Community Paediatric Review

Fever in children
Fever is an important and very common symptom. Fever is one of the oldest known signs of illness and reference is made to it in Egyptian papyrus texts of 5,000 years ago. Early medical practitioners thought that fever was beneficial and patients were sometimes artificially heated to help fight off infection. In the last 150 years thinking on fever has reversed and, until recently, fever has been seen as harmful. Antipyretics were universally recommended. In the early part of this century, aspirin was the world’s most widely used drug, predominantly for its antipyretic effect. Now paracetamol and other antipyretics, such as non-steroidal anti-inflammatory agents, have taken this lead position.

A child can be said to be febrile when it’s “thermostat” (the thermoregulatory centre in the hypothalamus) has been reset to maintain body temperature at a higher level than normal. This is different from hyperthermia, which occurs when the body fails to lose heat at a rate which keeps up with the rate of heat gain, even though the thermostat is trying to maintain a normal temperature (e.g., heat stroke, malignant hyperpyrexia, or in severe dehydration).

Normal Range: Normal human body temperature sits within a fairly narrow range around 37°C. The standard deviation is only ±0.4°C. It is important to remember that the normal temperature range and threshold for fever varies with the site of measurement and that there is a diurnal variation of about 1°C between early morning and evening times.

Aetiology: By far the commonest cause of fever in children is infection. Drug fevers, especially caused by antibiotics, are relatively common, but often overlooked. Rare causes are malignancy, endocrinopathy, and collagen disorders. Infection induces fever by a number of mechanisms including the production of exogenous and endogenous pyrogens.

One of the major challenges is recognising which febrile children have some form of serious bacterial infection (SBI) such as pneumonia, meningitis or bacteraemia. Most febrile children seen will have self-limiting viral infections. It is known that the risk of SBI is inversely proportional to the age of the patient and proportional to the height of the fever.

For example, in infants less than three months of age, fevers over 40°C are uncommon (<5% of all febrile episodes). In children of this age, over 1/5 of those with a fever of this magnitude will have a SBI. Conversely, less than 10% of those with a fever under 40°C will have SBI. In children over three months of age, fevers of over 40°C are quite common (20% of all febrile episodes). At this age, the risk of a SBI at this magnitude of fever is probably only about 2-5%. It must also be remembered that 50% of infants with SBI will be afebrile.

In assessing a febrile child, the health practitioner must take into account the height of the fever, the age of the child, any localising features, and non-specific behavioural changes such as reduced level of activity or feeding. There is no single temperature threshold which alone can be used to recognise SBI.

Measurement Methods: Body temperature can be measured in many ways. The commonest is the use of a parent or health practitioner’s hand to feel if the child has warm skin. Unfortunately this method has low sensitivity. Doctors and nurses can only pick 50-60% of febrile children by feeling their skin. Interestingly, a child’s mother has an 80% chance of detecting a significant fever.

Of the quantitative methods available, oral, axillary, and rectal routes are those most commonly used. In recent times the use of infrared tympanic thermometers has become popular.

The oral route is impractical for most children and the rectal route is time-consuming and somewhat unpleasant for older children. If
used properly, the axillary route can be used to measure body temperature quite accurately.

Recently infrared tympanic thermometers have been introduced into widespread clinical practice. These are now being aggressively marketed and parents can even buy them in their local department store. Their attraction is the relatively non-invasive and rapid way that a temperature can be measured. Unfortunately the accuracy of tympanic thermometers may not always be reliable. Some other studies have suggested tympanic thermometers are quite inaccurate when the detection of fever is very important, and at this stage it is strongly urged that a rectal thermometer be used.

Tympanic thermometers can be used as a reasonable screening test for fever in older children who do not look particularly unwell. For young babies and those where the doctor is concerned about SBI, their use is not recommended.

Plastic strips containing liquid crystals (e.g. Feverscan®) can be placed on the patient's forehead and will give a temperature readout. These have been shown to be quite inaccurate in young babies and of only limited accuracy in older children, and their use is not recommended.

Management: There is continuing controversy as to whether a febrile response to infection is beneficial or harmful to the patient. It is clear from recent research that fever offers some benefit. It has been shown to reduce the duration of viral illnesses, and there is some direct evidence that fever helps in the immune response.

The other side of the argument suggests that fever causes discomfort and that this can be alleviated with antipyretics. This is a difficult issue to address because all commonly used antipyretics are also analgesics. Some argue that antipyretics can prevent febrile convulsions, but attempts to prove this in clinical trials have failed. Health practitioners and parents often use antipyretics for children with common viral infections because at least something seems to be being done. This is obviously a poor reason in itself.

So what is the health professional to do when faced with a febrile child and knowledge of these controversies? The beneficial effects of fever can be explained to the child's parents and antipyretics should be reserved for patients in obvious discomfort or for when the child has a condition which is known to be painful (e.g. otitis media).

It is important to have realistic expectations of what antipyretics will actually do. A good dose of paracetamol (e.g. 15mg/kg) is likely to reduce body temperature by just over 1°C. So it is quite likely that the child will remain febrile, albeit at a lower level. Antipyretics will also lead to increased alertness and activity but are unlikely to have a measurable benefit on mood, comfort or appetite. Obviously if they are to be used parents need to be warned about their potentially toxic side-effects and about appropriate storage. The maximum dose of paracetamol a child should receive in any 24 hour period is 90mg/kg.

A significant proportion of parents are highly anxious about fever in their children, particularly associating it with febrile convulsions and brain damage. It is important that we reassure parents, and ourselves, that fever is a beneficial adaptive response that helps children fight off infection and recover more quickly. The use of antipyretics will not prevent febrile convulsions, and brain damage from the febrile response to infection is almost unknown in children.

Antipyretics should not be prescribed routinely for the management of fever in children but should be reserved for those with obvious discomfort from fever, or for those with known painful conditions.

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**Dealing with dogs**

There are two approaches to reducing dog bite injuries among children; encouraging responsible pet ownership, and teaching specific dog bite prevention techniques. A recent Adelaide study (Medical Journal of Australia 1997;167:129-32) identified the risk of attack from German shepherds, bull terriers, blue and red heelers, dobermans and rottweilers as four to five times greater than for other common breeds. Limiting the availability of some breeds, certification of owners of dangerous dogs, dog training, leashing dogs in public places, fencing properties where dogs reside, and compulsory insurance as part of dog registration, are all geared towards responsible pet ownership.

A Canadian study (Canadian Veterinary Journal 1996;37:478-81) discusses the change in emphasis in Toronto from encouraging responsible pet ownership to teaching children how to behave defensively around dogs. The author identifies the most dangerous breeds too, but indicates that any dog is capable of biting, given sufficient provocation. Dogs are unaware of people's rights, they need to be socialised to accept children, and children need to be trained to act correctly around dogs.
The “Dogs’n’kids” resource kit, recently sent to Maternal and Child Health nurses around Australia, takes a middle course. Dog breeds are not named, but the kit recommends specific prevention techniques to be taught to children, e.g. standing still with arms straight by their sides when approached by a strange dog, and not rushing at the dog.

Dog bite injuries disproportionately affect young children under five years of age, and parents may need to be counselled to postpone dog ownership during those years, or at least choose child-friendly breeds and train them rigorously.

**Hib Immunisation – a success story for public health**

The incidence of Haemophilus influenzae type b (Hib) disease has fallen dramatically in the past few years following the introduction of immunisation against this serious public health problem. Once the commonest serious bacterial disease in children under the age of five years, Hib has now become rare in this age group. Invasive Haemophilus influenzae disease is usually caused by encapsulated strains of the organism, with the majority of infections being caused by type b. The commonest clinical manifestations of Hib disease are meningitis and epiglottitis.

The first Hib vaccine was licensed in 1992. A polysaccharide vaccine, this was suitable only for children 18 months and older. Conjugate Hib vaccines, which are effective in infants, were licensed in 1995, and made available on the routine immunisation schedule for all children from July 1995.

Table 1 shows the number of cases of Hib disease detected in Victoria by various means of surveillance means described above. This is an example in one state of the dramatic fall in Hib disease.

The incidence rate of infections in children aged less than 5 years has fallen from 71.7 per 100,000 in 1991 to just 1.9 per 100,000 in 1996. In 1997, only 9 cases of Hib infection have been reported. Of these 9, only 5 were under 5 years of age. Vaccine failures with Hib do occur, but are rare.

Hib immunisation is now an established part of every child’s routine immunisation schedule. Immunisation with HibTITER is recommended for all children except Aboriginal and Torres Strait Islander children; these children should receive PedvaxHIB. HibTITER should be given at 2, 4 and 6 months, at the same time as DTP and OPV immunisations. A fourth dose at 18 months is recommended at the same time as the fourth dose of DTP. Hib vaccine must not be mixed in the same syringe as any other vaccine, and should be given in a separate limb from DTP.

Children receiving PedvaxHIB require only three doses at 2, 4 and 12 months.

Any child aged 15 months or older who is behind with immunisations, or has started late, requires only one dose of Hib vaccine (either HibTITER or PedvaxHIB) to be fully immunised. Children who develop invasive Hib disease under the age of two years should still be immunised, as they do not always acquire protective immunity following disease.

Immunisation coverage with Hib vaccine in Victoria has been measured by Maternal & Child Health nurse reports to DHS. Coverage over the past few years has been stable, with approximately 85% of children completing the three dose primary course by 12 months of age. Initial figures from the Australian Childhood Immunisation Register indicate a similar coverage of about 82% for the primary course. Coverage with the booster dose at 18 months is not so high, with only approximately 70% of children recorded as having received this dose by 2-3 years of age. Extra efforts, by the provision of mobile and outreach immunisation services, are being mounted by the Department to try to increase coverage in this “hard to reach” group.

In the future, we expect to see combination vaccines including DTP with Hib and perhaps other antigens such as hepatitis B, which will simplify the immunisation schedule. We can also expect the continued decline of clinical cases of Hib disease.

**Table 1.**

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Update on attention deficit hyperactivity disorder (ADHD)

The National Health and Medical Research Council has produced its report on Attention Deficit Hyperactivity Disorder, which reviews the current scientific literature and evidence on diagnosis and management of ADHD. The report provides lists of resources for non-professional and general readers and refers to video tapes and computer databases as well as giving contact points for ADHD support groups throughout Australia. Many community nurses are asked about ADHD, and it is useful for them to have some understanding of the condition and know when and where to refer.

The report endorses the use of the DSM IV criteria for diagnosis. This requires that 6 or more symptoms of either inattention or hyperactivity/impulsivity occur in two or more settings, have persisted for at least six months, and have been evident before 7 years of age. The symptoms should be present to a degree which is maladaptive, inconsistent with developmental level and produce impairment in social, educational and/or occupational functioning. Conditions which may better account for the symptoms, such as oppositional defiant disorder, conduct disorder or learning disabilities should be excluded, although it is recognised that comorbidity with these conditions often occurs.

The acceptance of these criteria for making the diagnosis requires that a comprehensive assessment is necessary for any child presenting with behaviour or learning problems, and/or in whom ADHD is suspected. This includes medical, behavioural, developmental, psycho-educational and family assessments with the use of rating scales to assist collection of information from home and school (or childcare) settings. The medical component of the assessment should include past and current medical, family and psychosocial histories and physical and neurological examinations. While the medical assessment may suggest further appropriate investigations, the report does not recommend investigations such as brain imaging or neurophysiological tests, including computed EEG’s, for routine assessment of ADHD.

Multimodal therapy is recommended. This comprises consideration of simultaneous medication use, behaviour management, family counselling and support, educational management and attention to specific developmental issues. As a result, a specific and individualised management plan is developed for each child and family which requires the collaboration of doctors, educators, other relevant professionals and parents to ensure optimal management.

The report endorses the appropriate use of psycho-stimulant medication (dexamphetamine and methylphenidate), concluding that they have established efficacy and safety in short term use.

The report discounts the use of a number of alternate therapies such as perceptual-motor and physical therapies, mega-vitamins and “sound” therapies. The increasing evidence relating to the effect of food and food additives on behaviour of some children is noted, but it is currently considered to be insufficient to recommend routine dietary management for ADHD.

Throughout the report the considerable difficulties confronting children with ADHD and their families are recognised, not only in current management but in the face of longer term educational, social and behavioural problems. The particular difficulties of diagnosis and management of ADHD in preschoolers are discussed. The high prevalence or comorbid conditions, especially learning difficulties, are reported with the recommendation that these require specific identification and management, and further research.

Community nurses can play an important role in assisting children and their families where behavioural or learning problems are of concern. In initial assessment abnormalities variations and minor behavioural problems may be identified and management strategies arranged. Where ADHD or other problems with psychiatric differential diagnosis may be considered, appropriate and timely referral is important. Within the framework of multimodal management, the community nurse can assist in behavioural management and provide family support and counselling. Nurses can obtain the report free of charge – it will be a useful resource for those nurses interested in this area.

REFERENCES:
(May be ordered from Australian Government Publishing Service. Freecall 132447)

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