

Diabetes and the Internet

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We are living in an information age. Much has been written in the past few years concerning the information superhighway, cyberspace, gophering, telecommunications, etc. The movement to the information wonderland will have an effect now similar to the communications developments in the past, from the pony express, say, to the telegraph.

Journals such as *Diabetes Care* and nongovernment organizations (NGOs) such as the American Diabetes Association (ADA) use the transfer of information as an inherent component of their primary missions. However, the information technology being used is that of Indian trails through early America, not a superhighway. *Diabetes Care* and ADA would benefit by joining.

Recently we have discussed these issues concerning telecommunication in relationship with global public health (1). Here we will describe the potential information transfer changes for *Diabetes Care* and ADA that will improve the interchange of information among the readership, among ADA members, and among the community of people who have dia-

betes. Implementing current methods of electronic communication with *Diabetes Care* and by ADA would not only greatly improve the ease and speed of such communication; it would also assure compatible and competitive methods of communication among corporate business and market economies and research and educational communities.

A major revolution is occurring in information technology based on computer-to-computer network links. Computers moved from a tool to analyze data to instruments that locate, transmit, and communicate information. This began in the late 1980s with fledgling computer networks that were based on a very simple concept. At that time the vast majority of computing used mainframe computers. One could contact people at their institution through electronic mail (e-mail) messages. The research community was the first to recognize that by connecting the mainframes of two universities, such as the University of Pittsburgh and Carnegie Mellon University, more diverse communications between students and faculty could take place for virtually no cost. Academic institutions in the 1980s

rapidly established links with one another. And various computer networks with differing protocols began to be established within local regions and within countries so that scientists could communicate accurately and cheaply.

The most significant event occurred in the mid-1980s: the establishment of the Internet. The Internet initially targeted academic and government agencies but has now expanded to commercial enterprises as well. The Internet represents a meta-network, a network integrating local networks. It represents a common protocol so that all networks connected (and thus all computers) can talk with each other. The development of the Internet has been explosive, with over a 10% growth rate each month. As of February 1995, 20 to 40 million people worldwide are now reachable through the Internet (2).

Commercial computer systems have also sprung up such as CompuServe, Prodigy, and America Online. These systems are based on concepts similar to the Internet, but they allow access to the general population and are profit-oriented. The companies originally were designed to allow for communication between subscribers through bulletin boards and to allow communication between a subscriber and various on-line services, such as airline ticketing and stock quotes. More recently, there have been gateways established between these systems and the Internet that permit information flow between those in the on-line services and everyone else on the Internet.

The Internet originally was difficult to use, and only a few experienced computer hackers could navigate through the complex address practices and protocols needed to transmit and receive information. However, in the past few years simple, very powerful tools have been established that make the Internet accessible to everyone. Moreover, simple books have been developed (3) as well as courses where one can learn to "surf" on the Internet.

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ADA, American Diabetes Association; NGO, nongovernment organization; NIH, National Institutes of Health; WWW, World-Wide Web.

Before describing the potential uses of the Internet for *Diabetes Care* and ADA, it is important to discuss some of its information tools. The primary use of the Internet is still for e-mail. It is simpler to send e-mail than it is to use the postal system. An e-mail message can be sent, for example, to the World Health Organization in Geneva by typing the e-mail address of the person you wish to contact at that site (e.g. "akazawa@who.ch").

After typing the letter, it is sent off with a simple command and received in Geneva within seconds. Sending and receiving electronic messages is easier, more "friendly," and far less expensive than calling, faxing, or posting mail.

Person-to-person transmission of information can also occur via list servers. A list server is basically an ongoing discussion group. Instead of sending a message or letter to one person, list servers allow messages to be sent to multiple people on the list in that group. List server discussion groups are useful for posting messages and information to which others also on the list server can respond. Two current list servers for diabetes address medical research issues (Diabetes@Irlern.Bitnet) and the concerns of people with diabetes (listserv@lehigh.edu). The first of these has a membership of about 430 subscribers as of March 1995 and is geared toward professionals in the field of diabetes. The second list server has a rapidly growing membership of about 450 subscribers as of March 1995. The main focus of this list server is a support group for individuals with diabetes; it is *not* a source of hard scientific/medical information. A simple e-mail message of "subscribe firstname lastname" sent to these list server addresses will add the user to the mailing list. Separate addresses for posting messages to all of the members of the list server are obtained once one has subscribed to the list.

In addition to e-mail capabilities, the Internet has powerful information retrieval mechanisms. The concept of information retrieval is similar to the computer networking of messages. For example, at

our university, we can search for information in the library, in the history department, or in the administration by computer. Data as well as text can be stored electronically. We can do this not only at the University of Pittsburgh, but through networking links we can do the same at Carnegie Mellon University, or Jikei University in Tokyo, or the Vatican Library.

Several information retrieval systems have been established. The gopher system (from "go for") was developed at the University of Minnesota (the Golden Gopher also being the mascot of the University of Minnesota). The gopher system allows one to visit libraries throughout the world, explore stored information at the National Institutes of Health (NIH), read documents from Singapore, and contact insulin manufacturers. Other tools include the file transfer protocol, which allows for the transfer of data or text files across networks, and the World-Wide Web (WWW), which permits rapid "jumping" from key information to key information; programs such as Mosaic provide easier systems for finding information in the WWW and permit the transfer of video and sound through the computer network.

How can these systems be applied to *Diabetes Care* and ADA? The following recommendations are means by which telecommunications can improve information transfer among our readership, members, and people who have diabetes. It is important first to identify who has access to the Internet. We have recently contacted authors and reviewers of *Diabetes Care* to obtain their e-mail addresses. In addition, if you would like to communicate with the *Diabetes Care* editorial office, you can send an e-mail letter to diabetes_care_journal@chplink.chp.edu.

The here and now

Currently, the editorial office of *Diabetes Care* is prepared to support the following electronic communication processes.

Contact with the editorial board. We are in the process of networking the editorial board, who can now be contacted

through the editorial office at the above e-mail address.

Improvement of the review process. You can now query the editorial office electronically concerning the status of your paper. We will encourage the reviewers to submit their reviews electronically. We are currently working on methods to send all results of reviewed manuscripts electronically to authors upon request.

Contact with authors. Frequently one wants to contact a person who has written a paper. However, it is costly to call and is often difficult to write a letter. Therefore, in future issues of *Diabetes Care* the e-mail addresses of authors will be published in conjunction with the articles. The appendix of this editorial include the e-mail addresses for articles published in the last year for those authors who provided us their e-mail addresses.

Future directions

Once an ADA network is established, how can we improve the journal for the readership, for the membership of ADA, for researchers, for clinicians, and for people who have diabetes? We recommend that the following items be considered for implementation by ADA.

Submission of manuscripts. Manuscripts could be submitted electronically to *Diabetes Care*. Papers could be submitted in postscript format (which allows figures and tables, including high-quality photos, to be included) via the Internet. The postscript format is also best suited for the electronic posting of manuscripts on the ADA gopher; it would be to the editors' and ADA's advantage to have this done already. Postscript viewers and writing formats are readily available on the Internet for authors to convert their submissions to postscript format or for readers to use in reading the articles.

Dialogue. *Diabetes Care* is designed in part to improve the care of people who have diabetes. Three ADA list servers could be established: one with a focus toward the providers of diabetes care and diabetes education to discuss issues re-

lated to diabetes care, a second with a focus on discussion of research issues, and a third with a focus on the day-to-day issues that people with diabetes face. If successful, these lists can splinter to several additional or more focused discussion groups, such as children with diabetes talking to each other worldwide through the Internet. As an example, there is a global educational "kidlink" program where elementary students worldwide talk via the Internet.

The establishment of an ADA gopher. The development of an ADA gopher would serve a very important function, bringing together a vast array of diabetes information at one site. This would be an important tool on the information superhighway for the diabetes community. It would provide information transfer to virtually any place in the world for little cost and could potentially improve diabetes care worldwide.

What types of information might be stored on an ADA gopher? Basic administrative information, such as the telephone numbers and e-mail addresses of staff at the headquarters office in Virginia. Program information, such as the government activities undertaken by ADA or professional section newsletters. The lay publications of ADA could also be made available electronically through this source.

For the research community, more refined data could be made available. For example, it would be possible to have an index of all the papers published in *Diabetes Care* from its inception as one part of the gopher. This could include a search index to locate articles by topic or by author. Authors could put appendix material on the gopher, thus saving valuable pages in *Diabetes Care*. This index is already published in the December issue of *Diabetes Care*, so why not post it electronically?

It would also be possible to list the addresses, phone numbers, and e-mail addresses of all professional section members in ADA on the ADA gopher. This could save ADA considerable money be-

cause they would no longer have to publish a membership directory on paper. The staff who currently put this together in paper format could easily do it electronically instead.

The ADA gopher could also list all grants, contracts, etc. related to diabetes that are currently underway. This would include the principal investigator's name, address, and e-mail address, as well as the abstract from the grant. ADA can certainly do this for all people with ADA grants. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) already has this information on-line for the diabetes grants from the NIH. This gopher could have a link to the NIDDK information in the NIH Gopher. The American Heart Association has recently developed a gopher; we hope ADA will also.

World-Wide Web home page. An ADA home page on the WWW could describe the ADA network and support links to the major services accessible on the network. Separate connecting pages for individual network components could include the monthly table of contents for journals like *Diabetes Care*, information about upcoming events and conferences, and individual pages for the various chapter affiliates with information of local programming and services. Maintaining an ADA "guest book" as part of the home page could track visitors and serve as a data source for ADA membership opportunities. As the leading technological tool for searching within a user-friendly interface, Mosaic would be a logical tool for disseminating information regarding the ADA network.

On-line journals. We suggest making *Diabetes Care* available on-line so that researchers and institutions who cannot afford the journal can have access to it for improved research and care. We would want people in Poland, Ukraine, and Zambia, for example, to have access to the latest research and clinical care information. Copyright laws need to be reviewed, however.

On-line protocols. Many of the major studies such as the Diabetes Control and Complications Trial have methods of operation that are unpublished or are difficult to find. However, this type of information could be easily accessible electronically.

Information. People with diabetes would be able to query ADA concerning any question related to diabetes. An Internet address could be provided for people to directly obtain information from ADA.

ADA local connectivity. All state programs could be reachable through the Internet. Courses could be set up through ADA to teach people how to use the system.

Continuing education programs through the Internet. ADA could explore the possibility of on-line continuing diabetes education programs for physicians and nurse educators.

We believe that having *Diabetes Care*, its readership, and ADA join the electronic superhighway will be a major improvement for the journal, for ADA, and for people with diabetes. We encourage the membership of ADA to come aboard the Electronic Diabetes Information Superhighway.

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