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Searching the Internet for medical information: Practical tips

■ ABSTRACT

The Internet can be useful for physicians, but beginning users are apt to encounter two problems: too much irrelevant information, and difficulty finding the desired information. This paper offers some practical tips that can prevent frustration and wasted time when searching for medical information on the Internet.

■ KEY POINTS

When using a search engine, one can save time by using advanced functions such as Boolean operators. However, since the syntax can vary among search engines, physicians should choose one or two search engines and use these exclusively.

Many Web sites offer reliable medical information. Here again, I recommend sticking with a few familiar ones.

Physicians may wish to choose an Internet start page that has links to their favorite Web sites and search engines

THE INTERNET has proliferated since the advent of the World Wide Web (WWW or the Web) in 1992 and 1993,¹ growing at the rate of 1 million pages per day by some estimates. There are two main reasons that physicians should be interested in the Internet:

- It is arguably the world's largest library, a tremendous resource of health-related information. Physicians can find some extremely useful resources there and use them to stay up-to-date with current medical information and to save time in their daily practice.

- Patients use it. In fact, one of the main reasons people use the Internet is to search for health-related information.² Physicians should familiarize themselves with the Internet so they can help their patients separate reliable from unreliable information and also so they can be aware of what their patients are reading or discussing.

However, for the beginning user, searching for medical information on the Internet can be frustrating and time-consuming. This article shares some techniques and practical tips that can save time when searching for information. It also lists some resources on the Internet specifically developed for physicians.

■ COMMON PROBLEMS

Users encounter two main problems when looking for medical information on the Internet:

Differentiating between reliable and unreliable information. A search for medical information on almost any topic brings up many Web sites, but a lot of the information is unreliable.³ To separate the wheat from the chaff, physicians should familiarize themselves with the range of available medical Web sites

Glossary of Internet terms

Browser	A program on the user's computer that connects it to the World Wide Web; examples include Netscape Navigator and Microsoft Internet Explorer
Domain	A unique identification of an Internet site. A domain name (eg, ccjm.org) has at least two parts: to the left is the name of the company, institution, person, etc; to the right is the country or, if within the United States, the type of organization (eg, .com for commercial institution, .org for nonprofit organization).
Fuzzy logic	A refinement of Boolean logic that allows for partial degrees of truth or falsehood. Useful in searching on the Internet to narrow a search without excluding too many items
Hyperlink	Text or images on a Web page that when clicked cause the browser to retrieve or display another Web resource (eg, a document, image, or audio file)
MEDLARS	Medical Literature Analysis and Retrieval System; the electronic index of medical articles from the US National Library of Medicine
MEDLINE	MEDLARS on Line; the electronic index of medical articles from the US National Library of Medicine available on line
News group	A discussion forum on the Internet for people who share a mutual interest
Operator	A mathematical function, especially used in combining sets, such as sets of Web sites; examples: AND, OR, NOT, +, –
Search engine	A Web site that offers a searchable database of Web sites
URL	Universal resource locator, ie, the address of a Web site
Web	See World Wide Web
Web page	A single part of a larger Web site that is viewable all at the same time on a personal computer screen
Web site	A specific location on the World Wide Web composed of interlinked "pages." A single Web site is usually maintained by an individual, group, or organization
World Wide Web	The most well-known part of the Internet, containing text and graphic information that can be easily accessed by a personal computer. The World Wide Web can also be used to broadcast sound, video, and motion pictures

Finding specific information on the Web is like finding a needle in a haystack

and select a few sites that maintain links to reliable sources of medical information. We can then recommend these sites to our patients as a valuable resource.⁴

Difficulty finding specific information. Often, finding a particular Web site or piece of information is like finding a needle in a haystack. The usual search methods yield thousands of results, and while the site that you are looking for may be in this list of

results, it may not be at the top of the list. Learning how to focus your search is a useful skill that can save a lot of time.

■ SEARCHING EFFICIENTLY

Searching the Internet is similar to using MEDLINE (MEDLARS On Line, the electronic index of medical articles from the US National Library of Medicine). In both, you need to learn



how to narrow the search to get the articles you want quickly and to ensure that the articles retrieved by the search answer your question.

We shall first look at some all-purpose search tools and then at some specifically designed for finding medical information on the Internet.

Search engines

Some popular search engines are Alta Vista, HotBot, Lycos, Infoseek, and Excite (TABLE 1). These use a software program called a robot or spider that automatically and constantly searches the Web and collects information about each Web site in a database. The search engines at these Web sites let users do a search against this database. Since each search engine uses a different robot program, each database is different. Also, each search engine offers different features, differing especially in their advanced search features.

Another problem: As new Web pages get published at a progressively faster pace the spiders are unable to keep up. Newly published pages may not be listed for up to 6 months!

Some of the search engine sites maintain a selected list of hyperlinks on frequently requested topics. These are called subject guides (TABLE 2). These sites are often a good starting point for beginners. If the subject you are searching for is catalogued, your task is easy. Unfortunately this is rarely the case for most medical information.

How to use advanced search features

Knowing how to perform an advanced search is very useful when looking for specific information, as we shall see in the following example.

Suppose you have a patient who you suspect has vitamin B₁₂ deficiency because he has macrocytic anemia and peripheral neuropathy, but his vitamin B₁₂ level is normal. You know there is a more sensitive test to detect early vitamin B₁₂ deficiency but cannot remember the name.

First, let's choose one of the search engines listed in TABLE 1. Let's try using Excite.

If we go to Excite (or any of the search engines), we find an area (text box) in which to type in the word or phrase to search for. You

TABLE 1

Some popular search engines

Alta Vista

<http://www.altavista.com>

Indexes over 125 million pages

Offers real-time translation of documents or entire Web sites into many different languages

Excite

<http://www.excite.com>

Indexes about 50 million pages

Searches for documents containing related concepts, not just keywords

"More like this" link next to a retrieved result uses that document as the basis for a new search

Can list results by Web site

HotBot

<http://www.hotbot.com>

Indexes about 110 million pages

Has intuitive menu-based search options, eliminating the need for Boolean operators

Infoseek

<http://infoseek.com>

Can search for Usenet newsgroups from the main search page

Can list results by Web site

Offers combination searches of URLs or document titles with keywords in the documents

Lycos

<http://www.lycos.com>

Features natural language search options, ie, one can ask it questions in English, without Boolean operators

Also features the "more like this" link

Can search for URLs and document titles

can type in **vitamin B12 deficiency**, but you won't like what you get. Excite treats a string of words as if it is a search for *any* of the words in the string. Thus, you will get a list of every Web site that contains the word **vitamin**, plus all the Web sites that contain the word **B12**, and all the sites that contain **deficiency**. That is more than 100,000 Web sites, with those having all the words in the string listed first.

To refine the search, try typing **+vitamin +B12 +deficiency** (leaving a space between each item in the string). This will retrieve only the sites that have *all* of the words in the

string (1,460 of them on the day I tried this, although the exact number changes from day to day). However, these words could be present anywhere in the document and not necessarily contiguously.

To search for the exact phrase, type it in quotation marks, ie **"vitamin B12 deficiency"**. This retrieves a list of 363 Web sites that contain the specific phrase.

Since you are looking for a test for this condition you can combine these two techniques. Type **+ "vitamin B12 deficiency" +test**. This will give you a list of Web sites that contain both the phrase **vitamin B12 deficiency** and the word **test**.

Alternatively, you can use the Boolean operator **AND**: **"vitamin B12 deficiency" AND test**. This also will give you a list of Web sites that contain both the phrase **vitamin B12 deficiency** and the word **test**. Either method narrows the search down to 179 Web pages.

Finally, you want to sort your results by Web site. Most Web sites have many screens or pages, each of which has a different address. If a particular Web site has more than one page that contains the terms you are searching for, each different page will be listed.

Grouping results by Web site reduces duplication of results and makes for a more efficient search. In our example, clicking on the **View by: Web site** link in Excite collects our results neatly into 40 Web sites.

The first site is from a commercial clinical laboratory, and it has your answer. The site discusses early detection of vitamin B₁₂ deficiency using serum and urinary methylmalonic acid and the role of homocysteine.

When to expand a search

Sometimes, when searching for a rare condition or phrase, using too many operators (eg, plus signs, quotation marks) can retrieve very few results. For example searching for **"methylmalonic acid" AND "vitamin B12 deficiency" AND test** gives only 22 results. In this situation I prefer to cast a slightly wider net and then group the results by Web site. For example, typing **"methylmalonic acid" AND B12** retrieves 54 results, which can be grouped into 37 Web sites.

Other options for narrowing a search

There are other operators as well. The hyphen or minus sign, placed in front of a word, excludes it from the search. The word **NOT**, typed in all caps, does the same thing. These operators can be combined into a complex search using parentheses.

Alta Vista has a very useful feature that lets you exclude certain domains or restrict your search to a specific domain. The term refers to the extensions such as .com, .org, .gov, .edu, and .mil that are used in host names. For example, **-domain:com** would exclude all Web sites of commercial organizations from the search. Using **+domain:edu** would limit the search to only university sites.

Using different search engines

To complicate the issue, different search engines use different operators or syntax. Fortunately, each of them also has a link to an advanced search page that lets you use a menu-driven interface so you can refine your search without having to remember how to use these operators. A menu-driven interface guides you in performing advanced searches without having to remember complex syntax. Using a pull-down menu you can specify Boolean terms such as "and" or "or," search for all the words in a phrase, or search for the exact phrase.

Nevertheless, it is best to familiarize yourself with one or two search engines for regular use. In my opinion the Infoseek site has the easiest advanced search features to use and has the best features to narrow your search, but depending on the topic you are looking for, it may not give the best results. For example, searching for **"vitamin B12 deficiency"** on HotBot gives the desired information in one of the first 20 results, but the same search on Infoseek does not.

We have seen how we can use the generic search tools to search for medical information. Now let us discuss the popular tools and sites designed specifically for searching for health-related information.

HEALTH TOPICS SEARCH TOOLS

Instead of using one of the all-purpose search engines described above, you can also go to a

It is best to stick with one or two search engines for regular use

number of sites that maintain databases of health-related information. Some are reviewed and rated, while others sites maintained by recognized organizations have links to even more sites. These sites are a reasonable place to start to look for medical information. One can follow the hypertext links to get to the information one wants. However, always keep in mind as you jump from site to site that there is no guarantee that the information on a particular site is reliable. Some useful health-related search tools are listed in **TABLE 2**.

MEDLINE on the Internet

A number of sites offer free access to MEDLINE, the index of medical articles from the US National Library of Medicine:

- <http://www.healthgate.com>
- <http://www.medscape.com>
- <http://www.pdrnet.com>
- <http://www4.ncbi.nlm.nih.gov/PubMed>

However, the free sites lack some of the more powerful features found in subscription-based sites. Two of the best pay sites that offer MEDLINE searches are:

- Knowledge Finder (<http://www.kfinder.com>). This site lets you use features such as fuzzy logic and word variants.
- OVID (<http://www.ovid.com>). This site has a very intuitive layout, and lets you view the full text of some of the articles online.

Searching for discussion groups and mailing lists

Besides Web pages and Web sites, one can also find useful information through Internet discussion groups such as Usenet and through mailing lists (also known as "listserves").

Discussion groups are virtual bulletin boards where people with similar interests (eg, with similar illnesses) can post and respond to messages. Physicians can refer patients to certain discussion groups, which act like support groups. We can also participate in discussion groups on topics of interest.

One problem with discussion groups is that one cannot be certain about the reliability of the information posted. Possible solutions are to participate in groups that are moderated, require identification of the par-

TABLE 2

Some subject guides for health-related information

Alta Vista Categories

<http://altavista.looksmart.com>
(Click on the link to Health and Fitness)

Excite

<http://www.excite.com/health>

Infoseek Channels

<http://www.infoseek.com>

HotBot

See Alta Vista

Lycos 5%

<http://point.lycos.com/topics/Health>

Yahoo!

<http://www.yahoo.com/Health>

ticipants, or are restricted, eg, to physicians only.

Deja News (<http://www.dejanews.com>) indexes more than 50,000 discussion forums, including Usenet news groups in a searchable database. Messages dating back 2 years can also be searched. Forum One (<http://www.forumone.com>) is another searchable index of discussion groups or Web forums.

Mailing lists and listserves are electronic newsletters or discussion groups, but instead of messages being posted on a Web site they are delivered to the participants via e-mail. Health A to Z (<http://www.healthatoz.com>) links to a number of health-related mailing lists and discussion forums. Intelihealth Professional Connect from Intelihealth Professional Network (<http://ipn.intelihealth.com/ipn/>) is an excellent health update service for physicians. The Doctors Guide e-mail edition is another similar service (<http://www.pslgroup.com/visitors/dgemailo.htm>).

Setting up a useful start page (or 'portal')

A timesaving technique is to select a good start page for your browser. This is the page that opens up automatically when you first start your browser. If the start page provides links to some of the important medical resources mentioned

You can get MEDLINE for free, but pay sites have more features

TABLE 3

Health-related opening pages**Achoo**<http://www.achoo.com>

A directory of health-related Web sites listed under human health and disease, business of health, and organizations and sources

Cleveland Clinic<http://www.clevelandclinic.org/gim/linksa.htm>

Contains links to several search engines, health-related Web sites, online journals, and professional organization Web sites

Doctor's guide to the Internet<http://www.docguide.com>

Maintains a comprehensive list of links to patient education resources sorted by specialty or disease

Health A to Z<http://www.healthatoz.com>

Catalogued by medical professionals, with links to 378 health-related mailing lists and 331 health-related news groups

Health Finder<http://www.healthfinder.gov>

Developed by the Department of Health and Human Services, in collaboration with other federal agencies; links to selected online publications, clearinghouses, databases, Web sites, and support and self-help groups, as well as the government agencies and not-for-profit organizations that produce reliable information for the public

Medical Matrix<http://www.medmatrix.org>

Targets primarily US physicians and health workers; an editorial board reviews and rates sites from 1 to 5

Medical World Search<http://www.mwsearch.com>

Indexes the full content of major medical sites, excluding many sites that contain information of questionable quality with the help of an editorial board of health care professionals; the user can search this database using a search engine from this site

Medscape<http://www.medscape.com>

An online journal designed for the Web, containing original articles and information, along with links to other health-related sites

OMNI<http://Omni.ac.uk>

Gateway to Internet resources in medicine, biomedicine, allied health, health management, and related topics; follows criteria for evaluation produced by its own advisory group

Physicians' Online<http://www.pol.net>

For health care professionals only; users must register; maintains a list of sites rated from 1 to 5 by other physicians

Six Senses Reviews<http://www.sixsenses.com>

Maintains a database of health-related Web sites reviewed and rated from 0 to 36 by a panel, some of whom are physicians and nurses

**Set your
browser to
a useful start
page**



above, you could quickly get underway towards a productive surfing trip online. An example of such a start page is at <http://www.cleveland-clinic.org/gim/linksa.htm>. This page has links to most of the health-specific search sites mentioned above as well as to Yahoo! and Lycos. Another excellent portal is Medscape (<http://www.medscape.com>). This site requires a one-time registration but lets you search the huge Medscape database of health information and also Medline and the Web. Others are listed in TABLE 3.

You can set up the page that your browser starts with by following these directions:

In Internet Explorer (4.0 or above), click on "View" and then "Options" and then "General" and then specify which page should be your start page. In Netscape Navigator 3.0, click on "Options," then "General Preferences," then "Appearance," and then enter the URL for your "Home Page Location."

Titles, URLs, and textwords


Certain search engines such as Infoseek and Lycos let you search for titles and universal resource locators (URLs). Titles are specified by the author of the Web page and show up in the blue bar above the tool bar of the browser. URLs (or Web site addresses) are what you type in the address or location area of the browser to go to a particular Web site.

By searching for a particular word in the title of a Web site, you will limit your search to sites that mainly deal with the topic you are looking for. But this could exclude a number of Web sites that may have the content you are looking for. For example, using the advanced features of Infoseek you can search for a particular word or phrase in the title of the document or Web page. Searching for "vitamin B12 deficiency" in the titles yields only 10 results, one of which is a letter to the editor of JAMA discussing the supplementation of food with folate and the masking of subtle vitamin B₁₂ deficiency due to this. It then mentions the use of methylmalonic acid in diagnosing vitamin B₁₂ deficiency.

Searching for URLs is useful when you know only part of the Web site address. Both these search techniques are useful in specific situations. Textword searching is the default

type of searching and is offered by all search engines. This yields the maximum number of results and casts the widest net.

PRACTICAL TIPS

The search strategy to use depends on the information you are trying to find. For factual medical information that you would find in textbooks and journals, MD Consult (<http://home.mdconsult.com>) is probably the best place to start. If you are searching for a medical Web site, discussion group, or mailing list, then the health-specific sources mentioned above may be more useful. If you have patients who need help searching for reliable medical information, direct them to one of the sites that review and rate Web sites before listing them. A physician, who may be able to evaluate the medical information better and wants to cast a wider net, would use the Web search engines. Judicious use of the advanced search features can yield good results. Starting with a title search may be a good idea, and if this does not give the desired result the search can be broadened to a textword search. 

REFERENCES

1. Mehta NB. Medicine and the Internet: why physicians should pay attention. *Cleve Clin J Med* 1996; 63:315-316.
2. College of Computing, Georgia Institute of Technology. Graphics, Visualization, & Usability (GVU) Center's World Wide Web User Surveys. http://www.cc.gatech.edu/gvu/user_surveys/survey-1998-04/graphs/use/q97.htm.
3. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the Internet: Caveant lector et viewer—Let the reader and viewer beware. *JAMA* 1997; 277:1244-1245.
4. Wyatt JC. Commentary: measuring quality and impact of the World Wide Web. *BMJ* 1997; 314:1879.

RECOMMENDED READING

Kansas City Public Library. Introduction to search engines. <http://www.kcpl.lib.mo.us/search/srchengines.htm>.

Fox L. The World Wide Web: A new patent medicine show? *Connections* 1998; No. 21 (Spring), Dennison Memorial Library, <http://www.uchsc.edu/library/spring98.html>.

Sullivan D. The major search engines. Search Engine Watch. <http://www.searchenginewatch.com/facts/major.html>.

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The best strategy to use depends on what you want to find