Accessing remote data bases using microcomputers

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SUMMARY. General practitioners' access to remote data bases using microcomputers is increasing, making even the most obscure information readily available. Some of the systems available to general practitioners in the UK are described and the methods of access are outlined. General practitioners should be aware of the advances in technology; data bases are increasing in size, the cost of access is falling and their use is becoming easier.

Introduction

Many general practitioners now have their own microcomputers. Various aspects of the use of microcomputers, especially for practice administration and record keeping, have been described.[1,2] However, many doctors may not appreciate that by linking with other computers their microcomputer may be used as a powerful tool for research or for obtaining information. Recent developments have reduced the cost of the hardware which is necessary to run such systems, and cheap software has become readily available.

This paper describes how, with a few pieces of additional equipment, a microcomputer can provide access to a wealth of useful information by using the telephone network.

The technology

There are three problems to overcome before computers can communicate with each other. First, a physical link must be established between them; secondly, they must 'speak' the same language; and finally, they must 'talk' at the right speed.

Generally it is impractical to lay cables between distant computers. Instead, either the telephone network or a specially dedicated data network is used.

Telephone lines are the most common link but they are designed for the transmission of voice signals. These are analogue signals not the digital signals used by computers. A modem (*mo*dulator *dem*odulator) is needed to convert the digital computer signals into analogue form for transmission by the telephone network. A second modem converts these signals back into digital form for the receiving computer.

Packet-Switch-Stream is a dedicated data network run by British Telecom and it is connected to similar networks in most other developed countries. It is possible to link directly into this system but this is expensive as lines have to be laid from the nearest Packet-Switch-System exchange to the computer. The system 'parcels' data together with source and destination addresses in such a way that many different users may utilize the same lines simultaneously thus enabling efficient transmission. In many cases it is cheaper to use this system than the telephone network — the user pays primarily for the amount of data sent; the time connected to the system and the transmission distance comprise a smaller proportion of the total cost. This can be an important factor when accessing data bases overseas. To avoid the cost of laying lines from the Packet-Switch-Stream exchange to the computer it is possible to use a modem and the telephone network to contact the exchange.

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Once the computers have been linked the problems of language and transmission speed arise. Most computers (but not Prestel, the British Telecom viewdata system) use a character code called American Standard Code for Information Interchange (ASCII) into which data is normally converted. The letter 'K' for example is represented by the binary number 1001011. Consequently, unless dealing with Prestel, language itself is not a problem. However, extra signals are included when data is transmitted. These signals control the flow of information between computers and check for errors which may result from data corruption during transmission.

Both the transmitting and the receiving computer must use the same protocol. This problem is overcome by using a suitable communications program which instructs the transmitting computer to use a protocol which is compatible with that of the computer system being accessed. Fortunately, there is some standardization between these protocols. However, Prestel uses non-ASCII codes, different data transmission rates from other systems, and is accessible only via telephone lines. Software packages have been specially designed to run on this system but may be unsuitable for more general use.

Equipment

Hardware

Most microcomputers are suitable for accessing data base systems providing they have an RS232 port. This is a socket on the machine which allows data to be transmitted and received in serial form. The microcomputer is connected via this port to the modem. Modems are of two main types. With acoustically-coupled modems, a telephone handset is fitted into rubber cups on the modem which does not require direct connection to the telephone system. Modems which plug directly into telephone sockets are now preferred because data transmission is clearer and is not affected by environmental noise. Some modems are suitable for use only with Prestel but more versatile types are available.

Software

Communications software consists of programs which run on the microcomputer to select the protocol required and the data transmission speed. They offer the user a variety of options for the data received, for example, printing it out or storing it on disc. Software is available in many forms — on magnetic tape, on disc or as ROMs (Read Only Memory chips) which can be fitted to some machines, for example, the BBC microcomputer.

The cost of a modem and suitable software can be as low as £150.

Data bases

Viewdata

Prestel. This is one of the largest publically available data bases. It has about one-third of a million pages of information which can be called up on the screen on subjects ranging from antiques to zinc prices. A wide variety of topics are of interest to health care professionals; these include the current Department of Health and Social Security benefit rates, vaccination data, details of conferences and the contents of the current issue of this *Journal.*[3] Information specifically designed for medical practitioners is also available.

As the data base is held on computer it can be easily and quickly updated. The system is interactive and so users can provide as well as extract information. Communication is possible with a variety of medical organizations and with other users of the system. This is an example of electronic mail.

The cost of using Prestel is composed of four elements. First, the telephone call to the Prestel centre (usually local call rates). Secondly, a charge for using the Prestel computer (5p per minute but free during off-peak periods). Thirdly, a page charge levied by a minority of information suppliers and finally, a quarterly subscription of £5. The maximum cost is approximately 10p per minute. After 18.00 hours and at weekends this falls to less than 2p per minute.

Scottish Poisons Information Bureau Viewdata Information Service. This is one of the most interesting viewdata systems for general practitioners, containing comprehensive information on approximately 10 000 potentially hazardous substances. The system can be accessed by the same equipment as for Prestel and is quick and easy to use. Also available is a literature file containing references to selected poisons.

One of the problems with such a system is that it does not have the flexibility of human conversation. However, ambiguity is avoided and if a printer is coupled to the microcomputer then a paper copy can be made for future reference.

Committee on Safety of Medicines. This viewdata facility has been available since November 1984 as a pilot scheme. It is run by the Committee on Safety of Medicines in association with Baric, an independent viewdata company, and use is made of the Baric computer to store the data. Doctors report suspected adverse drug reactions to this system and these reports may later be amended in the light of further information. It is also possible to view statistics on adverse drug reactions and to receive messages.

On-line computerized libraries and bibliographies

Since the early 1970s large computer systems have held bibliographic and abstracted information from medical and scientific literature. These systems allow rapid searches of references and abstracts from a wide range of journals traditionally available only in the printed form. Originally, when access to these systems was difficult and expensive and involved complex search procedures, large libraries were the main users.

Recent developments have made such systems more widely available. These developments include the introduction of simpler, 'user friendly' search techniques, the availability of less expensive equipment and of data transmission networks which reduce the cost of access.

Data bases usually originate from publishing houses, for example, Exerpta Medica from Elsevier, or from institutions, for example, Medline from the National Library of Medicine in the USA. These data bases are supplied to host systems such as Dialog or Datastar which may be private or governmental organizations. The data bases are used in accordance with the host data management system, which controls the search facilities. A host may offer a variety of data bases and a particular data base may be offered by a variety of hosts, so it is important to check both cost and availability before registering with a system.

A typical example of a user friendly system is Knowledge Index which is a subset of Dialog. This utilizes many of the Dialog data bases (including all those which are medically oriented) but is much easier to use. It consists of 27 data bases with 18 million citations. Each citation gives the title of the publication, the name of the author and the source of the item. Many citations include abstracts, and all include descriptors which are labels indicating the different topics covered. Items of interest are easily found. A command is given to enter a section of a data base and then search criteria are set up. The search criteria may be based on an author's name, a journal title, descriptors or any combination of these. It is necessary to plan searches. For example, entering 'doctor' as a descriptor would exclude references to 'physician' and 'medical practitioner'. In practice users should consult the manual and have clearly defined ideas before beginning their search. Once the search is complete the user may have the references displayed or printed in a variety of forms. Original papers may be ordered on-line and they are then sent by post to the user but this is very expensive. These services are accessed using Packet-Switch-Stream, so the cost is limited to the call to that exchange and the time connected to the host computer. In the case of Knowledge Index this is US $25 per hour including Packet-Switch-Stream costs (charged to the user's credit card). There is no subscription charge, but there is a registration fee of £25 which includes two hours practice time. Also included is a comprehensive manual describing the data bases offered, search facilities, and search techniques. A typical search would cost about £5. One problem with Knowledge Index is that it is only available after 18.00 hours. Searching a medical data base using the standard Dialog service, which is available throughout the day, would cost US $35 per hour.

Some host systems plan to publish medical journals electronically. One such service is Clinical Notes On-Line which will be distributed on the Datastar system.

For general practitioners in remote areas these on-line services are helpful for finding useful references. Papers may then be ordered from the local postgraduate medical centre. However the cost of these on-line services can be high compared with some library services (including that of the Royal College of General Practitioners) which may offer a subsidized facility with the added benefit of professional advice.

Terminal to mainframe

As more Family Practitioner Committees obtain computers the possibility arises of exchanging information between the surgery microcomputer and the Family Practitioner Committee computer. It has been suggested that such links would facilitate administration, screening programmes and audit.[4]

Most universities have large mainframe computers. Data from research projects in general practice may be entered into the university computer by the researcher via surgery microcomputers using an appropriate communications package. The researcher is then able to make use of sophisticated programs, which can be run on the mainframe computer, for example, statistical packages, and distribute the resulting data to other users.

Accessing the data base

After assembling the required hardware and software it is necessary to log-on to the required system. In the case of viewdata systems this simply involves dialling a telephone number but for other systems this may be more complex. For example, Knowledge Index requires the user to dial a Packet-Switch-Stream exchange, then enter a network user identity which is supplied by Dialog followed by a destination address code in order to reach the computer in California. Once the computers are linked the computer screen will display instructions and the user will be required to enter a user identity, usually a number supplied on registration. A password is then required which is usually a word or number of the user's choice. The user is then logged-on to the system.

With viewdata the user is led through the system by instructions appearing on the screen until the desired information is reached. With bibliographic data bases less guidance is provided on the screen, instead the user must refer to the handbook.

Conclusion

Accessing viewdata is cheap, easy and worthwhile. Accessing bibliographic data bases is more expensive and alternative services are available. However there may be times when convenient access to these services could prove helpful. Any general practitioner who is thinking of using on-line services should consider investing the small additional cost for equipment which is compatible with all the services available.

The use of computers makes even the most obscure information accessible. Information can be updated quickly and distributed widely. In the future data bases will increase in size, the cost of access will fall, and their use will become easier. General practitioners should be aware of this technology and its potential.

References

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Lassa fever

A 27-year-old British nurse, who had been working in Sierra Leone, is the tenth reported case of lassa fever imported into the UK and the first case to be evacuated from West Africa to this country in an isolator, although a sick doctor was evacuated to Germany in 1974 with similar high-security precautions. All of the other nine UK cases are believed to have travelled on scheduled flights; four of them were ill, two in the incubation period and three convalescent at the time of their flight. No spread of infection was reported.

Five of the UK cases were in nurses or doctors and the other five had lived or worked in rural areas of West Africa. No cases have been reported in visitors to large towns or cities nor in holidaymakers and, indeed, because the small multimammate rat which is the source of the infection does not usually inhabit such urban areas, the risk to those travellers is negligible. Rodent infection with lassa virus is mainly localized in rural areas where human infection usually occurs, probably by the contamination of broken skin or mucous membrane with infected rat urine. Infection may also occur in health care staff by accidental inoculation of virus from patients during health care procedures in the hospitals serving these rural areas. Experience suggests that spread of virus by the airborne route is exceptionally rare.

Advice on control measures in the UK is provided in the *Memorandum on lassa fever* (Department of Health and Social Security), a revision of which is to be published soon, and is available from the CDSC to which all suspected and confirmed cases should be reported.

Source: PHLS Communicable Disease Surveillance Centre. *Communicable Disease Report* 1985. Weekly edition 85/10.