matter, provided treatment is adequate? Here is the crux of the clinical problem. These infections occur in patients in whom any infection may be difficult to control. In addition, the organism is relatively resistant to many of the more common and less toxic antibiotics. Not surprisingly, therefore, one recent survey[6] analysed it together with *Pseudomonas aeruginosa*: the patient in whom it occurs, the problems of interpreting its presence, and its management all show many parallels with this other difficult coloured customer, though its spectrum of antibiotic resistance is not quite as extensive.

Strains are at present predictably sensitive to gentamicin. Nevertheless, R (resistance) factors mediating for gentamicin resistance are circulating between strains of *Serratia* in France.[7] Interestingly, these transfer optimally at a temperature lower than 37°C, a throw-back to the environmental origins of the organism.[8] The Birmingham group report sensitivity to cotrimoxazole,[2] but *Serratia* is frequently solidly resistant to sulphonamides: a satisfactory outcome would depend to some extent on in vivo synergy, and this in a group of patients many of whom would have underlying complicating factors.

Unless clinicians and pathologists are careful to contain this organism whenever it occurs their problems are likely to increase, especially if even more resistant strains emerge—which seems only too likely. This is another reason for clinical laboratories to employ systems which accurately characterise all Gram-negative rods isolated both from patients and from environmental specimens.

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Reducing doctors' errors

The human mind behaves like an information system of limited channel capacity.[1 2] Or, to put it more bluntly, we become easily overloaded with information. As we acquire more and more data we get into a state where we make mistakes, overlook the obvious, and "can't see the wood for the trees." Of course, doctors are no different: they become overloaded with information almost as easily as the rest of the population. This has been suspected for some time and was confirmed in the pattern-matching studies of the Leeds group about five years ago.[3]

What is new, and important, is that we are beginning to realise how much doctors' performance (in both diagnosis and management) is damaged by the constant flow of large quantities of (often irrelevant) information in a short space of time. When keeping watch for random and infrequent events under experimental conditions,[4] man predictably overlooks some "target" events (occurrences that should alert him to possible future trouble). The doctor who is, so to speak, "on watch" for pathological events and problems is no exception. Doctors may overlook radiological and bacteriological evidence of active tuberculosis,[5 6] fail to react to adverse drug effects,[7] and miss a host of other laboratory "clues" to diagnosis,[8] while in some circumstances clinical diagnostic accuracy seems to be inversely related to the amount of information elicited.[9]

As with aircraft pilot error, many medical errors are probably due to a doctor's intrinsic limits rather than to flaws in his fund of knowledge. The doctor who cannot remember an occasion when—in response to tiredness or pressure of work—he committed some error for which he afterwards kicked himself is either a genius, a liar, or an idler. How many times has one been grateful for a quiet reminder in a period of intense stress that "You've left the patient in cubicle 5 for rather a long time, doctor," or "You usually order a haemoglobin for Mrs Y. Do you want one this time?"

Such a state of affairs, however, depends on someone being there to do the reminding. All too often nowadays there is no one—or, more usually, the person doing the reminding is worked into the ground as well. This being so, can we provide some kind of automatic reminder system similar to those used in, for example, aviation, by which the doctor may be warned and potentially harmful events may be anticipated? McDonald[4] has developed such a system in Indianapolis dealing mainly with the effects of drugs. For example, when a doctor in the Indianapolis trial prescribed digoxin the computer in the system looked at such factors as the blood urea concentration and could recommend consideration of a lower dose in view of this. We might say that the doctor should have done that anyway. Indeed, he should; and most of us would, most of the time. Nevertheless, in 390 patients McDonald found that doctors made significantly fewer "errors" of this kind when provided with a system of simple reminders.

Is this the medicine of the future, with a computer-aided system sitting on the physician's shoulder like a cross between a guardian angel and Jiminy Cricket? Well it may be, and if it provides a safer, better service for the patient perhaps it should be (as soon as we can afford it). As with all automated systems, however, we ought to look at the alternatives before ordering several for each hospital. For information theory does not state that doctors need a computer to remind them: it merely states that to reduce such simple errors we must spend more time processing the relevant data.

The three key words in this dictum are "more," "processing," and "relevant." "More" time is important, but may be impracticable. The simplest answer to the problem would be to halve the patient load for each clinic, so that the doctor could spend twice as long with each patient. Unfortunately, however, this seems even less likely to happen in the United Kingdom than the widespread introduction of computers, and we must all face the fact that doctors in the 21st century are likely to be busy, harassed creatures. "Processing" is a key word, for a doctor spends much of his time gathering information rather than analysing it. We could probably do a lot by providing him with some help in data gathering. In one study[10] patients presenting to hospital with dyspepsia underwent a structured interview before they saw the clinician which was conducted by a non-medically-qualified physician's assistant. This was shown to be feasible, acceptable to the patient, and beneficial to the clinician. Other clinics have since used this system successfully.[11]

Finally, the word "relevant" is important. Most of us were taught as medical students to take a full case history and recite this (often quite irrelevant) information on the chief's grand round. Far too little time was spent distinguishing between relevant information and that which was merely interesting. The great clinical teachers knew this instinctively; but sadly much of their expertise has died with them. Many of today's junior doctors have been trained as "fact gatherers." Small

wonder that they become overloaded with data and can't see the wood for the trees.

So we may well need an automated reminder system. And, unless we consider ourselves better at making decisions than people such as airline pilots, why not? It will, however, be expensive; and we cannot yet afford it. Until we can much can be done to help the clinician, especially by teaching our students to consider *why* they are eliciting each item of patient data and by providing paramedical help to take some of the routine fact-gathering off the clinician's shoulders. Provided that the central role of the clinician in making decisions remains unimpaired, most sensible doctors will welcome anything that helps them to do their job better.

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Warning: smoking may damage your children's health

Most adults who smoke cigarettes should, by now, be well aware of the risks to their health.[1-3] Similarly, pregnant women are told that they may damage the health of their unborn child if they smoke during pregnancy.[4] A recent series of papers[5-7] has now confirmed reports[8 9] that parental smoking may be associated with an increased risk that their children will develop respiratory disease.

Many factors influence the development of respiratory disease in childhood[10]—including atmospheric pollution, social circumstances, and genetic background. Children of parents with respiratory symptoms, such as cough and sputum production, have a higher incidence of respiratory illness themselves, and this is true for both pre-school[8] and school-age[11] children. This may, in part, be due to common genetic factors or to cross-infection. Smoking is relevant in that adults who smoke have a higher incidence of respiratory symptoms than non-smokers[12]; however, no effect solely attributable to parental smoking could be found in the children of school age. On the other hand, a quite definite association has been found between parental smoking and pneumonia or bronchitis in their pre-school children.[8] The work of Leeder and colleagues[5] extends this observation and provides further details. They studied a large cohort of children born in 1963-5 in north-west London and found that infants whose parents had no respiratory symptoms and did not smoke had an incidence of pneumonia and bronchitis of 7·6% in the first year of life compared with an incidence of 17·7% among infants whose parents were smokers. Significant associations were also found between respiratory disease in infants and parental asthma, the number of siblings, and the health of the siblings,[5 6] but parental smoking stands out as the factor most amenable to change.

Exactly how parental smoking is associated with respiratory illness in infants is not known. The fact that atmospheric conditions can acutely affect the respiratory tract of infants was clearly shown by the excess mortality seen in children under the age of 1 year during the London smog in December 1952.[13] Possibly "passive smoking" by the infant impairs his defence mechanisms against infection. Certainly there is considerable evidence to suggest that cigarette smoke may impair mucociliary transport.[14]

The occurrence of pneumonia and bronchitis in infants under the age of 1 year is worrying. Mortality from respiratory disease in this age group has remained static since the mid-1950s, in contrast to falling mortality rates for respiratory disease in older children.[10] Also there is much evidence that later problems may occur. Leeder and his colleagues[7] showed that ventilatory function was impaired at the age of 5 years in a group of children who had had pneumonia or bronchitis in the first year of life. Their mean peak expiratory flow rate after correction for height was 8·5% lower than that in children without such a history. Also events in childhood may influence the development of disease in adult life. Follow-up of the children in the 1946 National Birth Cohort[15] showed that at the age of 20 those who were non-smokers but had a documented history of chest illness before the age of 2 years had a prevalence of cough of 9·1% compared with a prevalence of 5·2% in those who escaped such illnesses. Such children may be the chronic bronchitics of the future.[16]

Quite apart from the possible toxic effects of cigarette smoke on young children, or the risk to older children of the parents having chronic cough and sputum production, the influence that parents have on their children's smoking habits cannot be underestimated. A study of 10- and 11-year-old children showed that as many as 6·9% of the boys and 2·6% of the girls were regular smokers,[17] and this prevalence rises with age in both sexes, so that half of the boys and 36% of the girls may be smoking by the age of 17.[10] Parental example is an important factor in determining whether or not young people start smoking; an environment where smoking is accepted as normal encourages children to take up the habit.[18]

In summary, parental smoking causes an increased incidence of pneumonia and bronchitis in children under 1 year old and this may risk the life of the child or leave it with residual lung damage for the rest of its life. The presence of respiratory symptoms in parents who smoke may cause respiratory illnesses in their offspring throughout childhood; and the bad example that they set by smoking may lead the children to start smoking at an early age, with all the implications that this carries for their future health. Clearly parents who smoke should be encouraged not to do so in the presence of their children, but, even more important, they should be told of the risks they are taking with their children's health as well as their own if they continue to smoke.

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