Global Considerations for Implementation of Telemedicine

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In December 1989, the United Nations proclaimed the Decade 1990-1999 as the "International Decade for Natural Disasters Reduction" (IDNDR).

As stated in the report, "The Decade is an opportunity for the world community, in a spirit of global cooperation, to use the considerable existing scientific and technical knowledge to alleviate human suffering and enhance economic security."

Which scientific and which technical knowledge? I quote from the Report of the Group of Experts: "New instruments and enlarged networks collect more and better data. There are opportunities in the Decade for extension and integration of existing databases using advanced computer technology. Another important breakthrough has been data gathering by satellites, readily providing information globally."

Indeed, the Decade identified a number of research programs, proposed by the UN and its specialized agencies, including the World Health Organization and its Regional Office for the Americas, the Pan American Health Organization (PAHO), by the International Council of Scientific Unions (ICSU), and by other bodies. Computer applications and communications, including teledetection, constitute a significant part of these projects.

As health professionals, our specific aim in disasters is to reduce deaths, casualties, and long-term adverse health effects. Where, how, and under what conditions could these new technologies be applied in the health field?

To get a clearer picture, disasters may be viewed as a system arbitrarily divided in five phases. It is the so-called "integrated approach"—central to the decade, a reductionist view—that makes disasters treatable as a system.

1. The anticipative phase. That is the dormant period in a disaster-prone area. It is the time for pre-disaster planning, including prevention, mitigation and preparedness.
2. The pre-disaster phase. This is the time for warning.
3. The impact phase. There is chaos, death, and shambles. The stricken community is isolated from the rest of the world. It is the time for rescue.
4. The relief phase. Feedback information is required for the organization and coordination of external assistance.

5. The rehabilitation phase. It is the time to learn from the past in order to get better prepared.

New technologies are useful at all these stages, although their relevance may vary according to the type of disasters. In the anticipative phase: remote-sensing and satellite imagery for land use planning, monitoring of drought and crops, hazard mapping, identification of secondary hazards, modelling for forest fires or spread of floods, simulation exercises for decision-making and preparedness of the public, computer databases of resources and expertise. Before an impending disaster: tracking of cyclones, monitoring of floods and volcanic eruptions, early warning for storms. In the relief and rescue phases: communications for search and rescue, surveys of destroyed areas, assessment of damages, monitoring of external assistance.

Communication of the right information at the right time and to the right place is an essential requirement of the health management for disasters. The fusion of computer science and new communication technologies makes possible the instant delivery of a huge amount of information aggregated from multiple and distant sources. This instantaneity is a major asset for disaster management when rapid decision is often a critical factor. The issue is how to develop the existing technologies into useful applications in the context of disasters. The information must be relevant, organized, geared to decision-making, and applicable in disaster-prone countries, which, for a large part, are poor countries.

A great future is opening up, but there are also a number of caveats.

1. Gadgetry. Often techniques are developed primarily to respond to an intellectual challenge rather than to serve a specific human need. Practical applications of technological breakthroughs take time to ripen. It is like evolution—mutation first, with all kinds of tentative, hybrid creatures. Selection comes later. Emergent techniques are for a while like actors in search of a play. Today the major outlet of integrated circuits, the most voracious chipsphages so to speak, are computer games. It is the time for gadgetry, which makes for irrelevance. The stage where at the moment sensors, satellites, computer networks, megabytes storage, optic fibers act out their play is still set in a scenery of prestige, vested interests, and at times futility.

New technologies should be used whenever and wherever they may provide relevant information. That information should be meaningful and cost acceptable.

It should also be integrated with commonplace and more prosaic methods. For example, while remote sensing systems are of growing importance in planning for disasters, they should be complementary to ground surveys, which can provide data not obtainable from satellites. Newspaper clips, rumors, snake behavior, and tam-tams are also part of information. There should be no technological dogmatism in that matter. There is indeed an educational value in this blending of the new and the old. Comparisons of space and ground observations, by a better visualization of the mechanisms involved, may also enhance public awareness and preparedness for disasters. One has to remember how weather forecasts with maps from satellites have introduced meteorology to the living room.

The conquest of relevance in the collection, transmission, and presentation of information calls for a dialogue between disaster managers and information specialists. Managers should know the opportunities as well as the limits of the emerging technologies. They should be involved in the design of new systems and their testing.

2. Language. Irrelevance may also proceed from the illusion that computers can generate meaningful information from unstructured and sloppy data.

As a first rule, terms have to be defined, categorized, and standardized. For example, epidemiological surveillance or post-disaster surveys require a precise definition of what is meant by death from impact, casualty, hospitalization, medical care, evacuation, psychological trauma, and similar terms. It is urgent to refrain from embarking on projects of large databases if there is no standard language agreed upon in advance. This requirement also has an educational value, since it will oblige the users to clearly formulate their objectives and to adhere to strict protocols.

Health professionals for their part have to learn how to think dichotomously, in bits. Before juggling with computers, they need to learn how to talk to computers. Before dreaming of entering hodgepodge data on terminals, they need to wire their own diagnostic mental networks. The inventory of useful decision-making data, its organization in significant algorithms, and the definition of format for presentation is the first priority.

3. Probabilities. Disaster management is for a large part made of decisions under conditions of uncertainty. Prevention is game theory, gambling on calculated risks. Prediction is betting. Evaluation of radiation accidents is balancing individual vs. collective, stochastic vs. non-stochastic risks. Human beings do not like probabilities. While they are quite apt to grasp odds ratios when betting on horses, they are reluctant to accept risks in real life. They want certainty, no false positives and false negatives. To top it all, zero risk is the motto. No cancer risk at any dose whatsoever, wherever, whenever, as exemplified in the Delaney Amendment.

When it goes to policy-makers, it gets worse. Dilemma is their best recipe for panic. At what moment should they issue warnings, either early, being sensitive at the risk of crying wolf and losing credibility at the next turn, or to be specific, being late and too late perhaps.

Continuous on-line telemonitoring raises another problem. Let us take as an example the monitoring of physiological parameters in individual persons through all kinds of sensors. People can be followed and watched for any irregularity in their heartbeat, blood sugar, brain waves, blood pressure, wherever they go or whatever they do, working, jogging, loving, movie-watching, scuba diving. What is a normal value? And when to give an alarm? Unless in exceptional situations such as for astronauts or for patients under intensive care, variations of physiological parameters on a continuous basis are much less well understood than the seismicity of the earth's crust. Repetitive medical examinations and multipurpose health screening are also known to generate anxiety. Electronic devices for preventing sudden infant death—cot death—sound so many repetitive false alarms that the parents either disconnect them or end up at the psychiatrist. A number of health problems are medically engineered.

People also confuse relative risks, that is, the risks in individuals, and attributable risks, i.e., the risks in populations. A small relative excess risk in many people may be more important than a large risk in a few people. Following Chernobyl, it has been guesstimated that up to 100,000 women in Western Europe had a pregnancy terminated, although the relative risk of a malformed baby was insignificant. Indeed, in our EUROCAT study, which monitors some 350,000 births per year in the countries of the European Community, no excess risk of a malformed baby was detected in the months following the Chernobyl accident.

People also confuse risk and detriment. Technology and better safety control can decrease the risks while they increase the detriment should a disaster occur.

Archaic or primitive societies were at ease with chance events. Outcomes were blamed on gods or devils. By contrast, the concept of probabilities is still quite unfamiliar to modern man. Hence, possibly, the success of horoscopes, the fascination with parapsychology, and the blooming of sects.

Prevention of disasters, prediction, warning, appropriate preparedness of the public, assessment of damages, surveillance of the long-term effects, will be effective only if people understand more about the vagaries of chance outcomes. The media could here play a major role in making probability a household concept.

4. Decision. Information for the sake of information is worthless. Information should serve decision. It should be timely and accurate. New computer and communication technologies make it possible to provide information integrated from a multiplicity of sources. But what information, how collected, and to do what?

The future no doubt holds great promise. The constraints of time and space will have been abolished. Sensors will be ubiquitous, everything will be networked and linked with anything. People on the move, refugees or evacuees, will be followed like polar bears or salmon. Satellites will zoom in from space on details on the earth. Computer modelling and simulation will probe the future, reconstitute the past, and experiment with a universe of imaginary disaster situations, blurring boundaries between the actual and the virtual world. Databases will regurgitate all the information ever secreted by mankind, with the exception of graffiti (computers will generate their own graffiti known as worms and viruses). Infojunk and rotten data will pervasively make their way into the system, like fax advertising today.

Versey and Afonte at a recent Annenberg Conference raised the question that while "computerized technology can absorb masses of information and disgorge it on command , ... can emergency managers deal with this information onslaught?" How will decisions be taken in confronting such a deluge of unfiltered, non-hierarchized, haphazardly presented information? At the information supermarket, too many choices means no choice. One is tempted to call here on the concepts of self-criticality and chaos—which are à la mode. The final menu presented to the decision maker could be an apocalyptic Mandelbrot set.

This is not a doomsday vision of the future. Communications and computer networks are today still a cottage industry and applications will turn up. Some of the problems will vanish. Society will settle into a new information ecology.

Yet the challenge is to make the best possible use of these opening-up technologies in order to improve present day disaster management while being on the move to look for future useful applications.

How to define, how to filter, how to organize, how to present the increasing amount of information? Selection of information, that is where real thinking is required. There is a need for some coordinating superclearinghouse to tackle this problem.

5. Cost and Relevance to Poor Countries. There is no doubt a bright future for new computers and communication technologies for disaster management. Crops are permanently satellite monitored by FAO, famine early warning systems have been developed, menaces of epidemics are identified by satellite remote sensing imagery of the vegetation and related ecological parameters, swarms of desert locusts can be spotted and controlled, victims can be located for search and rescue operations, prediction of floods is now common, timely warning can be given to threatened communities.

New technologies, however, are costly and far beyond the financial capacity of developing countries. This is especially so since some of them are at the same time among the most disaster prone and the poorest countries in the world. It would then be unrealistic and futile to design specific information systems exclusively for disasters. Such systems should be integrated into general planning for development. (For example, monitoring for landslides can be linked with reconnaissance for land use planning.) They should also become part of the general information and communication systems developed at the country level. Advantage should be taken of what is available. Information for disaster management should piggyback the existing facilities and draw on the resources, expertise and imagination of the private sector. When little exists, the need for disaster preparedness could serve as a spearhead to promote better communications.

Such systems should be user-friendly and robust as well as relevant to the local needs. Some would say they should be appropriate, but the term of appropriate technology has a connotation of "small is beautiful" which, attractive as it is , smells of amateurism. Advanced technology can also be "appropriate." The microscope after all is a very sophisticated technology and it has been used in the bush for over 100 years.

What adds to the cost is that in order to avoid liability, and to keep credibility, technology must be specific as well as sensitive. That is, it should yield few false positive results, such as giving a false disaster alarm or telediagnosing a disease in a healthy person. While sensitivity is cheap—it costs little to cream out positive signals—specificity is expensive. It is why sensitive tests with poor specificity are widely used in the rural areas of the Third World, and why highly specific diagnostic procedures are so costly in our hospitals. It can be expected that, in the future, due to the spiraling costs of medical care, new batteries of more specific and less expensive tests will be developed for extramural diagnosis. This evolution should be of direct benefit to the poor countries. Cost is not the main issue. The issue again is relevance to the developing world. To quote David Webster, we should be cautious not to "prescribe the rich man's solution to the poor man's problem."

While vested interests may be a factor in the provision of inadequate technology to the developing countries, a more important obstacle could well be misguided humanitarian motivations. The most uncontrollable factor for technological irrelevance is technological philanthropy, that is, the donation of needless equipment. This process leaves the poor countries totally defenseless, for who will refuse a gift? Technological philanthropy is responsible for the huge amounts of costly equipment left unpacked or unused in those countries. It wrecks the little expertise locally available by generating frustration, a sense of hopelessness and a loss of confidence in the people's capacity to solve their own problems.

What above all is important is training and creating the right technological environment, always putting ourselves in the situation of the people whose lives should be improved as a result. This is not a health concern; it is not a disaster concern; it is part of sustainable development in general.

IDNDR, the International Decade, provides us a unique opportunity to explore the potential offered by the emerging technologies, and to promote, develop, and support those technologies deemed adequate to make the next century a safer one, especially in the poorest countries of the world. But all this improvement cannot be accomplished in a vacuum. We must begin now to eliminate pitfalls and illusions. A new attitude must emerge. In the scope of reducing human damages resulting from disasters, we must reconsider the cross-cultural understanding, and reach a real awareness which combines humility with a sense of relativeness. Promoting the right context is essential to the mandate of the Decade.