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International perspectives and initiatives

Introduction

This issue of the feature column reports on developments in Peru on the use of information and communication technologies to improve public health. The authors describe how cell phones and hand-held devices are being deployed to monitor diseases. Recent concerns about the spread of swine flu highlight the importance of robust public health systems in developing countries.[1]

Jeannete Murphy

Reference

1 Swine flu could be a disaster for weak public health systems in developing countries. *British Journal of Healthcare Computing and Information Management*, 30 April 2009. http://www.bjhcim.co.uk/news/2009/n904046.htm (accessed 18/05/09).

Biomedical and health informatics in Peru: significance for public health

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Introduction

Peru has experienced a substantial growth and improvement in its telecommunications market over the last 10 years. Despite these developments, Peru is only starting to make progress in biomedical and health informatics. This article reviews applications of information and communication technologies in public health, and addresses issues relating to national ehealth policies, interoperability, electronic medical records (EMRs), access to information and capacity building.

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About Peru

Peru is an Andean country with poverty concentrated in rural areas. The total population for July 2008 was 29 180 900 (Peru, The World Factbook. Accessible at: https://www.cia.gov/library/publications/the-world-factbook/geos/pe.html), most of whom live in urban areas. Overall life expectancy was estimated to be 70.4 years in 2008. The Peruvian population is multi-cultural and multi-ethnic, including Amerindians (45%), mestizo-mixed Amerindian and white (37%), white (15%), black, Japanese, Chinese and other (3%). The main spoken language is Spanish, although a significant number of Peruvians speak Quechua or other native languages.

The Peruvian health system

The Peruvian health system is split between public and private provision with significant barriers (economic, geographical, cultural, etc.) which restrict access to health services. Approximately 20% of the population has access to the Peruvian Social Security System (EsSalud), 12% has access to private services and 3% has access to healthcare services provided by the Armed Forces and the National Peruvian Police. Overall, approximately 65% of the population access public services (MINSA) and an estimated 25% of the population has no access to healthcare.

Evolution of a national health information system

Currently, there is no national health information system, but there are several applications that provide this functionality locally. These systems

belong to the different organizations that compose the health sector. Each one uses its own standards and protocols; so, interoperability among these systems is very limited or non-existent. Even within one organization, MINSA, there are several fragmented systems, all running in parallel and each one collecting information on different, and sometimes redundant, topics such as disease surveillance, vertical health programs and strategies, child vaccination, tuberculosis, HIV/AIDS, etc.

Electronic medical records

Clinical care institutions in Peru have delayed the development of clinical information systems because of the cost of these systems for smaller organizations. There have been some attempts to deploy focused EMR systems that have been successfully used elsewhere, but there has been little interest in their use. Systems for general hospital/clinic management have been more readily accepted given the economic drive to use information systems in healthcare facilities for reimbursement purposes (e.g. to keep track of what procedures a patient has undergone and what medication or analysis have been made).

Issues of interoperability

Interoperability among different health information systems in Peru is quite primitive. Although the need to seamlessly move patient information is recognized, various factors have worked against this goal:

1 The chaotic way the systems have evolved, usually built without an overarching plan or design, largely in isolation and with obsolete technology;
2 The work cultures and politics of the main health providers;
3 The lack of standards, enforcement or legislation for even the most basic things, such as patient identity registration, data coding (diseases, treatments, etc.), protocols of information exchange, security and confidentiality safeguards for health information.

The main obstacle to information interchange is that each healthcare institution has different ways of identifying patients, and there is no way of mapping data being recorded for each person among the disparate systems. There is a possibility of using a unique identifier, the National Identity Card; at least one of the widely used insurance systems has adopted this unambiguous person identifier. However, not all citizens have this card, particularly children in rural areas.

To improve basic software infrastructure we need to overcome resistance to new technologies on the part of clinicians who see electronic recording as a chore rather than a means of improving patient care. Incompatible working cultures, needs and agendas between the major healthcare institutions present another obstacle.

Technological infrastructure

Although there has been significant growth and improvement in the telecommunications market in Peru during the last 10 years, there is still room for further growth because of the relatively low penetration of telecommunication services. The number of fixed phone lines increased dramatically from 760 000 units in 1994 to 2.6 million in 2007.[1] By the end of 2007, the Internet penetration rate in Peru was 27.37 users per 100 inhabitants (or >7.6 million people), which includes users of Internet cafes (cabinas), the primary access of Peruvian people to the Internet. In 2007, Internet subscribers' rate in Peru was 2.04 per 100 inhabitants.[2]

Internet access is progressively being replaced by broadband connections. Wireless technologies like Wi-Fi are available in some public areas. In most rural areas, satellite links are used because they are the only available option. Mobile Internet access has been available in the country for many years but it is not very popular because it is still quite expensive. In Peru, personal computer penetration is about 10.01 PCs per 100 habitants, below that in other Latin American countries.

Developments in public health informatics

Neither mobile phones nor hand-helds are used routinely for disease monitoring by the two biggest players in the healthcare sector—the Ministry of

Health and EsSalud. With the current disease monitoring system, it can take up to 1 month (or more) for a notification from a remote area to reach the central level. Up until now, the use of mobile health applications has been restricted to pilot projects and the delivery of SMS alerts.

Use of cell phones and hand-held devices

In Peru the number of mobile phone lines overtook the number of fixed phone lines in 2001 and the rate of growth is still increasing. The Peruvian telecommunications regulator expected a 30–50% growth in the number of mobile telephone lines by the end of 2008. Here are some examples of how cell phones and hand-held devices are being integrated with web technology:

- *Alerta DISAMAR*. A web-based disease surveillance system used by health workers of the Peruvian Navy to notify cases of diseases under surveillance.[3] Two studies showed Alerta DISAMAR was a sustainable and cost-effective system.[4,5]
- *Cell-PREVEN*. A real-time surveillance system using cell phones and the Internet to monitor adverse reactions to metronidazole treatment among female sex workers.[6] Cell-PREVEN was part of large randomized trial in Peru in 20 cities which sought to lower STD rates in Peru. The project showed that it is unnecessary to have the latest PDA or Tablet PC to create a sophisticated public health surveillance system.[6] Both healthcare interviewers and female sex workers were satisfied with cell phones as a method of data collection, and the system led to much earlier and more complete reports of adverse events.[7]
- *Colecta-PALM*. A pilot project using PDAs to enhance adherence to antiretroviral treatment and to support safer sex and HIV transmission risk reduction for people living with HIV/AIDS.[8] The pilot showed that PDAs could be a culturally appropriate way to approach and support people living with HIV/AIDS in Lima.[9]
- *PDA-PREVEN*. A project using low-cost PDAs to collect sexual behaviour data.[10]
- *Cell-POS*. A computer-based system using cell phones and the Internet to enhance adherence to antiretroviral treatment (via SMS reminders) and to support HIV transmission risk-reduction among adult people living with HIV/AIDS in Peru.[11]
- The National Institute for Research and Training in Telecommunications (INICTEL) has developed a series of prototypes of devices to be used to remotely monitor cardiac activity and other vital signs. Signals were transmitted using fixed and mobile phones.[12]
- *CareNet*. A project funded to develop a solution for monitoring chronic diseases while increasing treatment compliance. CareNet uses cell phones for patients with diabetes to report on compliance and self-monitoring and to send reminders, alerts and useful information to them and to healthcare workers.[13]

Clinicians' access to online information

A 2001 cross-sectional, questionnaire study in 10 main cities in Peru found that 86.6% of physicians used the Internet and 79.5% used email.[14] A total of 84.2% reported having sought online medical information. Of those physicians who have used the Internet, 55.9% reported using it more than four times in the previous month and 44.8% reported searching the Internet for medical information more than four times in the last month, with most using it from Internet cafes (54.7%).

Physicians seek medical information through online sources such as MEDLINE (28.7%), LILACS, Latino American medical database (7.1%) and LIPECS, Peruvian database (1.7%). Less than 17% of physicians have taken an online continuing medical education course. To solve patient-specific problems arising during practice, physicians mainly consulted textbooks (69.1%) and colleagues (50%) and, less frequently, the Internet (32.9%). Among the reported barriers to Internet use were difficulties in finding what they were looking for (34.3%), cost (29.5%) and time (27.9%). Physicians reported a high interest in using CDs at home for continuing medical education (88.2%). They reported a need to improve their computer skills and increase their use of the Internet.

Sources of information for healthcare workers

Due to the rapid expansion of medical knowledge and information resources, especially the Internet,

medical students, physicians and other health professionals frequently have difficulties in finding quality medical information in a timely manner.[15] There are some portals and databases that offer health information at low cost or even for free.

- LIPECS (Literatura Peruana en Ciencias de la Salud) is a database that compiles published research in Peru and includes the main Peruvian health journals, thesis summaries, technical reports from government or non-governmental entities. Access is provided through the 'Biblioteca Virtual en Salud Perú' (http://www.bvs.org.pe). Registration and updates are the responsibility of Universidad Peruana Cayetano Heredia.[16]
- SCIELO Peru (http://www.scielo.org.pe) is an electronic virtual library covering a selection of 25 Peruvian Scientific journals; all of them met high-quality criteria.[17] Although this portal is not solely for health sciences, 14 are health journals (March 2009). In contrast to LIPECS, it allows free access to all the content.
- The Health InterNetwork Access to Research Initiative (HINARI) is managed by the World Health Organization and helps promote access to scientific information by providing free (or low-cost) online access to major science journals. However, the number of journals available through HINARI has decreased over time. The recent loss of access to many key biomedical journals through HINARI in Peru could be a step backwards.[18]

Health science librarians have an important role to play in providing training, support and information to healthcare professionals and managers, such as implementing and evaluating online educational resources. In addition, they can help to train health informaticians in Peru.

Capacity building

Training in biomedical and health informatics

In developing countries, the education and training of health professionals in informatics remains one of the greatest public health challenges. Inadequate education in medical informatics skills is apparent amongst medical students, doctors, nurses and many other healthcare professionals who have varying levels of computer competence.[19] A 2002 study conducted by Horna *et al.* found that 40% of a sample of medical students in Peru reported lack of proficiency in the use of the Internet.[15] At the moment, only a few universities have incorporated some kind of medical informatics course into their medical curriculum (e.g. information retrieval). Most Peruvian universities only teach Office Software applications to students, without providing any understanding of their underlying design.

Enlace Hispano Americano de Salud (EHAS) was a project that offered access to e-learning courses for health professionals in Peru, with local involvement of UPCH and Pontificia Universidad Católica del Perú.[20] Currently, EHAS is a foundation that has had projects in four countries (Perú, Colombia, Cuba and Ecuador). In addition, the Tropical Medicine Institute 'Alexander von Humboldt'—UPCH has developed online courses for health professionals and patients regarding HIV/AIDS.[21,22]

Biomedical informatics program (AMAUTA)

In Peru, there are no formal master's or doctoral-level programmes in health informatics, but there is the AMAUTA (Quechua word for 'master') Global Informatics Research and Training Program for professionals in the region. The AMAUTA programme was developed in 1999 to train Peruvian healthcare workers in the use, development and application of information and communication technologies for health. This collaborative programme is an institutional partnership between UPCH of Peru and the University of Washington (UW) in the USA with support from the Fogarty International Center. Four short courses in biomedical informatics have been organized in Lima, offering training to more than 200 graduate-level students.[23,24] Ten long-term trainees have been trained at the Master, Doctorate or Post-Doctorate level at the UW. The UW collaboration enhanced the ability of UPCH to strengthen its own portfolio of research projects.[25,26] UPCH is the first Peruvian University to offer a diploma programme in biomedical informatics.[27] The programme recognizes the need for inter-institutional collaboration with well-established health informatics training programmes such as UW.

Conclusions

Biomedical informatics in Peru is at an emergent stage. The ICT sector and the telecommunications market has increased substantially in the last decade, giving rise to new challenges and opportunities. The Peruvian health information system is presently fragmented, consisting of different information systems, with limited interoperability. Health informatics can play a key role in overcoming these problems. Information systems should be carefully designed, using the most appropriate technologies and scaleable to a national level. To succeed we need a national strategy, a well-trained workforce and leadership. At present, there is a lack of policies and support to promote the use of standards and protocols. Training of health professionals in informatics is a priority, but, at the same time, there is a lack of medical informatics training programmes. Those who are well trained command high salaries and are fit to migrate to other countries. We need to exploit the exponential growth of mobile phones, the widespread use of low-cost Internet cafes and the improving Peruvian economy to enhance biomedical informatics in Peru. Finally, there is an urgent need for funding to support research and development in this area by public and private agencies.

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