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Short papers

Special report: Outbreak meets the Internet

Outbreak meets the Internet: global epidemic monitoring by ProMED-mail

Introduction

Yusef ... has just come from the Nuba Mountains, a region in the south of Sudan that is the size of Oregon, and in a state of chaos. The citizens of Nuba are black Sudanese, mostly Christians and animists, and have been engaged, like the rest of southern Sudan, in a 40-year fight with the Arabs of the north.

'A hundred children are dying each week of measles right now,' he says, pausing. 'I *think* it is measles.'

This has been going on for two months, he says, and there has been no intervention by the outside world. He doesn't know how far the epidemic will spread. 'There is no medicine at all, no doctors,' he says, and asks me to take word of the outbreak back to Nairobi. [1]

A recent US Government report recommends the development of a global alert system through which national governments can inform health authorities around the world of outbreaks of infectious diseases. It also says that the US Government should help establish regional disease surveillance and response networks linking national health ministries, World Health Organization regional offices, and US Government laboratories and field stations abroad. Copies of the report, *America's vital interest in global health*, are available from the Institute of Medicine's Board on International Health, tel. (202) 334-2427:

<URL:http://www2.nas.edu/whatsnew/269a.html>

Jeffrey Goldberg says 'there will be no establisment of 'regional disease surveillance and response networks" in the Nuba Mountains. But I know that area, and there is a way they could easily send outbreak reports and receive information on treatment and response. It is the system currently used by Vanga Hospital, Zaire, and the Albert Schweitzer Hospital in Gabon - both in the Ebola belt of Africa - and several other sites to connect with remote health clinics in developing countries.

All that is required is a ground station costing less than $9 000 and a trained operator. The ground station basically consists of a computer, radio and omni-directional antenna, which links through SatelLife's low-earth-orbit satellite system to the ProMED-mail global outbreak reporting network. Power could be provided by solar batteries, and no telephone lines are necessary. SatelLife is a not-for-profit organization operating out of Boston, Mass., and it has already placed satellite ground stations in seven developing countries, including one in the University of Khartoum, Sudan. In other countries it provides Internet connectivity through its HealthNet nodes, which are connected by land line or ground radio. Boston headquarters polls these nodes by phone several times a day.

HealthNet home page:
<URL:http://www.healthnet.org>

ProMED-mail is a creation of the Program for Monitoring Emerging Diseases, a project of the Federation of American Scientists. ProMED-mail is a moderated, free e-mail list, started in 1994, with over 11 000 direct subscribers in more than 135 countries - and thousands more via the Web - who report and discuss outbreaks of emerging infectious diseases of man, animals and plants. Calls for assistance are also passed through the list moderators to appropriate responders.

Federation of American Scientists:
<URL:http://www.fas.org>

ProMED-mail:
<URL:http://www.healthnet.org/programs/promed.html>

ProMED-mail subscribers include, among others:

- World Health Organization (WHO)
- United Nations humanitarian and relief agencies
- Federation of International Red Cross and Red Crescent Societies
- US Centers for Disease Control and Prevention (CDC)
- Laboratory Centers for Disease Control, Canada
- Public Health Laboratory Service, UK
- Pasteur Institutes in France, Tahiti, Vietnam
- National Institute of Health, Japan

and national health ministries and departments worldwide, as well as thousands of interested members of the general public.

The direct subscriber base has grown by 28% over the past 12 months.

LEO satellite and store-and-forward technology

The technology used by SatelLife for picking up and forwarding e-mail documents comprises a Low Earth Orbit (LEO) satellite and store-and-forward software. The LEO satellite, named HealthSat-2, is about the size and shape of a small refrigerator, placed in polar orbit at 800 km altitude. The small size means it can share a launch vehicle, which reduces launch costs, and the low altitude reduces energy requirements and transmission errors. The polar orbit means that every spot on earth passes through its footprint several times a day, from four times a day at the Equator to 14 times near the poles.

The window open at each pass of the satellite is approximately 15 minutes, allowing for the download of up to 150 kilobytes of compressed data, or about 150 pages of text, and the upload of 25 kilobytes (25 pages) - and remember, this is 4-14 times per day, so a lot of data can be transmitted. Each time HealthSat-2 passes over the Boston ground station, the data is downloaded and fed into the Internet for distribution.

HealthNet technical details:
<URL:http://www.healthnet.org/tech/tech.html>

SatelLife staff travel to developing countries to install the ground stations and train the local system operators.

List operating technology and personnel

ProMED-mail's operations are handled using Majordomo listserv software, tweaked by SatelLife staff to better serve the needs of the list, a dedicated Sun Microsystems computer, and batch processing software. A volunteer director (the writer) coordinates the work of four other moderators - two veterinarians, an arbovirologist and a plant pathologist - and a part-time staff member of the FAS office. All messages to ProMED-mail pass through the hands of at least one of these moderators before posting. The rejection rate of items submitted is very low. A number of volunteers surf the Internet looking for reports of new outbreaks, and translate items which are not in English. A parallel discussion list in Portuguese began recently, and one in Spanish is planned.

Speed and reliablity of reporting

ProMED-mail's primary objective is to report outbreaks of emerging diseases as fast as possible. Thanks to input from our 11 000 subscribers, ProMED-mail has been able to notify the world of the following outbreaks up to 4 weeks before even the World Health Organization's global reporting system:

(1) Cholera in the Philippines

> On 28 May 1996 a ProMED-mail subscriber in Manila watching local TV news told us about a big outbreak of cholera in the Philippines, which we posted immediately [Original report].
>
> It was not reported on WHO's electronic bulletin until 14 June [Original report].

(2) Dengue/Dengue Hemorrhagic Fever in Malaysia

> On 7 June 1996 the Director of the WHO Collaborating Centre for Dengue Fever/Dengue Hemorrhagic Fever in Kuala Lumpur advised us of the start of the dengue season in Malaysia, with 2450 cases reported. We posted his report the same day [Original report].
>
> WHO's automatic faxback bulletin reported it only three weeks later, at the same time it was published in the Weekly Epidemiological Record No.26 of 28 June 1996 [Original report].

(3) Fatal case of yellow fever imported into Switzerland

> In June 1996 a infectious disease specialist in Switzerland registered with the OUTBREAK site on the World Wide Web (http://www.outbreak.org/). He was consequently invited to subscribe to ProMED-mail, which he did on 20 June, mentioning in passing that he had just diagnosed a patient who died from yellow fever in his hospital. The patient was a tourist who had visited the Brazilian Amazon. There was some delay in persuading the doctor to give permission to publish, but the report was posted on ProMED-mail on July 1, with his note that he hoped this would encourage would-be tourists to get their yellow fever shots [Original report].
>
> The Brazilian authorities recommend vaccination, but do not require it as a condition of entry.
>
> This case only appeared in the WHO Weekly Epidemiological Report No.30 on 26 July, nearly four weeks later, as a notification (statistic) on the back page, without a warning note advising travelers to the Amazon to be vaccinated [Original report].

(4) New Ebola outbreak in Gabon

> The WHO Regional Office for Africa called a press conference to announce this new outbreak on Friday 11 October 1996, and the newswire report was forwarded by a subscriber to ProMED-mail and posted the same day [Original report].
>
> But the report did not appear in the e-mail/fax bulletin of WHO's Geneva headquarters until the following Tuesday [Original report].

Fast reporting translates into quicker arrival of prevention & control assistance from other countries, better advance warning to neighboring countries and intending travelers, and other benefits to public health such as heightened awareness of health workers to the threat, time to prepare countermeasures and to react in an appropriate manner rather than a reflex emergency response. Some travelers may alter their plans to avoid the possibility of contracting the disease; this also protects their home population from spread, in the event that they were to return from their trip with a communicable disease.

The fact that all the above reports were later confirmed by WHO headquarters in

Switzerland testifies to the reliability of the reports coming in to ProMED-mail.

Response to outbreaks and queries

Examples include:

(1) Dengue hemorrhagic fever (DHF) in India

> On Saturday, 21 September 1996, ProMED-mail received a call for help from the Division of Emergency Medicine of the All India Institute of Medical Sciences. Children were dying of DHF in their wards and they needed information on treatment.
>
> The call was seen by the WHO Regional Office for South East Asia, also located in Delhi, and on the following Monday a team drove to the the hospital and provided the needed assistance [Original report].

(2) Smallpox burials, South Africa

> In March 1997 the National Institute of Virology of South Africa sent ProMED-mail a message that a cemetery containing the remains of long-buried smallpox victims was to be excavated to permit the construction of low-cost housing. They wanted to know the chances of the smallpox virus having survived burial for 30 years [Original report].
>
> A world expert on smallpox replied that there is no danger, but to allay public concern it would be a good idea to have the people who would be handling the remains vaccinated against smallpox [Original report].

Confirmation of reports

Examples include:

(1) *E. coli* O157:H7 in Japan

> In June 1996, an epidemiologist with the County of Los Angeles, California, health services asked for confirmation of a report from a

local Japanese newspaper reporter that there was an outbreak of *E. coli* in schoolchildren in Japan [Original report].

Within four days, the doctor in charge of the Hiroshima Quarantine Station in Japan replied with a day-by-day account of the spread of the outbreak, translated from local newspapers [Original report].

(2) Delta hepatitis in the upper Amazon

In January 1997 a ProMED-mail subscriber in Brazil forwarded a local newspaper report of an outbreak in the Upper Amazon province of Acre of rash, bloody diarrhea and vomit which had killed 27 people in 20 days [Original report].

After a flurry of long-distance tentative diagnoses from other readers, a message came in from a doctor involved in the investigation of the cases, with the laboratory diagnosis of delta hepatitis [Original report].

Who would have imagined that, in one of the remotest regions of the world, a physician would be on e-mail, and able to react to the news media reports of a mysterious outbreak with a definitive diagnosis?

(3) Meningococcal meningitis in Moscow

In February 1997, MASTA (Medical Advisory Services for Travellers Abroad, UK) requested confirmation of a report of an outbreak of this disease in Moscow [Original report].

Within six days confirmation was received from the Laboratory for Meningococcal Infection and Bacterial Meningitis in Moscow [Original report].

Official use

Various countries and health organizations have recognized the value of ProMED-mail by specifically requesting distribution of their outbreak information through its list, and by responding to posts. This shows their appreciation of the value of the list in disseminating outbreak information,

clarifying reports, and educating subscribers about emerging diseases.

(1) Australia

Government health and veterinary agencies have sent ProMED-mail reports on:

- the first recognized cases of Japanese encephalitis virus in Australia, in 1995 [Original report].
- the new equine morbillivirus which killed a number of racehorses in 1995, their trainer and a farmer, and appears to be harbored by fruit bats [Original report].
- a new rabies-like virus from fruit bats, in 1997, associated with a human death [Original report].

(2) Chile

In March 1997 the Undersecretary of Health sent notification of an outbreak of amebiasis, an intestinal infection, in a coastal city [Original report].

(3) Russia

The State Epidemiologist for Russia sent reports of outbreaks of infectious disease every week or so during much of 1996, until a reorganization of his office intervened [Original report 1] [Original report 2].

(4) United States of America

In August 1996 the Regional Epidemiology Office based in New York State put out a warning through phone, fax and ProMED-mail, concerning a batch of renal dialysis fluid that was causing toxic reactions in kidney dialysis patients [Original report].

The post on ProMED-mail contributed to the identification of 73 cases, fortunately none of them fatal, and the withdrawal of that batch of fluid from use [Original report].

Conclusion

The experience of operating ProMED-mail over nearly three years has shown that the public, interactive, unofficial reporting of outbreaks can be faster than through official channels, yet be reliable and responsive to the needs of healthcare providers in epidemic locales. The constantly expanding number and geographical spread of ProMED-mail subscribers, both health professionals and general public, with an interest in exchanging information on emerging infectious diseases, provides a much larger reporting base than any national or international health organization, and an unequalled capacity for discovering and reacting to outbreaks wherever they may occur.

ProMED-mail currently receives outbreak reports passively from the WHO and CDC (via the online M*orbidity & Mortality Weekly Report*), and actively from subscribers who check the Internet sites of the health agencies of other countries, and the news media. The European Union and numerous other countries and agencies are in the process of developing disease reporting networks, and - providing financial support is forthcoming - ProMED-mail will link with these in a continuing effort to bring information on outbreaks as rapidly as possible to those who have the need to know, and who can contribute to their prevention and control.

Reference

1 Goldberg J. Our Africa. *New York Times Magazine* 1997;Mar 2:32-39,59,62,75-77.

Jack Woodall PhD
Director, ProMED-mail
New York, USA

Society for the Internet in Medicine

Comments to: simq@cybertas.demon.co.uk

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