what proportion of their time is taken up with useful interaction as opposed to managing technology. Since the patient is party to all communication, this may reduce the usefulness of the consultation in terms of changed clinical actions, which need to be compared with those after a conventional consultation.

Making general practitioners reliant on expensive telemedicine may reduce the range of specialists to whom they can refer, leading to technology "lock in"; this needs to be checked. Telemedicine may also change the profile of referrals, leading to some patients receiving only the more economical teleconsultation; so the referral profile should be monitored. We also need to measure the ancillary resources required to install and maintain the equipment and train doctors in its use—resources readily available to enthusiasts but scarce elsewhere. Logistical problems in getting doctors and patient present at the same time may inhibit success and should be logged.[10]

On the positive side, telemedicine may enhance the exchange of clinical knowledge compared with conventional continuing medical education,[11] so educational benefit should be measured. The turnaround time is clearly improved, but the quality of written records may be reduced; both should be measured. The two way flow of information during the consultation will probably lead to improved detection of clinical signs, which should be compared with the normal consultation process.[12] One problem is that, if telemedicine leads to more accurate staging of disease or detection of complications, this may cause an apparent worsening in outcomes for telemedicine patients compared with less rigorously investigated controls.[6] Equally, because doctors often fail to record a precise diagnosis, the obligation to record one in teleconsultations may lead to a spurious increase in diagnostic accuracy.[13]

Conclusion

Trials of telemedicine need to be conducted on representative cases and subjects to ensure that results can be generalised. The control intervention must be the best that can be achieved without telemedicine, as otherwise it is hard to credit any benefit to telemedicine itself. Since telemedicine is simply another kind of medical technology, the same principles of rigorous evaluation of costs and benefits apply.[6 14] However, investigators may need to strive harder to maintain their clinical perspective and scientific rigour, since these trials are often driven by high technology and sponsored by those who provide it.

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Sentiweb: French communicable disease surveillance on the world wide web

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For 12 years the French Sentinel system has collected about 330 000 cases of eight communicable diseases in France from a sample of about 1% of the country's general practitioners (see box).[1] These sentinel general practitioners use a PC with a modem or a videotex home terminal to transmit data to a front server.[2] Case records are automatically stored in a relational database (Oracle), and the incidence of each disease, expressed in cases per 100 000 inhabitants, is calculated weekly. Incidences are calculated for each administrative district (96 departments and 22 regions in metropolitan France). Weekly electronic bulletins give feedback to the sentinel general practitioners and public health authorities.

Cumulative numbers of cases recorded in Sentinel database by June 1995

Flu-like illness	178 000
Acute diarrhoeas	81 000
Measles	7 000
Mumps	7 000
Chickenpox	17 000
Acute viral hepatitis	1 000
Male urethritis	5 000
HIV tests	25 000

Sentiweb

Since September 1995 the results of this communicable disease surveillance have been available on a worldwide web site called Sentiweb (http://www.b3e.jussieu.fr/sentiweb). Sentiweb also provides an electronic version of our quarterly paper bulletin *Sentinelles*, which is currently distributed to 60 000 doctors in France. Sentiweb can also be accessed from several important health related web sites (such as those of the World Health Organisation, Communicable Disease Surveillance Centre, Karolinska Institute, and Centers for Disease Control and Prevention).

Sentiweb provides a way to interactively consult the database. Two kinds of outputs may be requested: time series of incidences of cases and spatial spread of communicable diseases incidences in France. The data can be visualised as maps or curves of incidences within a selected range of time or space (fig 1). Maps may be produced either by means of a classic fill in method based on administrative contours or by a "kriging" fill in method based on iso-incidence contours.[3] The system allows a user to request as many as 25 000 different maps and 10 000 graphs of time series. An image is built in 3-15 seconds (excluding transmission time) depending on the complexity of the request. Since its opening, Sentiweb has provided about 9000 maps and time series.

Misuse of information

There is an unavoidable conflict between freedom of access to information and the risk of spurious interpretation of this information, leading in the worst case

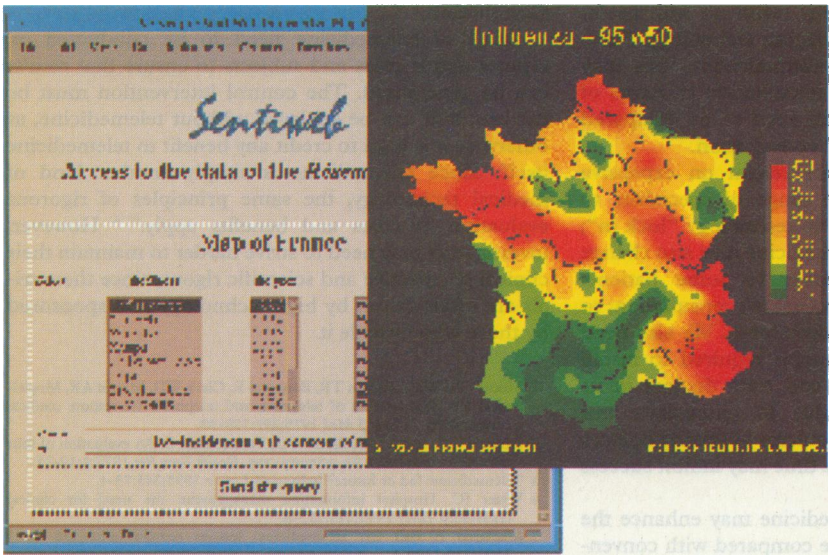

Fig 1—*The Sentiweb query interface and a resulting map of influenza in France. Users can browse the database in "real time" and, by choosing the disease (influenza), the year (1995), the time step (50th week), and possibly the type of graphical representation (iso-incidence with contours of regions), can request maps or curves of incidences of communicable diseases in France*

to a false alert. This is particularly true when searches are made in units of space or time that are too small, leading to analyses that are statistically meaningless. The open philosophy of the Internet brings this problem into the public arena. But do we have any alternative? How do we decide which of the maps or curves are not suitable for public view? Information on small numbers of cases is regularly published on many epidemiological bulletins, and this may be also used spuriously.

We therefore consider that, instead of censoring material, we should train users of the Internet to ask the appropriate questions of such a database. We have posted warnings about inappropriate use of information that appear when any requests for data are made, and users can send email requests for epidemiological help. We also maintain a weekly updated electronic report, written by epidemiologists in simple words, to guide users in their interactive queries on the most recent data. Moreover, the site provides links to other expert information classified by topics (such influenza, diarrhoea) or by organisations (such WHO, CDSC). Thus, users have the opportunity to extend their expertise by comparing our data with those of other sources.

We thank the sentinel general practitioners who collected these data. The Sentinel system was developed at INSERM (national institute of health and medical research) U.444 in collaboration with the Réseau National de Santé Publique (public health network) and the Direction Générale de la Santé (national department of health).

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Commentary: How good are the epidemiological data?

Norman Noah

This surveillance system was provoked into existence by the virtual non-functioning of the existing notification system in France. In its 12 years, 330 000 separate episodes of communicable disease from a selected list of eight rubrics have been reported. This gives an average of one diagnosis a week from each of about 500 general practitioners, a surprisingly low rate considering the conditions that are reported. These are an interesting but curious mix, ranging from specific (measles, mumps, chickenpox, and HIV tests) through broad (male urethritis, acute viral hepatitis) to diffuse (acute diarrhoeas, flu-like illness).

The strength of the system is undoubtedly in its technical sophistication. The use of paper is (presumably) minimal or non-existent. Thus the statistics, provided the sentinel general practitioners report promptly, are right up to date, while the analysis and feedback are not only virtually instantaneous but also make use of modern statistical methods such as "kriging." Ease of access to the system and feedback are enviable.

The system nevertheless remains a general practitioner based sentinel system and is not a substitute for the existing notification system in France. Diseases for which local or individual public health action need to be taken—such as rabies, meningococcal meningitis, or food poisoning—cannot adequately be covered by this or indeed any other general practitioner sentinel system. Measles and mumps—two diseases for which it has been most useful—will decrease in incidence with increasing vaccine coverage and become no longer viable for sentinel reporting. Moreover, even when the incidences of these infections were high, the number of reported cases to the sentinel system was fairly low—between 401 and 1558 cases annually between 1985 and 1990 for measles.[1] Since the general practitioners' list sizes and the age and sex distributions of their patients were not known, cases were often reported as numbers per general practitioner and it is not clear how age specific incidence rates are calculated.

Including acute diarrhoeal disease in the system without laboratory backup may be of limited value unless there is an acute and overwhelming epidemic, which is uncommon and unlikely nowadays. Flu-like illness without appropriate laboratory backup will act as an effective early warning system for influenza, but several other infections masquerade under the heading of "flu-like" and in recent years have undoubtedly accounted for more illnesses than influenza itself. It is a pity that much valuable epidemiological information on this type of illness will have been lost because the organism or organisms responsible were not known. The time and place maps of flu-like illness produced by the system[2] are beautiful but can be something of a mystery without this information.

The HIV tests give a positivity rate. This may be difficult to interpret in a sentinel system if the distribution of HIV infection and AIDS varies considerably by geographical area, especially when the system has a high turnover rate of general practitioners.[3] What would also need to be known is the pattern of patients' access to their general practitioners, and not only for HIV.

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