Satellife: getting relevant information to the developing world

Trish Groves

On 23 September 1996 Professor Praveen Aggarwal in New Delhi appealed to doctors and researchers around the world for help. "We are facing a near epidemic of dengue haemorrhagic fever in Delhi, India," he said. "Despite managing these patients on the lines stated in textbooks, many of our patients are dying. I wonder whether we are erring somewhere in diagnosis and management of these patients. Therefore, I request you kindly email me some of the recent information on pathogenesis, diagnosis, and management of these patients."

Professor Aggarwal had sent his plea by electronic mail through a global computer network called HealthNet. Specifically, he had posted his message to ProMed (the Program for Monitoring Emerging Diseases): a 24 hour, seven day a week, electronic conference on emerging diseases. Prompted by this appeal, a team from the World Health Organisation's regional office for South East Asia visited Dr Aggarwal's hospital the next day, bringing advice on staff training and two brand new reports on managing dengue haemorrhagic fever. Over the next 10 days Dr Aggarwal was offered help by a doctor with 10 years' experience of treating the disease in Rio de Janeiro and put in touch with another doctor in Bangkok who worked at the centre of a major dengue epidemic last year.

Professor Aggarwal works in the All-India Institute of Medical Sciences, a large and prestigious medical school in a city. But he could have been practising in a remote rural village with no phone lines and still have got the help he needed. This is because Satellife, a not for profit organisation based in Boston, has spent the past 10 years linking up health professionals and researchers in the developing world through satellite, radio, and—where available—telephone systems.

HealthNet, Satellife's electronic network, is just one of many initiatives currently trying to solve the problem of what is increasingly called information poverty. HealthNet has two special advantages: it can reach the parts of the world that other schemes cannot reach, and it sifts much of the information it carries to ensure its high quality and its relevance to the developing world.

Information poverty

It goes almost without saying that doctors and other healthcare workers, wherever they are, have much to gain from keeping up to date with medical research and development. But it is often very difficult to do: in the rich northern countries of the world doctors are overloaded with information.¹ And, more worryingly, in many poor southern countries doctors have little or no current relevant information to learn from.²

One big problem is the lack of books and journals in libraries in poor countries. The BMA library in London subscribes to around 700 journals; many libraries in the developing world can afford to take only a few, if any. Several organisations are trying to put this right, such as the International Network for the Availability of Scientific Publications (INASP).^{2,3}

Getting print media to medical libraries is obviously very important, particularly for teaching students. But

books and journals have two main drawbacks: limited relevance and limited distribution. Firstly, for many doctors in developing countries print media are too heavily based on research and practice in the developed world. Publications produced more locally, however, are even harder to acquire, partly because they are rarely indexed in international literature databases such as Medline. This is doubly wasteful; medical workers in developed countries could also learn from such publications.

Secondly, books and journals rarely reach doctors and other health workers in remote towns and villages, who seldom, if ever, get to a library. Satellife's electronic HealthNet system has got round both these problems.

Satellife's chief medical adviser, Dr Ramnik Xavier, explains why electronic communication is so important to doctors in the developing world: "Undergraduate medical education in the developing world often meets high standards, and graduates who can continue postgraduate education do well in exams and provide good medical care," he explains. "But those who return to their communities often suffer from lack of access to medical information. If they want to do research, they have to move away, causing a local brain drain." Satellife, says Dr Xavier, can help them to stay where they are and still learn.

Leela McCollough, Satellife's information director, emphasises that the organisation is an information broker, seeking out information and enabling information exchange that is relevant to the developing world. "Of course, the Internet offers more medical information than HealthNet. But relatively little of it is generated in, or relevant to, poorer countries. And it is much more difficult and expensive to access than HealthNet."

Satellife

Satellife is the brainchild of Dr Bernard Lown, an American cardiologist who founded the Nobel peace prize winning organisation International Physicians for the Prevention of Nuclear War. Through his campaigning Dr Lown was keenly aware that truly international cooperation among health professionals was badly hampered by poor communications systems. Those in the

Waiting for a telephone in the developing world

If you applied now for a new telephone line in the following countries it would take¹:

Bangladesh	10 years
Ghana	6.5 years
Kenya	8.4 years
Malawi, Mali, Nigeria, Tanzania, and Zambia	10 years
Zimbabwe	5 years
Nepal	<10 years

Source: International Telecommunications Union

Satellite ground station installed at Guizhou Provincial Institute of Parasitic Diseases in Guiyang, Guizhou, People's Republic of China

world's rich northern countries could happily chat among themselves by post, telephone, fax, and email. But very few doctors in the poorer countries of the south, particularly in Africa, could join in.

Even now, as the millennium closes, people in the world's poorest countries are having to wait 10 years to get basic phone lines installed (see box). And, as the *Economist* put it earlier this year, "While the lucky few million in the rich world amuse themselves in cyberspace, half the human race has never made a telephone call."⁴ How many of that unlucky half have suffered and even died because their doctors have been unable to keep up to date with modern medicine?

Ten years ago Bernard Lown learnt of a surprisingly simple way to link up doctors in the south: low earth orbit communications satellites. These are very different from the huge and costly satellites that beam telephone and television signals to many of us from 35 400 km up in space. Low earth orbit satellites are much tinier (no bigger than a refrigerator), cost 20 times less to build and launch, and operate at an altitude of only 885 km. Yet, as Dr Lown found out, one such satellite can link together a global email network. In 1989 Dr Lown set

up SatelLife, having persuaded several corporations and investors to fund the idea, and paved the way for a medical information sharing network called HealthNet.

How SatelLife and HealthNet work

SatelLife provides a bridge between health professionals and the Internet using something called "store and forward technology." This system does not rely on a continuous or "real time" connection to the Internet to exchange data and thereby costs less to use. Instead, SatelLife allows messages to be relayed from point to point along an electronic pathway, using either the satellite or telephone modems, or both.

The first satellite, Healthsat 1, went up in 1991 and was replaced in 1993 by the more sophisticated Healthsat 2. Orbiting from pole to pole, Healthsat 2 can send and receive electronic messages from each of its ground stations around the world at least four times a day. Each ground station comprises an antenna, a personal computer, relatively simple email software, high frequency radio and, where available, a telephone.

When the satellite comes into range of a ground station it beams down data at a rate of about one page of text per second. In addition, messages composed on the ground station computer are sent up to the satellite, where they are stored and later delivered to SatelLife's headquarters in Boston. From there, email messages are forwarded to other HealthNet users and also, via the Internet, to anyone in the world with an email address. Messages back to the ground stations take the reverse route.

Where HealthNet operates

Africa—Botswana, Burkina Faso, Cameroon, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, South Africa, Senegal, Sierra Leone, Sudan, Tanzania, Uganda, Zaire, Zambia, Zimbabwe

Asia—China, Indonesia, Myanmar, Nepal, Philippines

Latin America—Bolivia, Colombia

Future centres—Bangladesh, Cambodia, Haiti, Madagascar

Satellite ground stations—Gabon, Northern Ghana, Nigeria, Tanzania, Sudan, Zaire, China

SatelLife may seem like a Model T on the information highway, but it gets from A to B and rarely breaks down

While the satellite and ground stations continue to serve remote medical units, much of SatelLife's email and Internet traffic is now sent by telephone lines, as international telephone connections to capital cities in the developing world are gradually improving

Even where the network relies on telephone lines, SatelLife still uses store and forward technology. The HealthNet user prepares and stores messages on a computer at home or work. When convenient, he or she calls up a local central computer or HealthNet "node." The node holds the messages, acting as a post office for all HealthNet users in the region or country. SatelLife retrieves such messages from the node several times a day and shuttles them to the Internet.

How HealthNet is used

At the moment around 4000 healthcare workers in 30 countries have access to HealthNet (see box). Many say it is a life saver. Only this year, the Albert Schweitzer Hospital in a remote part of Gabon appealed urgently through the network for information on Ebola virus, which had rapidly killed at least a dozen people in a small village nearby. Within one week of the appeal, the hospital had more than 40 pages of current information from the Internet, regular email contact with the medical team who handled the major outbreak of Ebola virus

in Zaire in 1995, and—with help from an American aid organisation, AmeriCares, and Sabena Airlines—a big consignment of protective clothing. The virus was contained in the village, and the hospital was fully armed for any recurrence.

As the Albert Schweitzer Hospital found, HealthNet offers a wide range of services. And, most importantly, HealthNet is affordable (see box). Subscribers can email each other; read and print out from 12 different electronic publications; search 21 literature databases held at the US National Library of Medicine (using an email system called BITNIS or Batch Internet National Library of Medicine Information System); take part in continuous electronic conferences on subjects such as AIDS; get formal education through distance learning programmes and teleconferencing; and retrieve pages from the Internet indirectly using a special email web browser called Agora. A HealthNet user cannot interact directly with the Internet pages that the Agora software provides. Because an Internet user is operating in real time he or she can jump to other parts of the Internet immediately, by clicking on links that have been set up within the screen. Agora is simply providing the HealthNet user with a copy of the Internet page, so it translates these interactive parts into written Internet addresses. HealthNet users then have to note down the addresses that they want and send email messages to SatelLife in Boston, giving those Internet addresses within the text of those messages. SatelLife then retrieves the desired information from the Internet and sends it back to the HealthNet user by email. It is a bit long winded, but it works.

Value for money in Africa

Typical costs in \$

Average spending on health per head each year	10
Monthly income for average doctor	150
Three minute phone call from Burundi to Botswana	23
Six page fax from Mali to Zambia	180
Monthly cost of Internet connection (individual)	100
Monthly cost of HealthNet connection (local phone call rates plus a nominal monthly subscription)	10

HealthNet News

SatelLife's main publication is its electronic newsletter, *HealthNet News*. Updated every day, it summarises current information that could realistically and affordably improve medical care and prescribing in the developing world. Dr Ramnik Xavier edits *HealthNet News* from Boston. He scans about 25 international and local journals a month (including the *New England Journal of Medicine*, the *BMJ*, *ACP Journal Club*, *Evidence Based Medicine*, *Journal Watch*, the *South African Medical Journal*, and the *East African Medical Journal*) and picks out relevant articles and abstracts to include in the newsletter.

Dr Xavier aims for high quality as well as relevance, sticking to medical science based on good evidence. But he also goes for articles introducing non-clinical developments such as managed care, audit, medical computing, and biostatistics. And the flow is two way: subscribers can tell SatelLife what they need to know, and some, through reporting back from conferences they have attended, can contribute to the newsletter. Few doctors and researchers in developing countries, however, get the chance to attend major conferences. So

HealthNet's electronic publications

HealthNet News
AIDS Bulletin
WHO Library Digest for Africa
WHO/AFRO Infodigest
AIDS Action
CBR News
Child Health Dialogue
Health Action
Practical Pointers on Primary Care
HDD Flash
Emerging Infectious Diseases
Morbidity and Mortality Weekly Report

HealthNet offers its subscribers, at no extra cost, its own ongoing moderated conferences on HIV and AIDS, infectious diseases, and drugs.

Continuous electronic conferences

ProCAARE

The United Nations AIDS programme reckons that, of the 21 million people infected with HIV around the world, 94% live in developing countries. This year hundreds of healthcare professionals and researchers in those countries have been able to confer for the first time, day or night, through ProCAARE (Program for Collaboration Against AIDS and Related Epidemics), a special part of HealthNet's email system.

SatelLife has an illustrious array of collaborators in ProCAARE: the Uganda Viral Research Institute, the All-India Institute of Medical Sciences, the Harvard AIDS Institute and Harvard School of Public Health, and the European AIDS Commission. Just as importantly, however, any interested medical worker or researcher can sign up and take part. Indeed, one of the first messages was an appeal from a doctor in Pakistan for information on home care for people with HIV. Within two days he had learnt what he needed from staff running home care in Puerto Rico and Zambia; he had not needed any help from the developed world.

PROMED

ProMED was set up in 1992 by the Federation of American Scientists, a charitable think tank based in Washington DC. It covers diseases of man, animals, and plants. Initially available only to those with access to the Internet, it can now be reached by SatelLife's email system.

E-DRUG

This conference regularly disseminates information on essential drugs, treatment guidelines, and new developments, pulling together material from the World Health Organisation and other international bodies. Its subscribers are warned, however, not to clog up E-drug's channels with requests on how to treat specific patients or with advertisements for drugs.

SatelLife in the future

SatelLife's plans for expansion include evaluating the effect of HealthNet on educational and clinical outcomes, compiling a database of library resources in the developing world, making greater use of its own subscriber database so that fellow users can contact each other more directly, offering more conferences (for example on tuberculosis), and making wider use of languages other than English (for users in Francophone Africa, Latin America, and Asia).

Some subscribers have defected recently to the Internet. But John Mullaney, SatelliLife's executive director, remains certain that this less glamorous system—based on rational technology—will have a vital role for many years. HealthNet works well enough and is affordable. Full and direct connection to the Internet may be more exciting and, in theory, may be much quicker because it delivers information immediately. But it is more expensive to set up and use, is difficult to use well (because it is unregulated and messy), it needs expensive technical support, and its telephone lines are often engaged or prone to disconnection. "Our store and forward low earth satellite technology may appear to some to be a Model T on the information highway," say SatelliLife's

directors. "Nonetheless it is appropriate, simple, inexpensive, and sustainable."

Publications are distributed in collaboration with other organisations including the World Health Organisation, the Centers for Disease Control, Atlanta, Appropriate Health Resources and Technologies Action Group (AHRTAG), World Bank, and publishers of medical journals.

1 Smith R. What clinical information do doctors need? *BMJ* 1996;313:1062-8.

2 Groves T. Information sharing: getting journals and books to developing countries. *BMJ* 1996;307:1015-7.

3 Kale R. Health information for the developing world. *BMJ* 1994;309:939-42.

4 Tele-haves and have-nots. *Economist* 1996;18 May:19-20.

5 *SatelliLife News* 1996;13:3.

Rights, wrongs, and journals in the age of cyberspace

Following their earlier onslaught on print journals,^{1,2} Ron LaPorte and Bernard Hibbitts argue—with a little help from the Beatles—that journals have forced scientists to give up their copyrights and lose control of their work. The Internet, and the possibility it offers of electronic self publishing, has changed all that, and they argue that journals must recognise that the world has changed. We asked the editors of the "BMJ," the "Lancet," the "New England Journal of Medicine," "JAMA," the "Annals of Internal Medicine," "Science," and "Nature" for their comments. One didn't reply and two declined, but the other four responded robustly.

"We all want to change the world"

Ronald E LaPorte, Bernard Hibbitts

You say you want a revolution,
Well you know
We all want to change the world.

These famous lyrics come from the Beatles' song "Revolution." In 1986 the world was startled to hear that the rights to this and most of the other Beatles songs had been bought by Michael Jackson. Paul, George, and Ringo now have to ask Jackson's permission to perform the music they wrote. They even have to pay him royalties. Meanwhile, Jackson can authorise others to use Beatle's materials for any commercial purpose he sees fit. As a result, "Revolution" itself is being used to sell Nike sneakers, and there is nothing the Beatles can do about it.

This artistic tragedy may make many scientists thankful they are not musicians. But wait a minute. Who owns scientific papers? Typically not the scientists who write them, but rather the journals and publishing houses to which scientists routinely grant their copyrights. Once scientists sign copyright forms, other scientists and even the original scientific authors have to seek the journal's permission before reproducing the figures and text which they created. The journals, in turn, can do what they like with scientific papers. They can grant permission to reproduce or reprint them, or they can refuse to grant permission. They can use scientific papers to advertise themselves in the media. In all these instances the original authors are helpless. In some respects, scientists are worse off than the Beatles. The contract with Michael Jackson at least granted Paul, George, and Ringo an ongoing income. Scientists, on the other hand, not only receive no income from the journals but often have to pay them page charges under the same contracts by which they surrender their copyrights.

"Let me tell you how it will be, there's one for you, nineteen for me"

Why do scientists tolerate this situation? The traditional answer is that they have no option. In this

century journals have monopolised scientific communication. They have provided virtually the only means of effectively and efficiently communicating research findings to the broader scientific community. Scientists, afraid of becoming like Father Mackenzie,

Writing the words of a sermon that no one will hear,

are willing to agree to virtually any terms of publication dictated by the *BMJ*, *Science*, *Nature*, the *Lancet*, the *New England Journal of Medicine*, and the like. They know that if they do not agree to those terms their papers will not be published, their work will not be known, and their careers will be compromised. No wonder scientists say,

If you really like it, you can have the rights.

Journals thus end up owning very valuable intellectual property which they barely contributed to making. Taxpayers and charitable donors fund most research; universities house much of it; scientists conceive of it, do the research, and pay to have it published; yet the journals have complete control of the articles coming out of it.

Self publishing for all

There is no need for this any more. The recent development of the Internet, and in particular the world wide web, provides scientists with a publishing alternative that is in many ways superior to traditional journal publication. In brief, scientists with access to web servers at their institutions now have the option of electronically publishing their work themselves. Self publishing on the web enables scientists to:

- Report their findings right away, instead of having to wait months or years for formal review and printing
- Post material virtually for free instead of paying hundreds of dollars per paper in page and reprint charges
- Make their findings available to a worldwide audience far larger than the subscription list of any journal

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