# *ABC of Computing*

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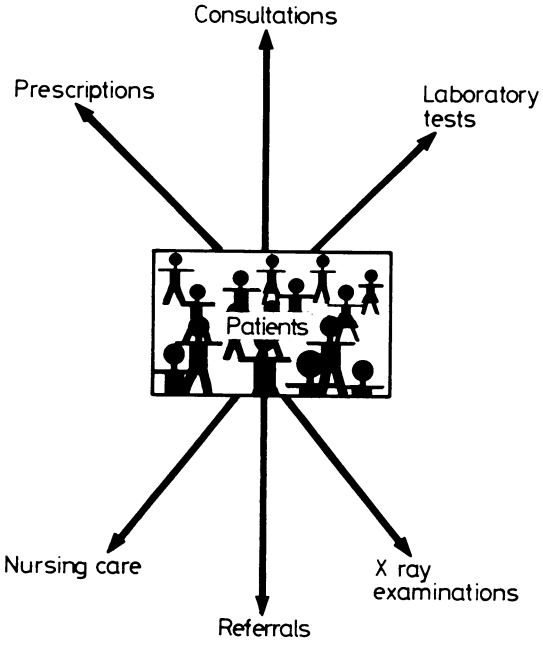
# GENERAL PRACTICE: HARDWARE AND SOFTWARE

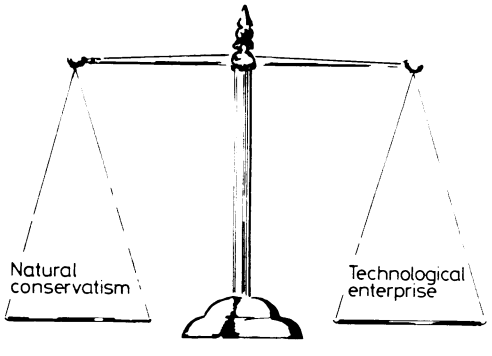



In our group practice of over 7000 patients we have had a computerised medical record and practice management system for two and a half years. Initially we were naive about computers and were not electronic enthusiasts but we set out to see whether computerisation could improve general practice records as a management information tool. A random scrutiny of almost any practice records is all that is required to show that a radical change in our manual system is long overdue. The average practice with a list of 10 000 patients will carry out about 38 000 consultations a year, make about 1000 referrals to specialist care, arrange several thousand laboratory and *x* ray investigations, and be ultimately responsible for medical care of its population costing over one million pounds.

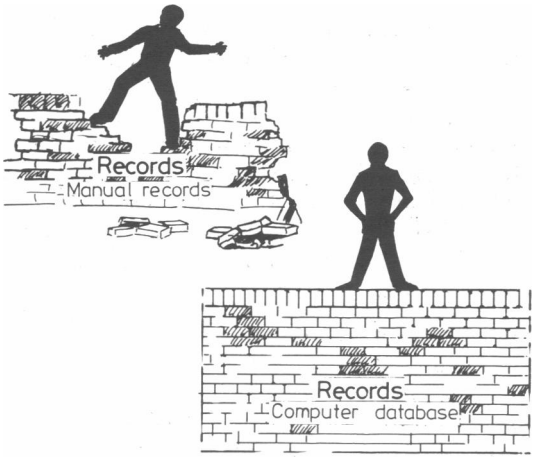
General practice has not escaped the technological information explosion that has characterised Western society in general. There has been a staggering increase in the volume and quality of data required by general practitioners, so the computer commended itself to us as the only practicable solution to the immense problems of information capture, storage, retrieval, recognition, and data manipulation, but it has brought with it its own special problems.

We have some sympathy for the view that to prepare for the coming of a computer into one's practice the records should be tidied up; age-sex cards should be prepared; problem summaries completed; registration and demographic data added; and then the order for the computer should be cancelled. The upheaval in our practice has been tremendous. From the beginning we were beset with problems due to the unreliability of hardware and software. We began by being relatively neutral, though some of us had misgivings about losing control to the computer, about the loss of individuality of patients who would become numbers instead of people. On balance, now that we have understood the immense potential that an adequate system can confer, I would hazard a guess that the rest of the practice would not willingly return to a manual system, although none of us would recommend our present system.

## Contraindications

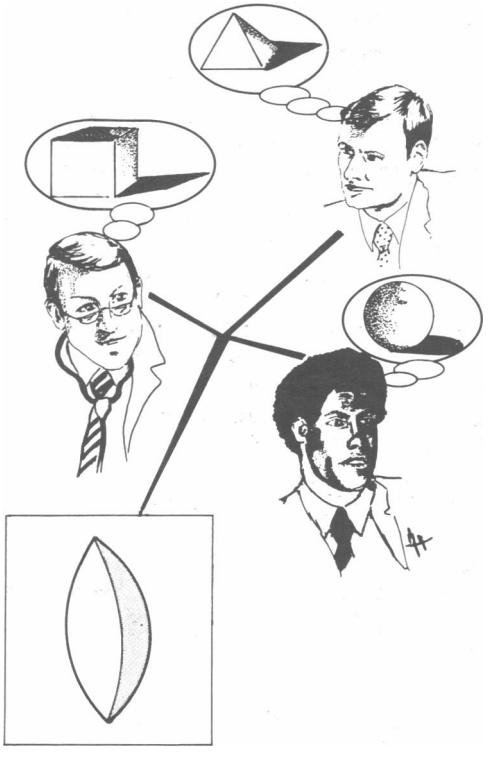



The general practitioner is an independent contractor, so purchase of a major item of equipment needs to be financially viable and costed realistically. The computer is, however, a major item of expenditure and is unlikely to pay for itself from additional income derived from computer initiated increases in those items of service which attract payment; this is a chimera held out by salesmen. The general practitioner, nevertheless, is a professional and needs to monitor his work and to perform it to the best of his ability. The promise of better work needs to be balanced against financial deficit.




Though an individualist, the GP will need to lend himself to standardised methods of entering data. General practice interactions are highly complex and fit with difficulty into any rigid systematisation. The balance in this instance is between natural conservatism and technological enterprise. The contraindications resolve themselves into two distinct areas. The first is the general acceptance that new technology is needed, has arrived, and can be used despite the attendant difficulties of cost, obsolescence, and compatibility of hardware and software. The second is the traditionalism of medical practice: the willingness and ability of individuals to change their behaviour, re-examine their own practices, give increased importance to preventing illness, improve the management of chronic and acute illness, and change practice organisation so that care of the patient fits changing needs. The challenge may be expressed simply: can we in general practice produce clinical and practice systems that do not merely fit existing patterns of practice organisation and patient care but instead change these patterns and produce new ones in a way that is not possible or cannot be conceived of in a manual system?

## Software

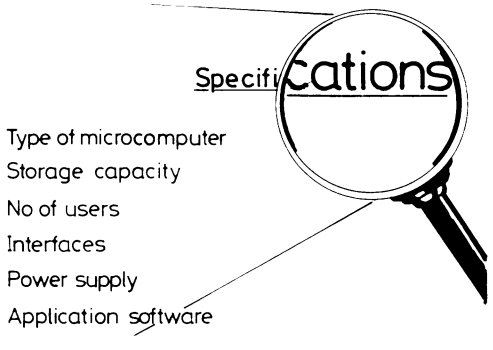


Software is the key element; the fundamental issue must be the user's needs. The software presently generally available is still in its infancy though rapidly evolving. There are few if any systems which even begin to advance from basic medical records and practice management to levels which include protocols for managing chronic illness, let alone reaching levels of pattern recognition and probability estimates for diagnostic use.

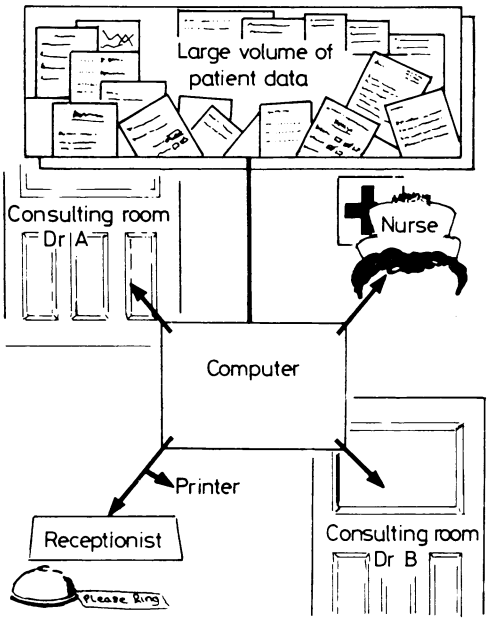
Software is expensive to produce and has maintenance costs; the analogy often drawn of software being equivalent to taped music played on a tape recorder falls down when applied to computer software. Software invariably has "bugs" since computer program logic cannot easily fit every situation; as a new situation arises so minor amendments need to be made, and this has to be paid for by the user in addition to the licensing fee for using the software.

As our present software is comparatively inappropriate what seems to be required is a full system analysis which begins to meet the needs of general practice. Doctors do not explain, and systems analysts do not fully understand, so many situations are not defined. The oft quoted figure of software being designed on a basis of 40 hours' conversational exchange should be amended in the case of general practice software to a figure of nearer 4000 hours. Such systems analyses are at present being carried out by at least one academic department of general practice. Systems are being designed which are modular and can grow or be amended to accommodate individual differences which exist between practices. Compatability of language and operating systems is a problem that needs to be resolved by a central advisory body, which at last seems to be in the process of formation, and it is time that general standards were set to which all new systems should conform. There is also a role for regional health authorities, which all have computer departments. If systems were devised that were applicable throughout the country without major compatibility problems these departments could arrange software maintenance, and perhaps even hardware maintenance. The regional health authority might also be responsible for bulk purchase of hardware; but which hardware?

## Hardware

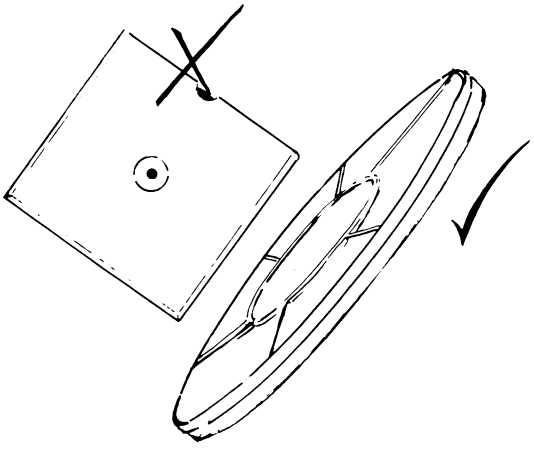



The problem of hardware is substantially that of its suitability for the software that has been written; compatibility with hospital and family practitioner committee systems; and financing, which might ultimately be negotiated with the DHSS. In this connection the Department of Industry initiative is a welcome one. There is some merit in the argument that computer systems for general practice should be regarded as "ancillary help" and reimbursed similarly, given, of course, the constraints and monitoring which need to be observed whenever public money is involved.




Hardware decisions depend on the specific software that is to be used. The initial requirements of general practice are for relatively unsophisticated processing but for large volume data storage. Speed of processing also needs to be considered since a major source of irritation is the wait for screen or printer output when a patient is present. This applies particularly to processing during a consultation—or "real time" processing. A critical decision to be made is whether the system is to be single user or multiuser. Important questions for practices to answer are: How many terminals and where? How many printers and where? The single user system involves a central processing unit, a single terminal, a single printer, and memory, which may be floppy disks or hard disks.

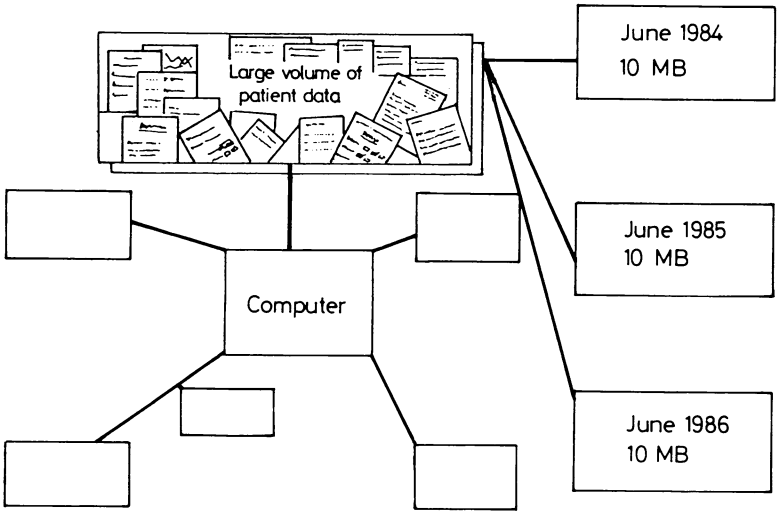
Floppy disks are less expensive but slower, store much less than hard disks, and are cumbersome when more than single list sizes are processed. They will handle little more than a very simple age-sex register and simple programs. Possibly 80-100 floppy disks may be needed for a multidoctor practice. A full patient record requires about 3000 bytes and even a modern floppy disk will contain only 200 patient files of this kind. For large lists the difficulties in managing large numbers of floppy disks are too considerable and may be counterproductive. This means that hard disks are almost mandatory in systems for two or more principals.



Studies have shown that even for simple unsophisticated data manipulation a large external memory is a necessity. For registration data, simple encounter data, and repeat prescriptions a memory level of 1 megabyte per 100 patients is an absolute minimum. A system rarely has enough memory for the user, partly because of the fertility of the user's ideas once the computer is being used. It is suggested that initial requirements should be multiplied by 25% to allow for the extension and incorporation of new ideas, which appear almost invariably as if by magic.

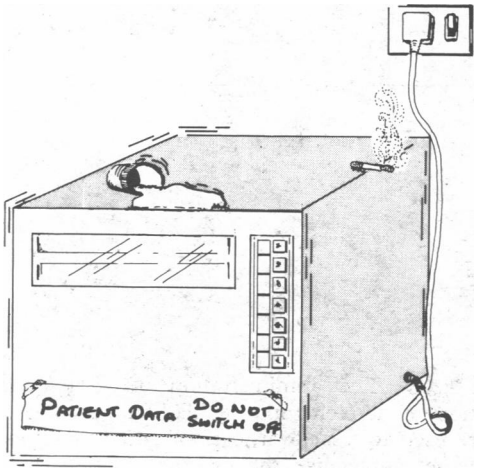
A practice with 10 000 patients thus needs a storage capacity of at least 25 megabytes. The system in use in the core practice of the department of general practice and primary care at St Bartholomew's Medical College has now used more than 30 megabytes to enter basic data on 7000 patients; there is still a long way to go. This experience must call into question the size of systems now being offered with memories that rarely exceed 10 megabytes. Such systems can perform minimal tasks only and must be purchased with expansion in view. The whole question of external memory is a difficult one. Some practitioners argue as follows: "All I need to do is to have an age-sex register with appropriate population subsets, and a repeat prescription package." The answer could well be that the change to computers might be too expensive if this is all that is required and too disorganising to the practice as a whole; a set of punch cards could do the same job.

## Processors—expansion



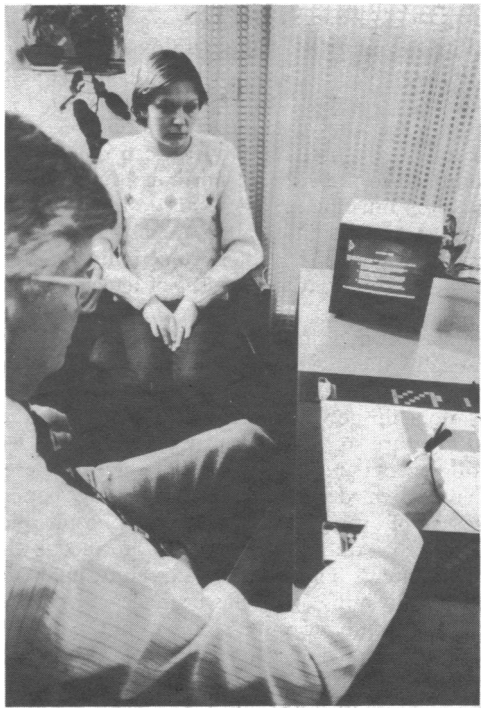

It is prudent to buy a system that can expand—that is, its internal memory is flexible enough to allow more powerful programs to be used, as these become available. There should also be capacity on the motherboard to house new programs as well as ports for the addition of extra terminals such as screens and printers.

## External storage




External storage memory is expensive, but hard disk memory is essential except for very modest requirements in small practices. Sealed Winchester disks offer large memories relatively cheaply, and the use of video cassette tapes has resulted in a further fall in back up costs. Practices with larger systems have been sold hard disk memories with the suggestion that no special environment was required. Many installations are necessarily in record rooms that are dusty, but dust is catastrophic to the moving heads in hard disks. Record rooms are hot, especially in summer, but heat causes malfunctions of the disk. Hard disks are subject to electrical interference which causes failure of memory with loss of data. The purchase of a voltage spike suppressor and the provision of a clean electrical line should be seriously considered. The hard disks themselves are extremely noisy. If a separate room is not available expert advice needs to be taken on the suitability of the chosen location.

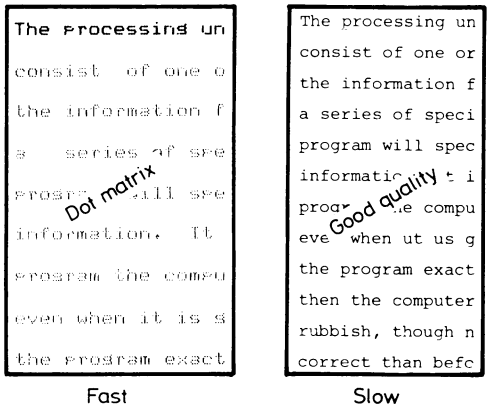
## Video screens



A standard size screen is necessary for the operator, particularly if word processing is part of the package, but if terminals in consulting rooms are contemplated nine inch screens are compact and relatively unobtrusive. The location of screens is extremely important and should be thought out very carefully. A screen in each consulting room is a major advantage for speedy retrieval of patient data during the consultation and may reduce the need for medical record file handling; it is also necessary if data are to be entered during the consulting period.

If one requires simple data input and output, the visual display unit and printer can be located in the records room within easy access of the reception staff. Registration data can be entered by the visual display unit operator, although repeat prescriptions may be printed by the reception staff. Does one need a special computer operator? Our experience is that an operator is necessary although not necessarily a specially trained one—a competent intelligent typist can do this job. Let no one, however, retain the illusion that computerising a general practice actually reduces the need for staff. If only registration data and prescription data are to be entered then one operator is probably enough for a practice of 7000-10 000 (until she goes on holiday or is ill). For more patients or if extra modules are required for more complete encounter data then one operator is not enough. There must be someone else who can enter data when the operator is not available.

## Printers




Printers are fast or slow, of typewriter quality or with "computer-like" print (dot matrix). If referral letters or reports are required then a word processing printer that is of equal quality to an electric typewriter will be needed. If speed is paramount then a dot matrix printer is advised; a bidirectional one is faster than a single direction printer.

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