Obtaining medical information from the Internet

ABSTRACT The Internet is rapidly expanding as an environment for electronic communication and resource sharing. The World Wide Web, a relatively new service on the Internet, provides access to a wealth of information resources through a simple point-and-click interface. Available resources of interest to physicians include bibliographical and statistical databases, literature reviews, discussion groups, press releases, newsletters, drug information, self-assessment questionnaires, multimedia textbooks, patient simulations, clinical decision aids, educational software, and much more. Access to the Internet is widely available in universities and medical libraries; physicians working at home can gain access from a personal computer linked by a modem to a telephone line, by subscribing to an Internet service provider.

Originally designed to enable the sharing of computer resources among academic and research institutions in the United States, the Internet has evolved as a global network of interconnected computer networks. It has become an indispensable tool for electronic communication and a repository for all kinds of information provided by academic institutions, libraries, government agencies, commercial organisations and individuals throughout the world. Although there is a charge for access in certain cases, most of the information is freely available to anyone with a computer linked to the Internet.

Internet resources of interest to physicians include bibliographical and statistical databases, literature reviews, discussion groups, press releases, newsletters, drug information, self-assessment questionnaires, multimedia textbooks, patient simulations, clinical decision aids, educational software, and much more. Many of the available resources are interactive programs, for example enabling physicians to search a remote database, complete a multiple-choice questionnaire or test their diagnostic skills by interacting with an on-line simulation of an imaginary patient. Access to the Internet is widely available in universities and medical libraries. Alternatively, if you are working at home you can gain access to the Internet from a personal computer linked by a modem to a telephone line, by subscribing to an Internet service provider.

A variety of services and tools for accessing and disseminating information are available to Internet users, such as electronic mail, the World Wide Web, mailing lists, newsgroups, file transfer, and on-line connection to remote computers.

Electronic mail

Electronic mail, or e-mail, is perhaps the most popular and useful service available on the Internet. It offers several advantages over other methods of communication, not least that the cost is independent of destination. The majority of e-mail messages are very informal and consist of only a few lines of text. Word processing or spreadsheet documents can be sent as attachments, and some e-mail programs automatically handle the encoding and decoding required to send and receive such documents. Delivery time varies from a few seconds or minutes to a day or more. If the recipient happens to be working at a computer when your message is delivered, it is not unusual to receive an almost immediate reply. By requesting confirmation of delivery, you can at least be assured that your message has reached its destination. If your message happens to be incorrectly addressed, it will usually be returned very quickly with a note to tell you that the destination, or user, does not exist.

Every user has a unique e-mail address (eg dmg.mcsherry@ulst.ac.uk) with the following structure:

user-name@host-name.organisation-type.country-code

The name of the user is followed by the symbol @, followed by the name of the host computer, the organisation type (eg ac = academic institution, com = commercial organisation) and the country code. A country code is not required for destinations in the United States.

When an e-mail message is delivered to your computer, if permanently connected to the Internet, a note appears on the screen showing the message title and the name of the sender, and inviting you to read the message. Most e-mail programs enable you to send an immediate reply. You need only click on a Reply (or similar) button to display a reply template complete with the recipient’s e-mail address and your own, and a message title consisting of ‘Re:’ followed by the title of the original message. To complete the reply, enter the body of your message. Greetings are usually informal and often omitted as a postcard. The message will not be sent until you click on the Send button, when your preferred electronic signature (name and contact details) will be appended if you have selected this option.

You can send copies of a message to any number of colleagues, or forward a message you receive to other interested users. Although convenience and informality are among the main attractions of e-mail, it is worth remembering that, once sent, messages cannot be retracted. Some Internet users prefer to use word-processing software to prepare messages, then paste...
them into an e-mail program when ready to be sent. It is also important to realise that e-mail is not secure. Unless protected by encryption\(^2,3\), your message may be read by someone other than the intended recipient, for example if human attention is required to resolve an addressing problem. A good rule of thumb is never to say anything in an e-mail message that you would not write on a postcard.

The World Wide Web

One reason for the rapidly growing interest in the Internet is the ease of use made possible by the World Wide Web\(^4,5\). Based on the hypertext approach to the non-linear presentation of computer-based information\(^6\), the Web provides access to a wealth of Internet resources through a simple point-and-click interface. Each site on the Web offers a collection of linked pages of information to which the usual point of entry is called the Home page. Each page may contain underlined phrases or buttons indicating links to other Web pages that may be located at a different site, possibly in another continent. The links contain the addressing information necessary to access the remote site when you click on the text or button.

A Web browser is a program that runs on your own computer. A Web server is a computer that sends information in response to requests from other computers. When you click on a hypertext link to a remote Web page, your browser sends a request to the appropriate Web server, the server sends back the required page, and your browser displays it on the screen. The time it takes to load a Web page ranges from a few seconds to several minutes, depending on how busy the server happens to be, the graphics content of the page, and the speed of your modem if you are a dial-up user.

Every Internet resource has a unique address called a Uniform Resource Locator (URL). The URL for a Web page has the following structure:

http://host-name.organisation-type.country-code:port/path

The first four letters stand for hypertext transfer protocol, the access method used by the World Wide Web. As in the case of e-mail addresses, a country code is not required for Web sites in the United States. The port component is a contact address required by the Web server only if the default address does not apply. The path component, if any, specifies the directory location and name of a file containing a Web page other than the Home page at the Web site.

A Web session is often started by entering the URL of an organisation’s Home page, or a Web site containing a catalogue of medical resources such as OMNI (Organising Medical Networked Information) at:

http://www.omni.ac.uk/

Before the session is finished, the user may have visited many Web sites without entering another URL. With the freedom of movement that the Web provides, finding your way back to a Web site or page that was particularly interesting could be quite tricky without the powerful navigational aids provided by most Web browsers. For example, a click on the Back button takes you back to the page you have just left. In most Web browsers you can add the URL (and title) of the current Web page to a list of bookmarks. In later sessions you need only select from your list of personal bookmarks to go directly to the corresponding page.

Many medical centres allow public access to information maintained on their Web servers\(^1\). One of the Web sites most widely used by patients as well as physicians is OncoLink, maintained by the University of Pennsylvania Cancer Research Centre at:

http://cancer.med.upenn.edu/

An outstanding example of how information can be effectively disseminated on the Internet\(^2\), OncoLink offers free information on all aspects of cancer. The resources available at the site are easily accessible from a menu of ten main categories including cancer causes, screening and prevention, frequently asked questions about cancer, psychosocial support and personal experiences, and treatments under evaluation in clinical trials. Alternatively, a full-text search engine with support for Boolean queries can be used to search the available resources. For example, a search for smoking and mortality will retrieve links to all Web pages at the site containing both of the keywords smoking and mortality.

Mailing lists

Mailing lists extend the usefulness of e-mail by providing the means for a group of users who share a common interest to exchange useful information. It is easy to subscribe to a mailing list, and there is no charge for the service. Once you become a subscriber, you will receive a copy of every message posted to the mailing list, and replies posted by other subscribers.

The National Mailbase Service based at the University of Newcastle runs a mailing list service for the UK academic and research community\(^7\). Before subscribing to a mailing list it is worth visiting the Mailbase Web site at:

http://www.mailbase.ac.uk/

where you can browse the archives of all messages previously posted to the list to assess the quality (and volume) of the mail you are likely to receive.

To obtain the names of all the available lists, send an e-mail message to:

mailbase@mailbase.ac.uk

with the single word lists as the body of the message. There are over 500 lists dealing with a wide variety of topics including several of interest to the medical community. For example, to subscribe to the list called evidence-based-health, send another message to the...
same address with the following single line as the message body:

subscribe evidence-based-health firstname(s) secondname

The message title should be left blank and no signature appended.

When posting a message to a mailing list to which you have subscribed, make sure you send it to the mailing list and not to the Mailbase service. For example, messages posted to evidence-based-health should be addressed to:

evidence-based-health@mailbase.ac.uk

If you wish to be removed from the mailing list at any time, send the following message to the Mailbase service:

LEAVE evidence-based-health

Finding relevant information

Following links that attract your interest, with no particular goal in mind, is called surfing the Internet, an activity most users find enjoyable and informative. However, because of the endless distractions, surfing can be very time-consuming and is seldom a cost-effective way to find information relevant to a specific query or problem. Fortunately, a variety of tools is available on the Internet to help you to find relevant information. One of the easiest to use is the Yahoo subject catalogue at:

http://www.yahoo.com/

By selecting first from a list of 14 top-level subject headings, and then from a series of lists of increasingly more specific subject headings, you are guided to a list of Web sites that offer information relevant to the topic of interest. To access one of the listed sites you need only click on the appropriate link. Although the Yahoo database is not restricted to medical information, one of its top-level subject headings is Health, leading to a list of more specific subject headings like Medicine or Diseases.

The Yahoo database can also be searched by keyword. However, keyword searching will fail to retrieve relevant documents in which a keyword you choose is replaced by a synonym or spelt differently. This is a general limitation of free-text databases in comparison with, for example, MEDLINE in which the indexing of documents is based on a standard thesaurus of Medical Subject Headings (MeSH). Because the scope of the Yahoo database is not limited to medical information, an unrestricted search is also likely to retrieve a lot of irrelevant information. For example, a search for fertility may retrieve links to Web sites offering information about soil fertility. However, you can restrict the search to an appropriate subset of the database by selecting one or more subject headings, eg

Top:Health:Medicine

and selecting the option to search only in the corresponding subset.

An unfortunate consequence of the ease of publishing on the Internet is that much of the available information is of dubious quality. Unlike the information published in medical journals, most of the medical information published on the Internet is not subject to peer review. Recognising the problems faced by health professionals requiring efficient access to quality information, organisations like the American Medical Informatics Association (AMIA) are responding to the challenge of organising and evaluating medical resources on the Internet. The Medical Matrix developed by AMIA is one of a growing number of evaluated catalogues of medical information. As yet less comprehensive, though with a similar commitment to quality, is OMNI. The OMNI database consists of two sections, one that focuses on medical resources in the UK and another that aims to provide worldwide coverage.

Only resources that have been evaluated for quality are included in OMNI. The entry for each resource includes a brief description of its content, thus enabling the user to assess the relevance of the information before accessing the resource. All entries are assigned appropriate subject headings to facilitate browsing. The database can also be searched by keyword, with options to restrict the search to UK resources or search the entire database.

Getting connected

To access the Internet from home using a personal computer, with support for e-mail and Web browsing, you will need:

- a high-speed modem
- a program that supports TCP/IP (Transmission Control Protocol/Internet Protocol), the protocols used by all computers connected to the Internet
- a SLIP (Serial Line Internet Protocol) or PPP (Point-to-Point Protocol) driver to enable TCP/IP to be used over a telephone line
- a Web browser such as Netscape Navigator
- an e-mail program such as Eudora or Pegasus Mail

For Web browsing, the minimum acceptable hardware configuration is a personal computer with a 486 processor and 4 megabytes of random access memory.

You will also need an account with an Internet service provider, who will supply the necessary software, instructions for installing it on your computer, and an address that uniquely identifies your computer on the Internet. As a dial-up user, your computer will be connected to the Internet only while linked by a modem and telephone line to your service provider. Your incoming mail will be stored, possibly for a limited period, by your service provider. You will need
to know for how long your mail is kept, and check your mailbox regularly for the arrival of new mail, which can be downloaded to your own computer for reading off-line. Another way to reduce telephone costs is to compose your own messages off-line and store them on file ready for sending the next time your modem link is active.

**Choosing an Internet service provider**

There is a choice of numerous Internet service providers in the UK. Many provide local-call access from anywhere in the country, enabling subscribers to connect to the Internet for the price of a local telephone call. Other factors to consider include the platforms supported (eg PC or Macintosh), technical support, software provided, set-up fee and monthly charges (typically around £12-15). Access to technical support by telephone is particularly important when installing the software and connecting to the Internet for the first time.

Some service providers offer a free trial period, while others insist on a minimum subscription period of 3 months or longer. Most, like Demon Internet, charge a set-up fee followed by a flat monthly charge, with unlimited connection time. CompuServe charges no set-up fee and a relatively low monthly charge which includes 5 hours free connection time; after that an hourly connection charge is payable. This arrangement could be very cost-effective if you intend to use the Internet mainly for electronic mail.

It is worth asking about the cost of any optional extras such as having the software sent to you on a diskette as an alternative to downloading it from your service provider’s system. Also check whether any of the software provided is shareware, for which a nominal licence fee is payable for continued use after a trial period.

**Discussion**

With ever more medical resources becoming available on the Internet, the benefits to medical practitioners of Internet access are growing rapidly just as costs and learning times are plummeting. A wealth of information resources and tools to support continuing medical education, decision making and research is now easily accessible at reasonable cost from the convenience of your own home. Particularly with the ease of use provided by the World Wide Web, the Internet is increasingly used as a source of information, and a forum for discussion, by patients as well as physicians. Goldwein and Benjamin warn of the dangers of potentially harmful medical information on the Internet and urge health care providers to become more familiar with Internet technologies to ensure that they remain the prominent providers of medical information.

**Further information**

For an excellent overview of medical resources on the Internet, including a ‘top ten’ list of resources, the reader is referred to Kiley’s book. Also recommended is the series of articles by Palen, Further details of Internet service providers in the UK can be found in popular magazines such as *Internet*.

CompuServe Information Services (UK) Ltd, P.O. Box 676, Bristol BS99 1YN. Tel: 0800 289 378.

Demon Internet Ltd, 322 Regents Park Road, Finchley, London N3 2QQ. Tel: 0181 371 1234.

**References**

1. Glowniak JV. Medical resources on the Internet. *Ann Intern Med* 1995;123:123-31.
2. Palen M. Guide to the Internet: introducing the Internet. *Br Med J* 1995;311:1422-4.
3. Palen M. Guide to the Internet: the world wide web. *Br Med J* 1995;311:1552-6.
4. Woodhead N. *HyperText and Hypermedia*. Addison-Wesley, 1991.
5. Watson I. The great electronic information bazaar: a rough guide to exploring the Internet. *Aslib Proc* 1993;45:153-9.
6. Siegel ER, Cummings MM, Woodsmall RM. Bibliographic-retrieval systems. In: Shortliffe EH, Perreault LE (eds). *Medical informatics: computer applications in health care*. Reading, Massachusetts: Addison-Wesley, 1990:434-65.
7. Klemenz B, McSherry D, Grandke V. Clinical problem solving by computer. *JR Coll Physicians Lond* 1997;31:32-6.
8. Goldwein JW, Benjamin I. Internet-based medical information: time to take charge (Editorial). *Ann Intern Med* 1995;123:152-3.
9. Palen M. Guide to the Internet: electronic mail. *Br Med J* 1995;311:1487-90.
10. Palen M. Guide to the Internet: logging in, fetching files, reading news. *Br Med J* 1995;311:1626-30.

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