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What are the common causes of fever?

AT SOME POINT IN THEIR LIVES, ALMOST ALL CHILDREN WILL DEVELOP A FEVER. A FIFTH OF ALL children will be taken to the doctor in the first six months of life with a fever, and nearly half by the age of 18 months.

Most illnesses associated with fever are self-limiting and children recover with no specific treatment. However, the concern for doctors and parents alike is that fever can also be the presenting feature of serious illness, which may be life threatening if not diagnosed and treated appropriately.

While death in childhood is rare, infection remains the most common cause in children aged one to four years, and is second only to congenital abnormalities in infants under a year.

How should children be examined and assessed?

The challenge is therefore to distinguish the small minority of children who have serious illness from the majority who do not. We need to recognise cases in which delay in investigation and treatment may influence outcome, without over-investigating and over-treating those with self-limiting illness.[1] The NICE guidelines give evidence-based recommendations on assessing children under five.[2]

'Infection remains the most common cause of death in children aged one to four'

Which children should be referred?

ASSESSMENT AND EXAMINATION

As is the case in all diagnoses, a carefully taken history is paramount. This will include:

- Time since onset of symptoms
- Duration of fever
- Periodicity, if any

It is important to establish whether the temperature has been measured and, if so, how. While many families will use a thermometer the impression of the child being hot to touch without formal measurement should still be taken seriously. The height of the temperature should be recorded, and always ask what device has been used as a reading from a forehead thermometer may not be accurate.

Enquire about other symptoms the child may have. It is important to know »

whether the child is still feeding or taking fluids adequately. Any child may be irritable when their temperature is high, but a constantly irritable or inconsolable child, or one who is extremely lethargic, drowsy or difficult to rouse is a cause for concern. Establish whether the parent has noticed any skin changes or rashes. Find out what measures the parent may already have taken to manage the fever, and in particular, whether, and at what time, antipyretics have been administered. Ask which agents, and the dose and frequency given. Enquire about contact with infectious illnesses, and any foreign travel.

'The challenge is to distinguish the small minority who have serious illness from the majority who do not'

In children who have underlying conditions, particularly learning disability or complex needs, it is particularly important to ask the carer in what ways their current condition differs from what is normal for them.

It is important to establish why the parent or carer has brought the child at this time. Many parents fear that fever itself may damage their child and may panic when they 'can't get the temperature down'. They may be concerned because of the height of the fever, which may to some degree be justified in young infants under six months, as a higher fever is more likely to be caused by serious illness, but does not differentiate minor from serious illness in older age groups. They may be concerned about the possibility of febrile convulsions, particularly if there is a history in the child or the family.

'Heart rate, respiratory rate and capillary refill time should be measured and recorded'

While taking this history, it is important to form an impression of the child from their general demeanour and behaviour. Clearly, if you find any life-threatening features, such as compromise of the airway, breathing or circulation, or significantly decreased level of consciousness, you will need to take measures to resuscitate and support the child until emergency services arrive. Otherwise, the next step should be to measure the temperature with an electronic thermometer in the axilla in infants younger than four weeks. A chemical thermometer under the axilla or an electronic tympanic thermometer can be used as an alternative in older babies and children.

Other vital signs, including heart rate, respiratory rate and capillary refill time should be measured and recorded. Guidelines have advocated this since 2007, and yet a survey of general practice in 2012 (albeit not exclusively in febrile children) indicated that only a minority of GP records contained this information.[3] Not only are these parameters essential in initial assessment of febrile children, but also the record may help if the child presents subsequently either to primary or secondary care.

The child should be examined for focal signs indicating the site of infection, and hydration should be assessed. Posture, tone, fontanelle

Table 1

Symptoms and signs suggestive of specific diseases[2]

Diagnosis	Symptoms and signs in conjunction with fever
Meningococcal disease	● Non-blanching rash, particularly with **one or more of** the following: — An ill-looking child — Lesions > 2 mm in diameter (purpura) — Capillary refill time ≥ 3 sec — Neck stiffness
Bacterial meningitis	● Neck stiffness ● Bulging fontanelle ● Decreased level of consciousness ● Convulsive status epilepticus
Herpes simplex encephalitis	● Focal neurological signs ● Focal seizures ● Decreased level of consciousness
Pneumonia	● Tachypnoea: > 60 breaths/min, age 0–5 months > 50 breaths/min, age 6–12 months > 40 breaths/min, age > 12 months ● Crackles in the chest ● Nasal flaring ● Chest indrawing ● Cyanosis ● Oxygen saturation ≤ 95%
Urinary tract infection	● Vomiting ● Poor feeding ● Lethargy ● Irritability ● Abdominal pain or tenderness ● Urinary frequency or dysuria
Septic arthritis	● Swelling of a limb or joint ● Not using an extremity ● Non-weight bearing
Kawasaki disease	● Fever for more than five days and **at least four of** the following: — Bilateral conjunctival injection — Change in mucous membranes — Change in the extremities — Polymorphous rash — Cervical lymphadenopathy

(if patent), the presence of a rash, neck stiffness and level of consciousness should also be assessed.

COMMON CAUSES OF FEVER

Most febrile illnesses in children are caused by viruses. Respiratory tract infections causing coryza, cough, sore throat, or ear pain are almost inescapable, particularly in children attending nursery. Severe viral gastroenteritis with nausea, vomiting and diarrhoea is less common in infants since the introduction of rotavirus vaccine, but many other viruses, including norovirus still circulate.

A variety of viral infections are associated with rash, including the classic exanthemata such as chickenpox. Other viruses, such as adenovirus, enterovirus, and erythrovirus (formerly parvovirus) B19 can cause macular, papular or urticarial rashes, which are most commonly (but not exclusively) blanching.

Urinary tract infection (UTI) causes 2-7% of episodes of fever presenting to primary care, and may have no focal symptoms and signs, particularly in infants under three months although a strong smell or blood in the urine may be described. This diagnosis should be considered in any infant less than three months of age presenting with fever. Older children may have frequency, dysuria, urgency, incontinence (in potty trained children), abdominal or loin pain.[4]

Symptoms such as vomiting, poor feeding, lethargy and irritability are common to many febrile illnesses, bacterial and viral, self-limiting and serious. Their severity, and accompanying symptoms and signs may distinguish one from the other. Symptoms and signs associated with serious illness are listed in table 1, p18.

REFERRAL

In general, GPs refer children because:

- The diagnosis is unclear after initial assessment and the differential diagnosis includes serious illness
- A diagnosis is suspected but the necessary confirmatory tests are not available in primary care
- The diagnosis is clear but management cannot be provided within primary care.

The NICE guidelines give explicit criteria for urgent referral using a traffic light system of symptoms and signs, see table 2, below.[2] Many of the criteria are objective but these are not a substitute for your own gut feeling that this is a sick child. There has been some debate about specific criteria, and whether they should be amber or red – and whether such algorithms may lead to over-referral.[5,6] However, few would debate the validity of the »

Table 2

Traffic light system for identifying risk of serious illness[2]

Children with fever and:
— any of the symptoms or signs in the red column are high risk
— any of the symptoms or signs in the amber column and none in the red column are intermediate risk
— symptoms and signs in the green column and none in the amber or red columns are low risk

	Green = Low risk	Amber = Intermediate risk	Red = High risk
Colour of skin, lips or tongue	● Normal colour	● Pallor reported by parent/carer	● Pale/mottled/ashen/blue
Activity	● Responds normally to social cues ● Content/smiles ● Stays awake or awakens quickly ● Strong normal cry/not crying	● Not responding normally to social cues ● No smile ● Wakes only with prolonged stimulation ● Decreased activity	● No response to social cues ● Appears ill to a healthcare professional ● Does not wake or if roused does not stay awake ● Weak, high-pitched or continuous cry
Respiratory		● Nasal flaring ● Tachypnoea: > 50 breaths/min, age 6-12 months > 40 breaths/min, age > 12 months ● Oxygen saturation ≤ 95% in air ● Crackles in the chest	● Grunting ● Tachypnoea: > 60 breaths/min ● Moderate or severe chest indrawing
Circulation and hydration	● Normal skin and eyes ● Moist mucous membranes	● Tachycardia: > 160 beats/min, age < 1 year > 150 beats/min, age 1-2 years > 140 beats/min, age 2-5 years ● Capillary refill time ≥ 3 sec ● Dry mucous membranes ● Poor feeding in infants ● Reduced urine output	● Reduced skin turgor
Other	● None of the amber or red symptoms or signs	● Age 3-6 months, temperature ≥ 39° C ● Fever ≥ 5 days ● Rigors ● Swelling of a limb or joint ● Non-weight bearing limb/not using an extremity	● Age < 3 months, temperature ≥ 38°C ● Non-blanching rash ● Bulging fontanelle ● Neck stiffness ● Status epilepticus ● Focal neurological signs ● Focal seizures

key points

SELECTED BY
Dr Peter Saul
GP, Wrexham and Associate GP Dean for North Wales

Most illnesses associated with fever are self-limiting and children recover with no specific treatment. However, fever can also be the presenting feature of serious illness, which may be life threatening if not diagnosed and treated appropriately. While death in childhood is rare, infection remains the most common cause in children aged one to four years, and is second only to congenital abnormalities in infants under a year. The challenge is to distinguish the small minority of children who have serious illness from the majority who do not. We need to recognise cases in which delay in investigation and treatment may influence outcome, without over-investigating and over-treating those with self-limiting illness. The NICE guidelines give evidence-based recommendations on assessing children under five.

It is important to establish whether the temperature has been measured and, if so, how. The height of the temperature should be recorded, and always enquire what device has been used, as a reading from a forehead thermometer may not be accurate. While many families will use a thermometer the impression of the child being hot to touch without formal measurement should still be taken seriously.

Check whether the child is still feeding or taking fluids adequately. Any child may be irritable when their temperature is high, but a constantly irritable or inconsolable child, or one who is extremely lethargic, drowsy or difficult to rouse is a cause for concern. Ask about any skin changes or rashes the parent may have noticed. Find out what measures the parent may already have taken to manage the fever, and in particular, whether, and at what time, antipyretics have been given. Enquire about contact with infectious illnesses, and foreign travel.

Other vital signs, including heart rate, respiratory rate and capillary refill time should also be recorded. The child should be examined for focal signs indicating the site of infection, and hydration should be assessed. Posture, tone, fontanelle (if patent), presence of a rash, neck stiffness and level of consciousness should also be assessed.

Viruses, such as adenovirus, enterovirus, and erythrovirus (formerly parvovirus) B19 can cause macular, papular or urticarial rashes, which are most commonly (but not exclusively) blanching. Urinary tract infection causes 2-7% of episodes of fever presenting to primary care, and may have no focal symptoms and signs.

Many of the NICE referral criteria are objective but not a substitute for your own gut feeling that this is a sick child. If the diagnosis is unclear, potentially serious, and specific treatment may be needed to prevent deterioration, the child should be referred. Children with amber features for whom the diagnosis is unclear can be managed in primary care, provided that there is a robust system in place for ensuring easy access to re-assessment should the child deteriorate.

majority of the features included.

In practice, many of the children seen will have no red features but one or more amber features, for which the guidelines are less specific.

The guidelines give the option of managing children in the community with safety netting or referral. Which one of these options is chosen will depend on individual circumstances and the expertise and facilities available within primary care.

'We need to recognise cases in which delay in investigation and treatment may influence outcome'

Those children with symptoms and signs of serious illness, see table 1, p18, need to be assessed and treated promptly, which in most cases will involve urgent referral. If the diagnosis is unclear, potentially serious, and specific treatment may be needed to prevent deterioration, refer the child. Examples are fever lasting five days (a possibility of Kawasaki disease), or limb or joint swelling or non-weight bearing, suggestive of septic arthritis or osteomyelitis.

Although not explicit in the feverish illness guidelines, the NICE guidelines on UTI in children recommend referral of all children under three months of age in whom UTI is in the differential diagnosis (i.e. any infant with fever with no alternative focus), in order to obtain a reliable urine specimen and initiate treatment.[3] While this is accepted as essential in infants who are unwell with fever, vomiting, poor feeding and irritability, there is some debate about its appropriateness in all circumstances in otherwise well infants with mild fever.[7] It is important in all age groups to obtain a reliable urine specimen before commencing antibiotics.

Even when the diagnosis is clear, children who need treatment or support only available in hospital, for example an infant with bronchiolitis, poor feeding and inadequate hydration need to be referred. Urgent referral is indicated for children who are unable to maintain adequate oxygen saturation in air. Similarly a mild to moderately dehydrated child with gastroenteritis who has failed a trial of oral rehydration needs specialist support.

Referral may also be needed if there is doubt about the capacity of the parents to care appropriately for the child when sick, or recognise signs of deterioration.

PRIMARY CARE MANAGEMENT

Children presenting with fever, but symptoms or signs not suggestive of serious illness (green features) do not need urgent referral, especially if the diagnosis is clear. Children with amber features for whom the diagnosis is unclear can be managed in primary care, provided that there is a robust system in place for ensuring easy access to re-assessment should the child deteriorate.

If a definitive diagnosis can be made and specific treatment, if needed, commenced, such as antibiotics in bacterial pneumonia, or oral rehydration in gastroenteritis, children are better managed at home. However, safety net arrangements do need to be in place together with adequate arrangements for follow-up.

Monitoring and follow-up

For any child managed at home, but particularly for those who have amber features, clear advice needs to be given to the parent or carer. This should include symptoms and signs to look out for which may indicate that their child's condition is worsening, and when to seek further healthcare advice.

'There is no substitute for sound clinical judgment based on knowledge and experience'

Many parents are unaware of how to manage their child's fever[8] so it is important to give clear advice about what to do until it resolves. Parents and carers need to know how to access further healthcare if they are concerned, particularly out of hours. This may involve liaising with other healthcare professionals to ensure there is no barrier to the family presenting the child for further assessment. It may also involve making a specific follow-up appointment. It is helpful to reinforce verbal advice with written information, particularly if the parents or carers are anxious.[1]

Assessment of acutely ill children is challenging for primary care and specialist practitioners alike. None of us can predict whether a child with

a self-limiting viral illness at the time we see them will subsequently develop sepsis or meningitis.

There is no substitute for sound clinical judgment based on knowledge and experience. However, the NICE guidelines provide some objective assistance in this process, and at best, enables clinicians to practise with more confidence, either by reinforcing their impression that referral is the correct course of action, or that the child has a self-limiting viral illness best managed in the comfort and familiar surroundings of home.

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Useful information

NICE CG160. Feverish illness in children
www.nice.org.uk/guidance/cg160/resources

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