Writing all prescriptions by computer

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SUMMARY. The information needed for safe prescribing is voluminous, complex and subject to continuous change. The computer makes an ideal instrument on which to store, access, and update general practice prescribing information. By using a desktop computer to check and write all prescriptions, it is possible for the general practitioner to build up a medication data base which has the capacity to record response to treatment and to supply information which can be reported to a remote central drug authority on a regular basis.

Introduction

THE three phases of development of computer systems in general practice are now well defined. The first phase, which confines the computer to the secretary's office, would appear to have attained such potential as it possesses — in repeat medication, in recall of patients for preventive procedures, and in taking over the control of age–sex registers and appointments. No new applications have been added to the list since 1981, despite the impetus of Department of Industry support for this phase of development and despite the efforts of a multitude of developers.

By contrast, the second and third phases of general practice computing — those in which the doctor himself uses the system at the consultation and in which his computer is linked to other computers through telecommunication — are still in their infancy despite their enormous potential. Only the more advanced of the developers offer a doctor's desk record system. These are systems which, because of their greater sophistication and power, require more processing capacity, storage and software support than can be accommodated on the small microcomputers.

There are many reasons why the disk-driven desk system with communicative facilities must ultimately become the norm in general practice. Faster entry of data, better display of records at consultation, and the acceptance of electronic mail through a terminal which can both process and file messages are a few of these reasons. Interactive procedures such as the validation of prescriptions and the acquisition and updating of data bases borrowed from other computers to assist with the consultation are other uses for the desktop system, and these uses are the particular concern of this paper.

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'Drug intelligence' package

Rationale

The following factors make the accurate use of drugs in general practice unnecessarily difficult.

1. The volume of information on available drugs is such that a digest has to be provided for the prescriber. Of the many digests published, some are at variance with other ones and often the presentation of the information is inappropriate to general practice. The most accessible digest is the *Monthly Index of Medical Specialities (MIMS)* but this reference source falls short in several important respects, for example as regards interactions, precautions and contraindications.

2. Information changes with the introduction of new drugs and the deletion of discontinued products; new uses and caveats arise for drugs already in use. Drug information therefore has to be updated at frequent intervals, and the updated information must be integrated with prescribing routines.

3. Although the pharmacist can check the doctor's prescription for errors of drug specification, for possible interaction of different drugs on the same prescription and for most dosage errors, there is no double check against known patient idiosyncrasy in respect of particular drugs, against interactions with drugs prescribed previously nor against precautions and contraindications, since the critical information needed for verifying these factors is vested in the patient's medical record.

4. It is difficult for the doctor to remember all the details relating to the drugs in his armamentarium — their

formulation, strength, dosage and pack sizes — and especially in the case of those drugs he uses infrequently.

5. Instructions given to the patient regarding administration of the drug may be poorly expressed, misunderstood or omitted. While written instructions prove more effective than those given verbally, there is little or no time to write down instructions for patients during consultation.

6. Handwritten prescriptions are often difficult to read — a source of error.

Computer solutions

Although some side-effects of drugs are an inherent risk in their use, other adverse reactions are avoidable. The prevalence of iatrogenic conditions is unacceptably high.[1,2] The computer, used as an aid to prescribing, has the capacity to reduce this risk to a minimum, and at the same time to improve on the speed and convenience of writing prescriptions.

The doctor's desk computer will act as an integrated unit during prescribing. In terms of its components, however, he will be using the visual display unit (VDU) to display textual information on patients, drugs and prescriptions; the keyboard to enter the medication data; the disk to store the drug data base and patient 'files'; the processing memory to check new drugs against information held in store; and the printer to print the prescription. A communicating modem will allow the exchange of drug data between the practice and a central drug intelligence agency.

Procedure

The computer will provide synoptic information on all branded products on demand, and to ensure that the proposed administrative schedule is appropriate it will also check the doctor's choice of drug against stored data on product and patient. Finally it prints the prescription, as a first issue or a repeat. For these facilities, though, the following steps must first be taken.

Drug information. Authoritative information, in the form of a synopsis of the data sheet, must be obtained from each manufacturer for every product. The format has to be such that it can be accommodated within one display screen and the text structured under subheadings where appropriate (the order of the subheadings is standard.) The doctor can recall a condensed data sheet by keying in one of several alternatives: the name of the drug, the action required of the drug, the body system to be treated or the disease to be treated.

Computer codes. Computer readable codes have to be allocated to those characteristics of the drug which are used in the processes of recalling the condensed data sheets, cross-checking the information on a proposed new drug, and in facilitating, validating and printing the medication entry and other prescribing details. Codes are prepared for both proprietary brands and generic drugs. The condensed data sheets, and the codes and programs required to harness them, are loaded onto the practice computer.

Visual display unit (VDU). The doctor uses the visual display unit to record his choice of drug and the schedule for its administration. After the consultation, the entries on the screen will be lodged in the patient's computer file. This screen must show the patient's name, address and date of birth, together with any history of drug problems (idiosyncrasies or overdosage). On a cumulative basis it will also show every prescription which has been issued, either as a 'once only' or as a repeat. The computer checks that the proposed medication and the treatment schedule do not contravene any stored instructions. Thus it checks for idiosyncrasies related to ingredient and/or action, for potential interaction with drugs used as repeats or drugs prescribed within the previous four weeks, for inappropriate dosage for age and it gives notice of precautions and contraindications in the use of the drug. Warning of interactions, necessary precautions and contraindications appears initially on the screen as a single character symbol which can be elaborated to full text on demand. The system also indicates if the drug is unrecognized, if there is a history of overdosage, and if the drug is subject to control under the Misuse of Drugs Act (in which case printing of the prescription will be prevented).

Entry of drug details. The computer can refer to internally held lists as entry proceeds. By these means, only the number of keys that is required to render the word unique on the list need to be depressed; the entry cannot be misspelt; and a preparation cannot be specified if it does not exist. Moreover, all the details required on the prescription form and on the dispensing label (in dispensing practices) will be included in the assisted entry data. A personalized 'dictionary' for the system, containing the doctor's own repertoire of tried and trusted drugs and their schedules, is also stored, so that if the doctor wishes to use a drug listed within it, depression of a few keys will identify the entry. By means of the assisted entry, which guides, checks and speeds keyboard input, prescriptions can be written more quickly, more accurately, more conveniently and more legibly by computer than by hand. Whereas with manual records the doctor must not only make an entry on the record but also write out the prescription and raise a repeat medication record or dispensing label where appropriate, the computer enables printing of these documents following a single entry on the keyboard. The patient's name, address, and age if under 12 years, are automatically added to the prescription from data held in the patient file. It is also possible to obtain a printout of instructions on the administration of the drug for giving to the patient.

Further cross-checks are built into the system. Thus two drugs in the same group in terms of action cannot be prescribed; the contraindications, interactions and idiosyncratic potential associated with the formulation are allowed for, and those administrative instructions which are mandatory in the use of the drug are supplied automatically.

The aim must always be to ensure that all forms of error in prescribing are eliminated. The computer system does not, however, choose a drug for the doctor, and the doctor is at liberty to override the warnings if he considers this course justified.

Updating

The initial loading and periodic updating of the drug package are most conveniently undertaken through a communication modem on the practice computer and through telecommunication lines with access to a central drug intelligency agency.

Response records

The computerized prescribing system which makes provision for the doctor to enter adverse reactions to drugs at subsequent attendance by the patient duplicates this information in the patient file. This provision can be extended to the recording of 'cure' response. Both types of information can be stored in the practice computer and, with the consent of the doctor, abstracted periodically through electronic mail at the time when the drug package is updated. Such recording provides the basis for reporting on drug response to a central agency by entirely automatic means which require no form filling on the part of the doctor. It may be argued that the doctor who is already protected through monitored prescribing is more likely to allow scrutiny of prescribing information. The confidentiality of data released to the central agency will be protected; the identity of the patient will not be known.

Integration

The computerized prescribing system may be used by the doctor as a 'stand alone' facility on his desk at consultation, or it may be integrated with an existing 'host' record system, a system in which case-file transfer between host and drug package will provide for tandem control. The package may also be integrated with an existing phase I computer system transposed to the consulting room.

One major advantage of the computer-based prescribing system is that initial loading of patient records is not required. Once the system has been running for the issue of the first few prescriptions, it is self-maintaining as regards patient data.

Sponsorship

The development of the drug intelligence package for general practice has received the full support of the Association of the British Pharmaceutical Industry and the sponsorship of 38 of its major member companies. Provision has been made for the dissemination of the package through a commercial data base service which involves a central computer connected to a private telephone network.

References

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Computer method for estimating hearing threshold

Auditory brainstem responses (ABRs) to click stimuli have become established as a useful indicator of hearing thresholds in infants and young children. Although the investigation is objective in so far as the patient is concerned, a subjective element remains in the decision by the operator as to whether or not an ABR is present in an averaged wave-form. A simple on-line computer detection technique is described which removes some of the reliance placed upon the operator. The technique employs a scanning window for correlation and amplitude analysis of pairs of averaged ABR waveforms.

The reliability and accuracy of computer and operator scoring of 25 thresholds in normally hearing adults and 50 thresholds in infants and young children with suspected hearing impairment have been investigated. In the adult group, 96 per cent of computer estimates of the threshold were within ± 10 dB of the subjective hearing threshold, compared with 92 per cent for operator scoring. There were 92 per cent of computer and operator scores within ± 10 dB of each other. In the patient group there was equally good agreement between computer and operator scoring with 90 per cent of the thresholds within ± 10 dB of each other; the incidence of possible false-positive thresholds was also lower with computer scoring.

This on-line scoring technique, therefore, offers useful assistance to the operator; requires only limited computing power, and is suitable for use in a routine clinical environment.

Source: Mason SM. On-line computer scoring of the auditory brainstem response for estimation of hearing threshold. *Audiology* 1984; **23**: 277-296.