. Problem with PCT in our setup is its high cost, precluding its use as a screening tool.

### ***Management***

In ill-appearing neonates and young infants, intravenous (IV) access should be established and empiric antibiotics should be started in the ED. Up to 28 days of age, ampicillin 100 to 200 mg/kg/day divided 8 hourly and gentamicin 7.5 mg/kg/day divided 8 hourly should be started, whereas in older infants, intravenous Ceftriaxone 100 mg/kg/day or 75 mg/kg/day divided 12 hourly is given, depending on presence or absence of meningeal involvement.

*Patient disposition from the ED:* After initial stabilization and management in the ED, the patient may either be hospitalized or be discharged home. **Box 2** gives indications for hospitalization and discharge of a febrile child from ED. Patient's stable condition, definite follow up plan and compliance become important while discharging the patient home. **Table II** provides broad guidelines for admission in pediatric floor or intensive care unit (ICU).

### **BOX 2. INDICATIONS FOR HOSPITALIZATION AND DISCHARGE FROM EMERGENCY DEPARTMENT**

#### *Indications for Hospitalization*

- All emergency patients in need for airway stabilization, ventilation or continued O<sub>2</sub> requirement
- Age <28 days
- Prolonged seizure/status epilepticus
- Altered sensorium
- Electrolyte imbalance
- Signs of Severe Dehydration
- Not feeding well
- Respiratory distress
- SPO<sub>2</sub> <90%
- Drug toxicity or drug reaction
- Unknown or undetermined cause
- Concern for non-compliance or inability to follow-up

#### *Indications for Discharge*

- No emergent need for airway, ventilation or circulatory support
- Vitals stable
- Child accepting orally
- Definitive management plan has been worked out
- Compliance ensured
- Follow up ensured

Some patients may need transfer to another health facility, due to non-availability of appropriate resources or services. **BOX 3** summarizes the guidelines for referral that should be stringently followed.

### SUMMARY

The outlined algorithmic approach on management of fever in the ED is the first step of its kind initiated by the PEM Chapter of ACEE-India under the aegis of INDO-US Emergency and Trauma Collaborative. This approach is based on the current literature search and available evidence pertaining to Indian context, aiming to familiarize the emergency physicians to a stepwise approach for evaluation and management of fever. This approach also includes focused triage and patient disposition guidelines. Further steps are intended to:

- obtain input from experts in pediatrics, EM, PEM, infectious diseases, epidemiologists to modify the algorithm
- create a robust database to collect retrospective and prospective data to elucidate the epidemiology of the febrile child across a multi-center setting.
- modify the algorithm based on epidemiological evidence.
- implement the algorithm and monitor compliance as well as measure impact on practice pattern variation, clinical outcomes and resource burden.

This algorithmic approach will require ongoing, periodic revision(s) as new research emerges and is established in the field.

*Contributors:* PM: Guarantor of the paper with responsibility for the integrity of the work as a whole; Substantial contributions to the conception and design of the work, and drafted and critically revised for important intellectual content; PB, RP, BF, BS, SG: substantial contributions to the conception and design of the work, and drafted and critically revised for important intellectual content; Neha T, NR, Nitin T, AS, DS: substantial contributions to the conception, and provided critical revisions; ML,RAO: Substantial contributions to the design of the work, and critically revised content; SG: Substantial contributions to the conception and design of the work; and drafted and critically revised for important intellectual content. All authors approved the final version to be published, and are accountable for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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**ANNEXURE I****PARTICIPANTS OF THE CONSENSUS MEETINGS****I Consensus Meeting**

*Chairperson:* Prashant Mahajan, (Michigan, USA); *Experts:* Binita Shah (Brooklyn, NY, USA), Bernhard Fassl (UT, USA), Prerna Batra, (Delhi, India), Abhijeet Saha (New Delhi, India), Dheeraj Shah (Delhi, India), Indumathy Santhanam (Chennai, India), AP Dubey (New Delhi, India), Devendra Mishra (New Delhi, India), Santosh Soans (Bangalore, India), Reena Patel (UT, USA), Narendra Rai (Lucknow, India), Neha Thakur (Lucknow, India), Nitin Trivedi (Jaipur, India).

**II Consensus Meeting**

*Chairperson:* Binita Shah; *Participants:* Prerna Batra (Delhi, India), Abhijeet Saha (Delhi, India), Reena Patel (Salt Lake City, UT, USA), Neha Thakur (Lucknow, India), Nitin Trivedi (Jaipur, India), and Narendra Rai (Lucknow, India).

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**TABLE I** IDENTIFICATION AND IMMEDIATE MANAGEMENT OF EMERGENT/LIFE-THREATENING CONDITIONS

<i>Triage Category</i>	<i>Symptoms/Signs</i>	<i>Immediate Treatment</i>
Emergent/Life-threatening (E)	Airway and breathing - Airway obstruction - Cyanosis - Respiratory distress - Respiratory failure	1. Secure and clear airway 2. Provide bag and mask ventilation 3. Intubate if ongoing respiratory support is needed. 4. Give oxygen: Nasal Cannula 2-3 LPM or Face Mask 5 LPM
	Circulation - Heart rate - Capillary refill time - Pulses (bounding or weak) - Blood pressure - Urine output - Level of consciousness	1. Establish intravenous (IV) or intraosseous line (IO) line 2. Give isotonic fluid bolus if clinically indicated 3. Continued assessment for signs of shock and cardiovascular compromise
	CNS - Unconscious or convulsions	<i>After stabilization</i> 1. Blood glucose – correct immediately with D25 2cc/kg 2. Hemogram 3. Blood gas 4. Electrolytes 5. Peripheral smear for malaria parasites if indicated 6. Specific investigations as indicated for instance blood group type and cross match, toxicologic screens in blood and urine.

**TABLE II** PATIENT DISPOSITION GUIDELINES

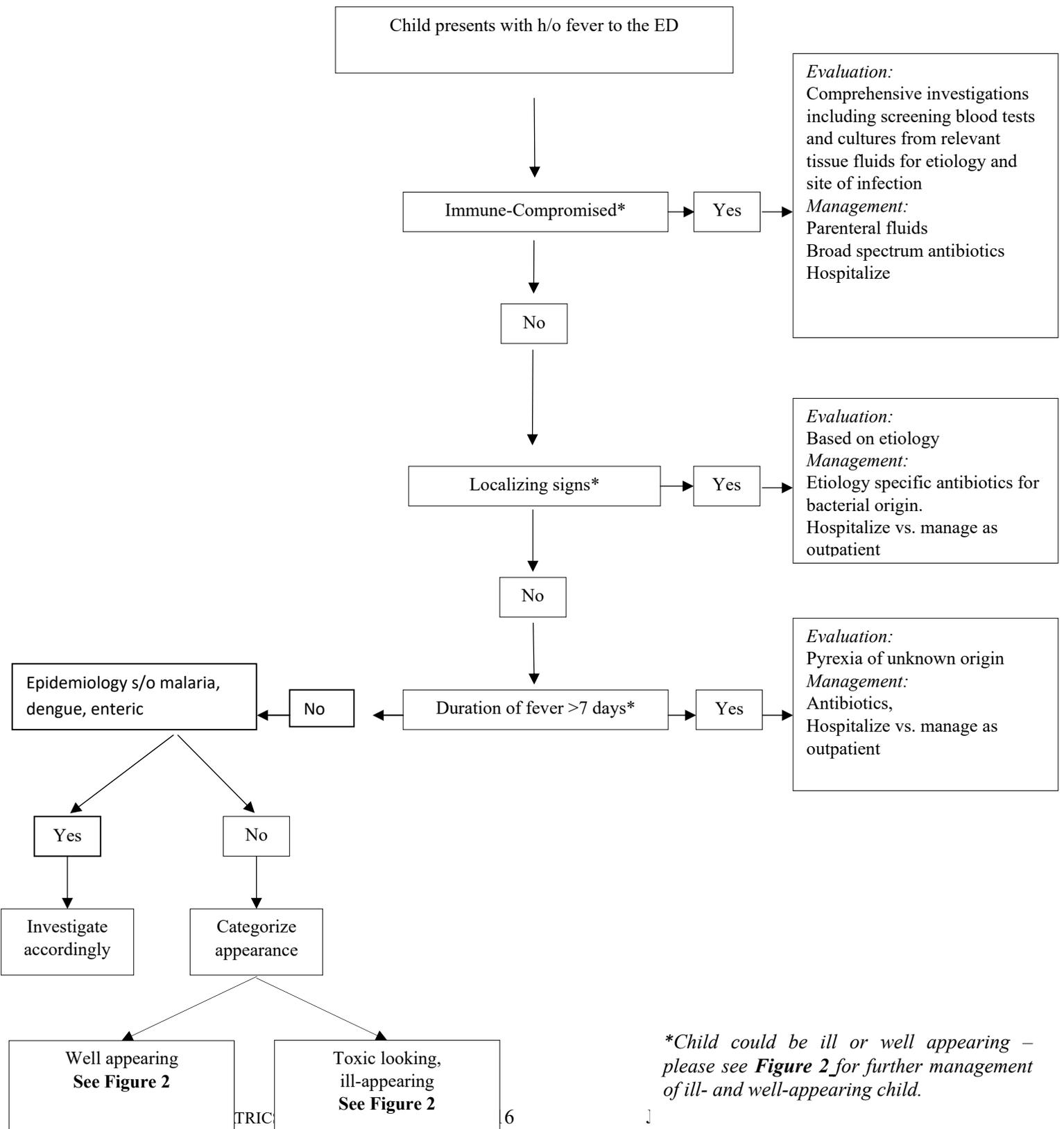
<i>Disposition</i>	<i>Action</i>
Observation during treatment in ED	Reassess patient frequently, review and document vital signs hourly
Discharging home	Provide appropriate counseling and a follow-up plan Elicit understanding of care plan by caretakers
Admission/Transfer to Pediatric Floor	Hemodynamically and respiratory stable patient, needs ongoing treatment, monitoring and workup;
Transfer to ICU	Patient remains in critical condition, warrants ongoing cardiorespiratory support to sustain life

**BOX 3** GUIDELINES FOR TRANSFER TO ANOTHER HEALTH FACILITY

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- Transfer, only when it is stable to transfer.
  - Appropriate stabilization before transportation:
    - Secure airway
    - Intravenous or intraosseous access
    - Place on cardiac monitor
  - Discuss transfer options with the patients' primary caregiver if available. Transfer is dependent upon patient's current status, the clinical concerns of the provider, the best place for receiving adequate care, and if caregiver/family is willing to transfer.
  - Directly communicate with receiving hospital regarding that transfer is required.
  - Transport with a person(s), capable of managing any emergency en-route.
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*\*due to non-availability of appropriate resources or services*

**Fig. 1** Algorithm for evaluation and management for the febrile child presenting to Emergency department within the context of health care in India.



**Fig. 2: Management of the febrile child based on appearance in the Emergency Department**

