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Children with very high temperatures are equally likely to have bacterial or viral infections

Research question How often does hyperthermia indicate a serious bacterial infection in children?

Answer About one in five children with hyperthermia have laboratory confirmed bacterial infections; a similar proportion have confirmed viral infections.

Why did the authors do the study? About one in every 2000 children presenting to emergency departments has hyperthermia, defined as a rectal temperature of at least 41.1°C (106°F). These authors wanted to find out what proportion of these children have serious bacterial infections and whether they have any distinguishing clinical features.

What did they do? They observed all 103 children presenting with hyperthermia to one US emergency department during a two year period. All the children had full blood count, blood cultures, and a nasopharyngeal washout that was cultured for viruses. They also had other tests—such as lumbar puncture, stool culture, urine culture, and chest x ray—depending on their presenting symptoms and signs. Any children with a bacterial pathogen in their blood, urine, stool, cerebrospinal fluid, or any other normally sterile site were classified as having a serious bacterial infection. The authors defined viral infection as the recovery of virus from the nasopharynx or stool, or a positive rapid test for viral antigens.

At the end of the study, the authors calculated how many of the children had a confirmed bacterial or viral infection. They also looked for associations between certain clinical features, such as white blood cell count, and either type of infection.

What did they find? Of the 103 children, 19 had a confirmed bacterial infection, 21 had a confirmed viral infection, and one had both. The remaining 62 children had negative cultures. The serious bacterial infections included eight children with urinary tract infections (six caused by *Escherichia coli*), two with lobar pneumonia due to *Streptococcus pneumoniae*, two with infected central venous catheters, and one with an epidural abscess. Adenovirus was the commonest viral infection (7 children), followed by respiratory syncytial virus (6) and influenza A (5).

The authors found a significant association between underlying illness and the risk of serious bacterial infection (odds ratio 3.19 (95% CI 1.06 to 9.61)), but they could find no other consistent predictors of either bacterial or viral infections. White blood cell count and absolute neutrophil count were both unrelated to the final diagnosis.

What does it mean? Children presenting to emergency departments with hyperthermia are equally likely to have a bacterial or a viral infection. White blood cell count doesn't help identify the type of infection, and may even be misleading; three children with bacterial infections were not prescribed antibiotics at first, possibly because an unremarkable white cell count suggested their infections were viral.

The authors say that the risk of bacterial infection in children with hyperthermia is high enough to justify antibiotic treatment when all tests for viruses are negative.

Trautner et al. Prospective evaluation of the risk of serious bacterial infection in children who present to the emergency department with hyperpyrexia (temperature of 106°F or higher). *Pediatrics* 2006;118:34-40.

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Editor's choice

Diagnosis—the next frontier

This week's bmjupdates+—immediately on the left if you're reading the print journal—looks at the causes of temperatures exceeding 41°C in children presenting to US emergency departments. Fewer than half had any sort of infection; viral infections were as common as bacterial infections; and neither white cell count nor absolute neutrophil count helped to distinguish between viral and bacterial infections.

Once the diagnoses had been made—urinary tract infections caused by *Escherichia coli*, lobar pneumonias by *Streptococcus pneumoniae*—the treatment was presumably straightforward. En route to treatment, however, the contribution of the signs (high temperature) and tests (white cell count) to the final diagnosis was anything but straightforward.

The message I take from this is that while evidence based treatment is well on the way to being sorted out, evidence based diagnosis is still in the dark ages. This week's journal suggests that things are beginning to change. In her editorial Sharon Straus states what should be a self evident truth: "When making a diagnosis in patients who are already ill we should be able to draw on evidence about the accuracy of diagnostic tests" (p 405). Yet just how far we have to go is shown by a study from Susan Mallett and colleagues of reporting and review methods used in systematic reviews of diagnostic tests for cancer (p 413). Lousy methodology means that "even these apparently evidence based studies are flawed," comments Straus. Relief is at hand: those repositories of evidence based treatments—*Clinical Evidence* (published by the BMJ Publishing Group) and the Cochrane Library—are turning their attention to diagnosis.

Perhaps it was their backgrounds in ion channel biophysics and mathematics that sensitised third year residents Matt Bianchi and Brian Alexander to the sloppy way that doctors think and talk about diagnostic tests. "Quantitative reasoning is neither intuitive nor well understood," they discovered on the wards (p 442). Yet understanding "the limitations of inherently imperfect diagnostic tests" is an important aspect of evidence based medicine, and the authors provide practical guidance.

Testing can become almost an end in itself. A diagnosis that eluded batteries of diagnostic tests haunts a German general practitioner's account of her 3 year old daughter's life (p 430). Leading her list of what was important was "to be protected from specialists who propose more and more tests but cannot admit they do not know what is wrong."

And here's a sign that's still awaiting validation, but which might be useful if you're considering joining the crowds that dash up Mount Everest each year. If you're not ascending 100 metres in 1-1.5 hours, then go back (p 452). Slower than this, there's probably something wrong, and your chances of survival are less. The sign is obvious enough for the French consul in Kathmandu to say of a mountainside fatality, "A 14 hour climb—it is too long. All the files we get of those that die on the mountain, c'est toujours la même chose—they take too long to reach the summit."

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BMJ: first published as 10.1136/bmj.333.7565.0-f on 24 August 2006. Downloaded from http://www.bmj.com/ on 20 March 2024 by guest. Protected by copyright.