PROBABILITIES, RISKS, AND DECISIONS

THE use of computers in medicine has paradoxically focused attention on the way human beings think. The computer provides one model of some processes involved in decision making: the principles involved may help the general practitioner to understand these processes in his own thinking and may even help him make decisions more efficiently.

Computers do not make decisions; they do not even make diagnoses; their area of excellence is the calculation of probabilities. Like the human brain the computer can be programmed with information derived from previous human experience. If the study is of patients with acute abdomens (de Dombal *et al.*, 1974) the computer is fed the clinical details of previous cases with their final diagnoses. If it is now given the findings in a new and as yet undiagnosed case, it will give the probabilities at each stage. In this study the computer's achievements were remarkable—its predictions had a greater accuracy than that of the senior surgeon involved. Action based on its " pre-operative " probability statements would, for example, have diminished the number of negative laparotomies.

Why should the computer have this advantage? There are at least two reasons. Firstly, the computer is able to multiply probabilities with a precision unrivalled by the human brain, and this advantage is more pronounced when a large number of variables are being considered. This is illustrated in a previous paper from the Leeds researchers (de Dombal *et al.*, 1971). The computer and clinicians were compared when dealing with computer-generated case histories. When access was allowed to 12 pieces of information chosen at will the computer was superior, but when only six pieces of information were allowed the performance of clinician and computer was similar. It seems that humans without mathematical gifts can make full use only of a small number of pieces of information: if they are given more information efficiency is not improved.

Secondly, computers while calculating the probability of a diagnosis are not influenced by the possible consequences of decisions based on the statement of probability. The clinician, however, is aware of and influenced by the risks inherent in his decisions particularly when his actions may contain the seeds of disaster. He prefers a margin of safety and is conservative rather than liberal in his use of data; he under rather than overbids his hand.

Not surprisingly Taylor *et al.* (1971) in Glasgow noted that a clinician's obsessionalism, as measured by psychological testing, is reflected in his performance in simulated diagnostic situations. The clinician who is tolerant of the uncertainty of the clinical situation tends to require less information before committing himself to a diagnosis than does his more obsessional colleague, who tends to get the diagnosis right more often.

What happens in general practice? The consultation in general practice is characteristically an unconfined loosely structured system of which information exchange and problem solving are only two facets. To concentrate on the interrogative mode is to ignore, for example, transactional relationships, role negotiation, and the counselling and psychotherapeutic activities of the consultation. It is true that " if we ask questions we only get answers " and there is a danger in the isolated consideration of the steps to decision making, of hearing the words, but not listening to the music.

Long (1974) has observed and recorded the phases of the consultation and classified it into six parts: the doctor relating to the patient; finding out why the patient believes he has come to the doctor; conducting a verbal or physical examination or both; sharing gathered information with the patient; agreeing or prescribing a course of action; and terminating the consultation. All through the consultation the perceptive and receptive

doctor receives a flood of information sought and unsought by him; verbal and non-verbal; perceived consciously and sub-consciously. As a decision maker he has first to select a few pieces of information which he feels are at the centre of the patient's problem.

From these he somehow works out a hypothesis which can be tested by further verbal or physical examination. If the result of this testing is to increase the probability of the hypothesis being correct, further verbal or physical testing may follow in an attempt to reach even higher levels of probability. At some level of probability the practitioner has to decide whether to intervene in the patient's problem and, if so, how. The level of probability at which a decision is " triggered " must vary from doctor to doctor and in the same doctor according to the urgency of the situation and the risks and benefits involved in intervention.

We have avoided the term diagnosis in describing this decision point. Indeed Howie (1974) has recently shown that in simulated consultations, experienced general practitioners require more pieces of information to make a diagnosis than to make a management decision. In a further study he found that to make either a management decision or a diagnosis trainees at the end of their general-practice year required fewer pieces of information than they did at the start (Howie, 1976).

Bridge builders strive to minimise the cost of their project in materials, time, and work required. At the same time they include a safety factor so that the probability of the bridge failing even in exceptional conditions is minimised. The general practitioner building a bridge between his patient's problem and its solution, likewise uses a safety factor, but at the same time avoids unnecessary overuse of material, time, and invasive techniques. Perhaps it is this combination of safety and economy which is characteristic of the consultation in general practice.

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A CONTROLLED STUDY OF THE EFFECTS OF SINGLE DOSES OF HYDROCORTISONE ON THE RESOLUTION OF ACUTE ATTACKS OF ASTHMA

To evaluate the effects of corticosteroids on the resolution of acute attacks of asthma, 38 young, acutely ill, asthmatic subjects were given a single intravenous injection of either 0·25, 0·50 or 1·0 gram of hydrocortisone hemisuccinate or a placebo (sterile saline solution) in a random, double-blind manner. Each was then treated with isoproterrenol (isoprenaline) at hourly intervals, for a minimum of six hours, and the serial changes in plethysmography, spirometry, lung volumes, subjective complaints, and physical findings that occurred as the patients improved were observed.

No statistical differences were found in any of the physiological or clinical variables between those patients given any dose of steroids and their matched controls. From this it has been concluded that hydrocortisone, in the doses and route of administration employed, does not produce any immediate benefits in the treatment of acute asthma.

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