CARFAX

Multimedia communication: *quo vadis?*

SIEGFRIED MERYN

Center for Advanced Medical Education and Health Communication, Medical Faculty, University of Vienna, Austria

SUMMARY *New interactive multimedia products including CD-ROM, video, online service and Web-TV have grown rapidly over the past several years. Since the acceptance of the World Wide Web (WWW) as a global standard for information, a medical online environment has evolved creating new forms of communications in medicine including desktop videoconferencing, multimedia interactive educational tools, online representation of literature, bibliographic databases and tools for authoring new-generation scientific publications. But the general and health over-information and the use of computer technology in medicine have already changed our communication behaviour, introducing fractal communication and the use of infoids. Concerns have been raised that these developments may on one hand lead to disinformation and on the other may have a significant impact on communication between patient and doctor. The new interactive electronic media and the entirely new forms of communication are discussed.*

General considerations

Modern communications technology accelerates information at a rate critical to our minds. TV satellites and data networks have overcome absolute reference frames such as those of space and time and are realizing the Utopia of omnipresence and complete mobility.

Einstein instead of Newton

With his general theory of relativity Einstein turned our conception of the world upside down. Now we see space and time as a co-ordinates that can be changed at random, subject to entirely individual definition, while Newton still believed time to be an absolute entity which would always remain unalterable and exist separate from and independent of space. But space and time, the fixed co-ordinates which we have cast over our world like a huge net, have suddenly become meaningless in view of our information pattern. They are no longer among the many reference items of our modern communication universe.

Electronics, and in particular microelectronics, are creating new spheres of life and communication. New media such as CD-ROM replace and complement our traditional supply of information. The multimedia segment—Internet, Web TV, online services, multimedia CD-ROMS, video games—will soon displace television. The advantage of these new media lies, above all, in their interactive component: we ourselves can determine at which rate and in which sequence we wish to retrieve the information they offer. The Internet stands for a new global concept of communication: both the access to and the exchange of information have been revolutionized by the Internet on a worldwide scale. To many of us, communication via email and mobilbox, and the transfer of information—independent of space and time—by means of speech processing, telephone answering machine and fax have already become everyday practice. The introduction of electronic media has brought about an entirely new form of communication.

Fractal communication

Information in a nutshell—that is what we are looking for: information in the form of simple messages and pictograms that will strike our attention in the confusing chaos of things and briefly tell us what is essential.

The clearest illustration of our new communication behaviour is the Internet. None of us is able to survey its full extent, none of us knows all the information it contains, none of us can fully explain it. But many find it great. Why? Because everybody can conjure up on his/her computer screen those bits and pieces of the universe he/she takes a personal interest in—provided he/she can manage to find them. Last but not least, the Internet fully corresponds to the needs of our pictogram society. It offers interaction, variety, concise illustrations, a host of disconnected bits of information which we can then assemble ourselves into a coherent body of information—fractal communication, as we wish to obtain it to an ever increasing extent.

And this is also the form of information which, above all, young people wish to get. The sociological character of the Net Generation, the successor generation to Generation X, has been shaped by the media network. The Internet is thus going to be a serious competitor for television as the key medium. Even now children watch less television than their parents. In 1995, the sales of computers

Correspondence: Siegfried Meryn, MD, Clinical Professor of Medicine, Director, Center for Advanced Medical Education and Health Communication, Medical Faculty, University of Vienna Austria, Pelikangasse 15, A-1090 Vienna, Austria. Tel: 0043/1/4031011. Fax: 0043/1/4031012. Email: smeryn@abacus.at.

0142-159X/98/020087-04 $9.00

for the first time exceeded those of automobiles—not least because it is only the computer that ensures assess to the world of information.

Over-information leading to disinformation

Carel des Bos, vice-president of Alta Vista, the Internet search specialist, has called the Internet "a minefield of opportunities". The World Wide Web no longer simply offers pure information in the form of letters—it is increasingly mutating into a world of entertainment and also into a communication platform. The Internet is already revolutionizing our communication pattern: it no longer offers complete and comprehensive works of art or science such as literary creations or technical textbooks but just 'infoids'—many small portions of text in new screen format. Individual fragments of information freely float in the Infonet; it is up to us how we connect these 'infoids'—and it does work, actually. The Internet combines interaction, brevity and variety. Fractal communication offers information modules which permit us to filter from the overall offer of information those parts that are of personal interest to us.

The Infogram

In this communication environment, information of convincing character is of increasing importance. It is characterized by five major elements:

(1) Value of novelty
We always take an interest in what is new. Who ever can offer us something new still stands a better chance of getting the message across.
(2) Value of utility:
What we can or must use right away will attract increased interest.
(3) Emotional value:
Everything appealing to our emotions will increase our respectivity.
(4) Conversational value:
Topics that are of general interest, or of interest for certain social groups such as a club, make us especially receptive for information regarding these topics.
(5) Entertainment value:
Last but not least we wish to be entertained.

Does all this apply to medical communication too?

Medical considerations

During recent years approximately one-third of general practices in Europe and two-thirds of general practices in the UK have installed computerized record systems. These technologies offer significant advantages. However, several studies (Greatbatch *et al.*, 1993, 1995) confirmed that the introduction of computers into the consultation had significant impact on the communication between patient and doctor. In particular, it was found that computer technology has had an impact on the practitioner's conduct and on the disclosure of information by the patient. Especially during discussions concerning confidential issues, physicians exhibited a preoccupation with the computational task at hand by, for example, confining themselves to minimal responses, delaying their attention until junctures in the use of the system, confining their visual attention to the monitor and keyboard and withholding their gaze from patients. Interestingly the doctors' increasing familiarity with the system did not lead to a reduction in the extent to which its use adversely affected social interaction. The system demands seem to undermine the doctors' ability to simultaneously interact with their patients. Moreover. the patients themselves may display an orientation to the system as constraining the doctors' actions by attempting to coordinate their conduct with its use and operation. Thus the system impacts not only on the communicative conduct of the doctors, but also on that of patients. It seems likely that many of the problems identified could be significantly reduced through the development of training programmes in the use of computerized systems in the consultation as well as through redesign of the technologies themselves.

Another feature with convergence of technologic and socioeconomic events will be the merging of interactive multimedia communications with longitudinal participatory health care systems (Elevitch, 1994). For example, diagnostic testing will extend from the home to the more sophisticated acute care settings. Throughout the network, clinical and managerial services are accessible as needed at all points of use. The networks will become 'physician extenders' by allowing broad interactive geographic and mobile accessibility to clinical information in a context that maintains patient confidentiality and data security. But what about the impact on human communication and the patient–physician relationship?

Another important aspect of extraordinary public interest and attention is patient education. Patient education is one of the most time-consuming and repetitive aspects in physician–patient communication and the provision of health care services (Sechrest & Henry, 1996). Physicians in all aspects of medicine agree that patient education is an essential part of any treatment regimen. Unfortunately, in most practices, the educational aspect of the patient–physician encounter is the first area that suffers because of the time constraints of a busy schedule. The health care industry in the United States is under enormous pressure to increase the efficiency of providing health care services, while at the same time facing a more educated consumer base that demands a more active role in making health care decisions. Thus, the implementation of interactive multimedia presentations for patient education is becoming more common in an attempt to increase the efficacy and efficiency of the delivery of health care. To create effective and efficient patient education software, attention has to be focused on three major areas: audience, content and interface (Kahn, 1993). In general, creating good communication programs relies on simple graphics and animation to illustrate the concepts. The incorporation of narrated soundtrack has made the programs easier to follow for most people, especially those with diminished reading skills. Regarding the input device, touch screens seem to be the best for non-computer users. Improvements in program design will soon result in task-oriented evaluation systems that allow the patient to use the information

gained to demonstrate understanding (Sechrest & Henry, 1996).

Gerbner *et al.* (1981) noted that daytime TV serials may well be the largest source of medical information in the United States. In order to allow for more effective maintenance of good health and for more effective allocation of health care dollars, health care providers and health care consumers must get to know each other better. We must communicate directly and not relate second-hand through the commercial media, which often exacerbate public anxiety through ignorant or alarmist coverage (Shaw, 1994). Smith *et al.* (1972) reported that as much as 70% of the health information communicated on television was misleading or inaccurate. In order to provide members of the lay community with timely, specific, understandable and responsible information on individually relevant medical questions experiments in interactive telecommunication have taken place. For example, the Los Angelos free-net, an interactive community information resource, was established in part to help community members become more effective consumers of health care services and to share medical information resources and personnel with similar organizations around the world (Bluming & Mittelman, 1996). The Los Angeles free-net offers timely expert answers to anonymously asked medical questions at no charge. Already services provide more than 4500 logons each day, with an average connection-time duration of 17.5 minutes. The system has been identified as a prototype community information network to be emulated around the country, and was featured in a nationwide satellite television broadcast used to launch the Clinton administration's 'Get connected' campaign (Bluming & Mittelman, 1996).

Although it is too early to define health care benefits from this kind of system it seems to establish an interactive working relationship that empowers the patient and places the physician in the role of counsellor rather than teacher.

But all other forms of physician communication are also in the process of revolutionary change. Prototypes of knowledge-management online environments for biomedical and medical sciences which integrate access to online representations of the scientific literature, bibliographic databases, high-performance visualization technologies, large-scale scientific databases and tools for authoring new-generation scientific publications have been designed (Doyle *et al.*, 1996). The Visible Embryo Project team has designed such a prototype knowledge-management online environment for the biomedical sciences that uses the World Wide Web for its underlying architecture (Doyle *et al.*, 1996). In the process of doing so, the project team has already made significant advance in the state of the art in online information access and communications. Primary among these has been the creation of the concept of the 'inline plug-in' and downloadable 'Web applet' within World Wide Web pages. This massive database is housed at the Human Developmental Anatomy Center at the National Museum of Health and Medicine in Washington, DC, while teams of researchers at more than 20 universities and companies around the United States will access widely distributed supercomputing resources to develop visualization, analysis and telecollaboration software tools, educational materials, virtual reality simulations, basic science investigations, and clinical research projects based on the data contained within the collection. This project will serve the dual purposes of providing a testbed for new technology development in high-performance computing and communications, as well as creating powerful new tools for the developmental biology research community.

Another fascinating area is the use of new educational interactive multimedia products in support of teaching and learning (Janssen *et al.*, 1996; Longstaffe, 1996). Computer-assisted education is becoming increasingly important. This is especially notable at universities using for example teaching files, multimedia textbooks, image databases and Internet discussion groups in various forms (mailing list, use net and newsgroups, web forums, intemet relay chat [IRC] and cool talk). There are even 'online journals' available only in electronic form on the Internet such as for example the *Electronic Journal of Orthopedics* or the *Online Journal of Current Clinical Trials* with a peer review system. But there are even more breathtaking advances with the use of the video-enhanced web integrating real-time video in hypertext documents (http://www.vosaic.com/), virtual reality simulations and desktop videoconferencing usable for virtual conferences on the Internet but also for remote studies (http://www.videoconference.com/about.htm) or continuing medical education. Many physicians, especially those in rural areas, find it inconvenient and impractical to attend CME conferences and meetings. To develop a physician-friendly continuing medical education tool for use on the World Wide Web, and to improve physicians' clinical and history-taking skills, developers at Marshall University designed a multimedia interactive patient encounter for a web server (Hayes & Lehmann, 1996). Any physician with access to the Internet can use this program to take a history, perform a physical examination, order laboratory and radiologic studies and submit a diagnosis and treatment plan. The system evaluates the user's performance electronically and delivers CME credits by mail. The Interactive Patient is located on the World Wide Web at http://medicus.marshall.edu/medicus.htm.

Visions

In January 1997, a UN symposium on the topics, 'Multimedia Convergences', was held in Geneva. The scenario of the future presented there showed—to put things in an extremely simplified way—a virtual workplace with a super-multimedia device for working, watching TV, net-surfing and interactive operations. Another particular area comprises new forms of life and work such as teleworking and teleshopping.

Knowledge is the capital of the future

To an increasingly lesser extent, the knowledge we need is acquired at schools and universities. What is in growing demand is instant learning or instant knowledge. Learning 'just in time' has the advantage that the distance in time between theory and practice is very small. In view of the short cycle of innovation of markets there is a demand for new forms of education which may be summed up under

the concepts of distance learning, teleteaching, virtual campus, or virtual university.

Nowadays fiction is becoming a science, as well as a division: "to go where no man has gone before". This concerns in particular the development of interfaces, the connections between man and machine. To an increasing extent, many interfaces can no longer be recognized as such; in the future, diabetics, for example, will be able to read their blood insulin level immediately on their forearm, as the LCD display of an implanted chip will be visible through their skin—wearable computing, as it were. Anne Balsamo, a US communication scientist, calls the virtual body of all data collected from a person and stored in cyberspace the 'infobody'. This 'infobody' is the best way of getting acquainted with the respective person's real body. The human body conceived as an information device would thus be synonymous to man as a password of flesh and blood. The corresponding technical term would be 'biomatrix'. This would comprise all unique characteristics typical of a person. Voice recognition systems, fingerprint analysis, acoustic head resonance, retinescene and even body odour could be used for verifying the identity of any individual. Even a person's individual rhythm of typewriting is to be recorded and digitalized. Identification Technological International coined the slogan "Your face is your PIN" (personal identification number). Since last year, immigration officers at San Francisco airport have been using ID-3D handkey devices, which by means of video cameras scan the geometrical characteristics of fingers and hands. As Alexis de Tocqueville wrote, after observing another wide-open community, "One must be careful not to judge newborn societies with the ideas of those that no longer exist" (*Time* Digital Supplement, September 1997). But there still remains the question, "*quo vadis?*"

Note on contributor

S. Meryn, MD, is professor of internal medicine and head of the newly founded centre for advanced medical education and health communication at the Medical Faculty of the University of Vienna, Austria. He is president of the World Academy of Medical Education and a member of AMME.

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