

A Pharmaceutical Guide to the Internet

Dr. Antony D'Emanuele

**School of Pharmacy and Pharmaceutical Sciences, University of Manchester,
Oxford Road, Manchester M13 9PL, UK**

Antony@DEmanuele.net

What is the Internet?

Physically the Internet is simply a global network of computers. Individual computer networks (e.g. within a company or university) are interconnected to enable information to be exchanged between computers in different locations. A connection to the Internet enables access to an extremely powerful communications tool and a vast information resource. Whilst the Internet has been in existence since the late 1960's, it was a low profile network until the early 1990's, used mainly by academics in a limited number of countries where Internet access was readily available. The development of the World Wide Web (WWW) in the 1990's transformed the nature of the Internet. The WWW offers a simple and consistent interface to the vast resources on the Internet and enables information to be retrieved by simple mouse actions. Electronic mail, on-line databases, real-time communication, and on-line discussion groups have all become accessible via a simple and intuitive 'point-and-click' interface.

The potential of this powerful technology has been realised and recent years have seen significant developments in an attempt to transform the Internet into a practical tool for communicating and information retrieval. Internet access is now available in virtually every part of the World.

Where is it all Going?

This period of history will undoubtedly be looked back on as the 'Communications Revolution'. This is perhaps emphasised when the phenomenal growth in the number of Internet users is considered. Estimates of the number of Internet users vary dramatically, however, there are presently believed to be at least 100 million users world-wide. This number is increasing at a rapid rate and is predicted to grow to 300 million by 2001. It should be borne in mind that the present userbase has grown from a figure of perhaps less than 100,000 pre-1990. Perhaps a real indication of the direction of the technology is the significant investment that is being placed into the Internet. It is estimated that 15% of total sales will be conducted over the Internet by 2002. The Internet has become established as a major new technology and will become used as routinely as the telephone.

The Internet is still very much in an embryonic state. It was not originally designed as the next generation communications system and indeed the present infrastructure of the Internet can not adequately deal with the demands of the increasing number of users. However, this, and other important issues are being addressed and there have been significant developments in recent years.

A major obstacle to the widespread use of the Internet is the bandwidth restriction on certain parts of the Internet. This problem has been exacerbated by the dramatic increase in Internet users and the development of new “high bandwidth” technologies such as real-time video conferencing. The limitations of the present Internet infrastructure is evident with slow connections to certain web sites or deterioration in the speed of Internet connections at certain times of day. It is important to note that the Internet is simply the interconnection of thousands of networks around the world, and even if a user is directly linked to a fast network, the interface between that network and the rest of the Internet (known as a router) may not have the capacity to deal with the data flow. Bandwidth is continuously improving with new high-speed cables and faster routers being introduced. Ultra-high bandwidth links are being installed across the globe that will facilitate real-time communications.

How to Connect to the Internet

In order to use the Internet effectively it is important to use a computer with an adequate specification and a reasonably fast connection to the Internet. When considering the purchase of a computer for Internet use, it is prudent to invest in a high specification machine in order to maximise the effective operating life of the computer and to be able to utilise the full range of Internet technologies. A computer based on either a Pentium processor or PowerPC would be a minimum specification (500 MHz processors are now available) with a 4 GB hard drive and at least 64 MB of RAM.

Most Internet users still connect to the Internet using a dial-up connection by means of a modem. The fastest modem presently available is 56 kbps, however, this may not be adequate for certain applications (e.g. real-time communications). ISDN provides a more attractive alternative, however, this is presently an expensive option for most users and offers a relatively small improvement in performance. High bandwidth connections (allowing data transfer in the region of Mbps) have emerged in the form of cable and satellite modems. A likely successor to the conventional modem will be ADSL (asymmetric digital subscribers line) which will allow data transfer in the region of 2Mbps and will work with conventional telephone lines. The success of the Internet will also depend on the costs of these connections. The demands of the technology will either require inexpensive and permanent connections to the Internet, or a connection that can be established within a few seconds. Cable modem and ADSL may provide this functionality.

Each computer on the Internet may be identified by a unique address (IP address). A consequence of the increasing number of users on the Internet is that the number of possible

addresses is being exhausted using the present Internet protocols (there are numerous protocols used on the Internet that enable computers to exchange information in a seamless manner). A new protocol (IPng or the 'next generation Internet protocol) has been proposed and is presently being tested and will address this and other limitations of the present protocols. The new protocol will provide 10^{28} addresses!

Connecting to the Internet is still the most daunting step for most people, however, Internet providers (IPs) usually supply all the software required to automatically configure a computer for connection to the Internet. There are many IPs to select from. The cost of IPs vary considerably from country to country, some are free, but will offer a limited service, and some may provide either low, or no charge calls when connecting to the Internet. The choice of IPs should be based on a number of factors including the speed of access offered (56kbps and ISDN support is an indication that an Internet provider is keeping pace with latest developments). It is important that sufficient modems are available so that a user can connect easily at any time of day. Some IPs provide a service where a user can access the Internet from several locations around the world by means of a local telephone call and this may be a useful facility for business travellers carrying a portable computer. Another useful facility is the ability to read e-mail via a web interface as this will enable a user to check e-mail from any networked computer (and obviates the need to carry a portable computer). The level of support required by a user is also an important consideration. A new user should select an IP that can provide good customer support. Information on IPs may be obtained from one of the many Internet magazines that are available.

Several aspects of security on the Internet have been a concern, particularly for commercial applications of the Internet. Any computer connected to the Internet is vulnerable to hackers, however, the security risks can be kept to a minimum by careful management of computer systems. The use of appropriate firewall software can control access to a networked computer and provide a high level of security. A second security concern is the vulnerability of data actually sent on the Internet to interception by an unwanted party. Transmitted data is relatively easy to intercept, and programs can be set up to actually look for certain characters in information being transmitted e.g. a name, or a credit card number. In reality, this does not seem to be a real issue (possibly due to the large volume of information that is transmitted), or at least one that is not publicised. Security of data transmitted may be achieved by the implementation of encryption technology that encodes data prior to transmittal. Several technologies are emerging for encryption, however, their adoption has been somewhat hindered by the US government who have been reluctant to permit the wide scale use of high-level encryption and indeed have restricted the export of this technology. Additional security will come from a standard in the 'next generation Internet Protocol' which proposes to encrypt data at the packet level. The success of the Internet will ultimately depend on the widespread implementation and acceptance of high level encryption technology. This will allow the

development of reliable and user-friendly methods of charging on the Internet. Whilst several different systems are emerging, a standard has not been widely adopted.

Using the Internet

The two main tools required to effectively use the Internet are e-mail software and a web browser. Modern browsers include e-mail software, but many users prefer the powerful features offered by standalone e-mail software such as Eudora Pro. The World Wide Web (often referred to simply as the Web, WWW or W3) has revolutionised the Internet and is the most powerful and simplest method of providing and retrieving information on the Internet. It enables users to access virtually all the resources on the Internet with a user friendly and consistent interface. Information from a Web server is retrieved using a programme called a browser (such as Netscape or Internet Explorer). Information is downloaded in the form of a file (usually referred to as a page). A page can be of any length, with different parts of the document being accessed by scrolling (using a mouse to move to different parts of the page). Within a document there is usually text, however other forms of data may also be present such as high-resolution graphics, sound clips, and movie clips. The Web is often described as a hypermedia system because of the capabilities of displaying these different forms of data. The main feature of the Web that makes it such a powerful tool for accessing information is the use of hypertext links. Certain words, phrases, and/or graphics are highlighted within a Web page. These are known as hypertext links. Clicking a mouse on one of these highlighted items will result in another piece of information being downloaded. This information may be another page of information, a graphic file, a movie, sound file or even a computer programme. In this way information can be retrieved following logical hypertext links. Moving around the Web in this fashion is often termed 'navigating'.

A commonly cited criticism of the Internet is the fact that information is not organised and can be difficult to find. The Internet can be difficult to navigate, particularly for the new user. However, there are several starting points for finding information. A common starting point is one of the popular search engines such as Yahoo, Alta Vista and Hotbot. These are web sites on the Internet which attempt to catalogue information on the Internet. They all operate slightly differently and generally attempt to catalogue every information source on the Internet. Information is retrieved by means of keywords, for example, the keyword 'pharmacy' may be entered which will produce an output of all information on the Internet relevant to pharmacy. Search engines often produce very long outputs with duplicate and irrelevant returns that can make the search for information time consuming. It is often more productive to focus searches using Boolean terms (AND, OR, NOT). The main problem with common search engines is that they do not tend to discriminate on the quality or integrity of information that they index, and as such they are generally only useful as starting points for information retrieval. More focused search engines are developing which

specialise in subject areas e.g. PharmSearch. In addition, there is considerable interest in the development of 'intelligent' search engines that learn the 'habits' of a user.

People using the Internet as a serious tool are unlikely to want to 'waste' time surfing in the search for information and several sites have developed which specialise in particular subject areas and are often a good starting point for retrieving specific information. One such site, PharmWeb, was developed for pharmacists, health-related professionals and patients. Established in 1994 by the author, it has become one of the main sources of pharmaceutical information on the Internet. PharmWeb was the first Internet provider specialising in pharmaceutical information and is a site from which pharmaceutical information can be retrieved rapidly and intuitively.

Pharmaceutical Resources on the Internet

One of the principle roles of the pharmacist is the retrieval and communication of information and the Internet will undoubtedly become an important tool. There is a wide range of pharmaceutical information available on the Internet with new sources of information appearing on a weekly basis. A good starting point is PharmWeb, which contains links to many useful sources of pharmaceutical information. The types of information available include journals, drug and health-related information, discussion groups, pharmaceutical company information resources, discussion groups, conference information to name but a few. Many of the sources of information (e.g. pharmacopoeias) that are presently accessed via paper or CD-ROM, are now becoming available via the Internet. Community and Hospital pharmacists will probably find that their ordering systems will eventually become automated via Internet connections to wholesalers. Recent developments include the first broadcast of a pharmaceutical conference on the Internet, a major drug delivery conference was broadcast live around the world over the Internet with full sound and video. Whilst the image quality is presently limited, this is likely to become equivalent to a television quality broadcast as bandwidth improves in the coming years.

Key Issues for the Health Professional

The Internet has presented health professionals with a number of challenging issues. There has been a proliferation of drug/health information web sites in the last five years, many (if not the majority) of which are a source of concern. It is relatively easy to create a web site with a convincing and professional 'look and feel'. Many health-related web sites have been developed by non-professionals. These sites may contain inaccurate and/or potentially hazardous information that may be perceived as reliable sources by the general public. It is important that the health professional can assess the validity of such sites and guide patients to reliable sources of information. Several criteria have been proposed to evaluate health-related sites e.g. credentials of the authors of a site.

Patients are becoming more knowledgeable about their treatments and conditions as a result of the availability of information on the Internet. It is therefore imperative that the health professional is familiar with information resources on the Internet, and is in a position to assist patients in the interpretation and assessment of this information.

A major challenge facing health professionals (and regulatory authorities) is the availability of medicines on the Internet. There are many sites that offer medicines to consumers. Some of these are professionally managed, however, of more concern are the significant number of sites that are offering prescription only medicines for general sale. It is also worth considering that many of the professional Internet Pharmacies offer customers/patients significant discounts, same day delivery, and are open 24 hours a day, seven days a week.

The Future

It is apparent that we are witnessing a 'Communications Revolution. The Internet is the most important development in communications since the telephone. Health information is the second most popular reason for people accessing the Internet. As a profession, it is important that Internet technology is understood and embraced, as it offers many exciting opportunities, and will certainly change the way we work in the future.

Useful Web Addresses

PharmWeb - <http://www.pharmweb.net/>
a site specialising in pharmaceutical information

Pharmaceutical Discussion Groups on the Internet - <http://www.pharmweb.net/forum.html>

The International Pharmaceutical Federation - <http://www.fip.nl>

Alta Vista - <http://www.altavista.com/>
a general Internet search engine

PharmSearch - <http://www.pharmweb.net/>
a search engine specialising in pharmaceutical information

Yahoo - <http://www.yahoo.com/>
a general Internet search engine

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