eHealth Conversations

Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to Health

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Pan American Health Organization
World Health Organization
REGIONAL OFFICE FOR THE Americas

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This publication was developed by the Knowledge Management, Bioethics and Research Office of the Pan American Health Organization (PAHO) (ehealth@paho.org), within the framework of the activities of the PAHO’s eHealth Program.

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ABBREVIATIONS

@LIS	Alliance for the Information Society
AARNet	Australian Academic and Research Network
ACOPI	*Asociación Colombiana de las Micros, Pequeñas y Medianas Empresas* (Colombian Association of Micro, Small and Medium Enterprises)
ACTO	Amazon Cooperation Treaty Organization
ADSIB	*Agencia para el Desarrollo de la Sociedad de la Información en Bolivia* (Agency for
ADSIB	the Development of the Information Society in Bolivia)
AECID	*Agencia Española de Cooperación Internacional para el Desarrollo* (Spanish Agency for International Development Cooperation)
AGESIC	*Agencia para el Desarrollo del Gobierno de Gestión Electrónica y la Sociedad de la Información y del Conocimiento* (Uruguay) (Agency for the Development of Electronic Government and the Society of Information and Knowledge)
ALICE	Latin America Interconnected with Europe Project
AMIA	American Medical Informatics Association
AMPATH	America's Path
ANS	*Agencia Nacional de Saúde* (Brazil) (National Health Agency)
ANSI X12	Accredited Standards Committee X12
APAN	Asian Pacific Academic Network
APROSS	*Administración Provincial de Seguro de Salud* (Argentina) (Provincial Health Insurance Administration)
ARANDU	*Red Académica para la Educación, la Investigación y la Innovación* (Paraguay) (Academic Network for Education, Research, and Innovation)
ASTM	American Section of the International Association for Testing Materials
ATALACC	American Telemedicine Association, Latin American & Caribbean Chapter
ATC	Anatomical Therapeutic Chemical Classification System
BDT/UIT	Telecommunication Development Bureau of the International Telecommunications Union
BIREME	Latin American and Caribbean Center on Health Sciences Information
BOAI	Budapest Open Access Initiative

C@ribNET FIber Optic Network Linking Institutions and CARICOM Member States

CAEM *Conferencia Argentina de Educación Médica* (Argentina Conference on Medical Education)

CAIBCO *Centro de Análisis de Imágenes Biomédicas Computarizadas* (Venezuela) (Center for Analysis of Computerized Biomedical Images)

CANARIE Canada's Advanced Research and Innovation Network

CAPRECOM *Caja de Previsión Social de Comunicaciones* (Colombia) (Social Security Fund for Communications)

CARICOM Caribbean Community

CCD Continuity of Care Document

CCOW Clinical Context Object Workgroup

CCSS *Caja Costarricense del Seguro Social* (Costa Rica Social Security Fund)

CCR Continuity of Care Record

CDA Clinical Document Architecture

CDC Centers for Disease Control and Prevention (U.S.A.)

CDR Clinical Data Repository

CDSS Clinical Decision Support System

CEDAW The Convention on the Elimination of all Forms of Discrimination against Women

CEDIA *Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado* (Ecuadorian Consortium for Advanced Internet Development)

CEN European Committee for Standardization

CENAT *Centro Nacional de Alta Tecnología* (Costa Rica) (National High Technology Center)

CENETEC *Centro Nacional de Excelencia Tecnológica en Salud* (México) (National Center for Technological Excellence in Health)

CENIbiot *Centro Nacional de Innovaciones Biotecnológicas* (Costa Rica) (National Center for Biotechnology Innovation)

CINTEL *Centro de Investigación en Telecomunicaciones* (Colombia) (Center for Telecommunications Research)

CINVESTAV *Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional* (Mexico) (Center for Research and Advanced Studies of the National Polytechnic Institute)

CIRA *Consejo Integrador de la Red Asistencial* (Chile) (Council for Integration of the Health Care Network)

CISAP *Centro de Investigación en Salud Población, Hospital Durand* (Argentina) (Center for Population Health Research)

CITEL-OAS Inter-American Telecommunications Commission, Organization of American States

CKLN Caribbean Knowledge and Learning Network

CLAD Latin American Center for Administration Development

CNSSS *Consejo Nacional de Seguridad Social en Salud* (Colombia) (National Health and Social Security Council)

CONARE *Consejo Nacional de Rectores* (Costa Rica) (National Council of Rectors)

CONICET *Consejo Nacional de Investigaciones Científicas y Técnicas* (Argentina) (National Council of Scientific and Technical Research)

CONRICYT *Consorcio Nacional de Recursos de Información Científica y Tecnológica* (México) (National Council of Scientific and Technical Information Resources)

CoP Community of Practice

COPACO S.A. *Compañía Paraguaya de Telecomunicaciones S.A.* (Paraguayan Telecommunications Company)

CRES *Comisión de Regulación en Salud* (Colombia) (Health Regulation Commission)

CRICS 9 Ninth Regional Congress on Health Sciences Information

CUDI *Corporación Universitaria para el Desarrollo de Internet* (Mexico) (University Corporation for Internet Development)

DANTE Delivery of Advanced Network Technology to Europe

DeCS Health Sciences Descriptors

DICOM Digital Imaging and Communication in Medicine

DINACYT *Dirección Nacional de Ciencia, Tecnología e Innovación* (Uruguay) (National Directorate for Science, Technology, and Innovation)

DGIS *Dirección General de Información de Salud* (Mexico) (General Directorate for Health Information)

DNI *Documento Nacional de Identidad* (Peru) (National Identification Document)

DNPDP *Dirección Nacional de Protección de Datos Personales* (Argentina) (National Directorate for Protection of Personal Information)

DOAJ Directory of Open-Access Journals

DRG Diagnosis Related Group

DVTS Digital Video Transport System

EBM Evidence-Based Medicine

ECG Electrocardiogram

ECLAC Economic Commission of Latin America and the Caribbean

ECTEL Eastern Caribbean Telecommunications Authority

EFMI European Federation for Medical Informatics

EHAS-Alto *Enlace Hispano Americano de Salud- Alto Amazonas* (Hispanic American Health Link-Upper Amazon)

eLAC 2015 Regional Plan (2015) for Development of the Information Society in Latin America and the Caribbean

EmONC Emergency Obstetric and Newborn Care

EMR Electronic Medical Record

ESF *Estrategia de Salud de la Familia; Equipos de Salud de la Familia* (Brazil) (Family Health Strategy; Family Health Teams)

EU European Union

EVALSO Enabling Virtual Access to Latin American, Southern Observatory

FAE *Fuerza Aérea del Ecuador* (Air Force of Ecuador)

FCC Federal Communications Commission (U.S.A.)

FCI-IC *Fundación Cardioinfantil, Instituto de Cardiología* (Colombia) (Child Cardiology Foundation, Institute of Cardiology)

FEMI *Federación Médica del Interior* (Uruguay) (Medical Federation of the Interior)

FEMI SD *FEMI Salud Digital* (Uruguay) (FEMI Digital Health)

FFAA *Sanidades de las Fuerzas Armadas* (Peru) (Armed Forces Health)

FIDETEL *Fondo de Investigación y Desarrollo de las Telecomunicaciones* (Venezuela) (Fund for Telecommunications Research and Development)

FINEP *Agencia Nacional de Investigación y Financiamiento de Estudios* (Brazil) (National Bureau of Investigation and Research Funding)

FLACSO *Facultad Latinoamericana de Ciencias Sociales* (Latin American Faculty on Social Sciences)

FODETEL *Fondo de Telecomunicaciones* (Ecuador) (Telecommunications Fund)

FONACIT *Fondo Nacional de Ciencia, Tecnología e Innovación* (Venezuela) (National Fund for Science, Technology and Innovation)

FPTI *Fundación Parque Tecnológico Itaipu* (Paraguay) (Itaipu Technological Park Foundation)

GÉANT Pan-European Information Network

GeHAP Global eHealth Ambassadors Program

GeHCs Global eHealth Consultants (Geneva, Switzerland)

GEL *Estrategia de Gobierno en Línea* (Colombia) (On-Line Government)

HCBI *Historia Clínica Básica Integrada* (Venezuela) (Basic Integrated Clinical History)

HfALA Health for All in Latin America

HIBA Hospital Italiano de Buenos Aires (Argentina)

HIPAA Health Insurance Portability and Accountability Act (U.S.A.)

HIS-LIS-RIS Hospital Information System – Laboratory Information System – Radiology Information System

HISP Health Information Systems Programme

HL7 Health Level Seven International

IAB International Association of Bioethics

IBE Identity-Based Encryption

ICA *Instituto para la Conectividad de Las Américas* (Institute for Connectivity of the Americas)

ICD International Classification of Diseases

ICD-10 International Classification of Diseases, version 10

ICIC *Programa Nacional de Infraestructuras Críticas de Información y Ciberseguridad* (Argentina) (National Program for Critical Information Infrastructures and Cybersecurity)

ICPC International Classification of Primary Care

ICT Information and Communications Technology

ICT4D Information and Communications Technologies for Development; National Strategy Final Project (Guyana)

ICU Intensive Care Unit

IDB Inter-American Development Bank

IDPC Instituto Dante Pazzanese de Cardiology Institute (Brazil)

IECS *Instituto de Efectividad Clínica* (Argentina) (Institute for Clinical Effectiveness)

IEEE Institute of Electrical and Electronics Engineers

IFF Instituto Fernandes Figueira (Brazil)

IHE Integrating the Healthcare Enterprise

IIDE *Instituto Interamericano de Derechos Humanos* (Inter-American Institute on Human Rights)

IMIA International Medical Informatics Association

IMIP *Instituto de Medicina Integral Prof. Fernando Figueira* (Brazil) (Institute of Integrative Medicine Prof. Fernando Figueira)

IMSS *Instituto Mexicano del Seguro Social* (Mexican Institute of Social Security)

INNOVA/RED *Red Nacional de Investigación y Educación de Argentina* (Argentine National Research and Education Network)

IOM Institute of Medicine (United States)

IP Internet Protocol

IRU Indefeasible Right of Use

ISfTeH International Society for Telemedicine and Health

ISO 13606 International Standards Organization 13606

ISSSTE *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (Mexico) Institute for Social Security and Services for State Workers

ITAES *Instituto Técnico para la Acreditación de Establecimientos de Salud* (Institute for the Accreditation of Health Facilities)

I-TECH International Training and Education Center for Health

ITU International Telecommunications Union

IVR Interactive Voice Response

IXP *Consorcio para el Intercambio de Tráfico de Internet* (Consortium for Internet Traffic Exchange)

LAN Local area network

LATU *Laboratorio Tecnológico del Uruguay* (Uruguayan Technological Laboratory)

LILACS Latin American and Caribbean Health Sciences Literature

LIS Laboratory Information System

LOINC Logical Observation Identifiers Names and Codes

MAIS-BFC *Modelo de Atención Integral de Salud Basado en la Familia y la Comunidad* (Peru) (Family- and Community-Based Model of Comprehensive Health Care)

MBA Master's in Business Administration

MBDS Minimum Basic Data Set

MCTI *Ministerio de Ciencia, Tecnología e Innovación* (Brazil) (Ministry of Science, Technology, and Innovation)

MCTI *Ministerio del Poder Popular para Ciencia y Tecnología* (Venezuela) (Ministry of Science and Technology)

MDG Millennium Development Goals (United Nations)

MEER *Ministerio de Electricidad y Energía Renovable* (Ecuador) (Ministry of Electricity and Renewable Energy)

MICA Montserrat Information Communication Authority

MIDAS *Modelo Integrado de Servicios de Salud* (Mexico) (Integrated Health Services Model)

MINSA *Ministerio de Salud del Perú* (Ministry of Health)

MINSAL *Ministerio de Salud* (El Salvador) (Ministry of Health)

MINTEL *Ministerio de Telecomunicaciones* (Ecuador) (Ministry of Telecommunications)

MPI Master Patient Index

MPPS *Ministerio del Poder Popular para la Salud* (Venezuela) (Ministry of Health)

MSP *Ministerio de Salud Pública* (Ecuador) (Ministry of Public Health)

NASA National Aeronautics and Space Administration (U.S.A.)

NCPDP National Council for Prescription Drug Programs (U.S.A.)

NGO Nongovernmental Organization

NHS National Health System

NLM National Library of Medicine (U.S.A.)

NORDUnet Nordic Infrastructure for Research and Education

NREN National Research and Education Network

NTES *Núcleo de Telesalud , Instituto de Medicina Integral Prof. Fernando Figueira* (Brazil) (Telehealth Nucleus, Institute for Integrative Medicine Fernando Figueira)

NTIA National Telecommunications and Information Administration (U.S.A.)

NTP National Telehealth Program

NTRC National Telecommunications Regulatory Commission (St. Vincent and the Grenadines)

NTS Norma Técnica de Salud

NUTEL *Centro de Telesalud, Facultad de Medicina de la Universidad Federal de Minas Gerais* (Brazil) (Telehealth Center, Faculty of Medicine, Federal University of Minas Gerais)

OAS Organization of American States

OGEI *Oficina General de Estadística e Informática* (Peru) Ministry of Health, General Office of Statistics and Informatics

OID Object Identifiers

ONCTI *Observatorio Nacional de Ciencia, Tecnología e Innovación* (Venezuela) (International Observatory for Science, Technology, and Innovation)

ONTI *Oficina Nacional de Tecnologías de Información* (Argentina) (National Office of Information Technology)

ORCYT Regional Office for Science and Technology of UNESCO for Latin American and The Caribbean

PACS Picture Archiving and Communication System

PAHO/WHO Pan American Health Organization/World Health Organization

PCYT *Proceso de Ciencia y Tecnología* (Ecuador) (Science and Technology Project)

PHC Primary Health Care

PMI People Master Index (Índice Maestro Único de Personas)

PNBA *Plan Nacional de Banda Ancha* (Brazil) (National Broadband Plan)

PNP *Policía Nacional del Perú* (Peruvian Naitonal Police)

PNT *Programa Nacional de Telesalud* (Peru) (National Telehealth Program)

PNTT *Programa Nacional de Telemedicina y Telesalud de Panamá* (National Telemedicine and Telehealth Program of Panama)

POA *Plan Operativo Anual* (Guatemala) (Annual Operations Plan)

PoP Point of Presence

POS *Plan Obligatorio de Salud* (Colombia) (Compulsory Health Plan)

PoS Point of sale/Point of service

SICERE *Sistema Centralizado de Recaudación* (Costa Rica) (Centralized Collection Service)

PPS Portales Personales de Salud

PROUNI *Programa Universidad para Todos* (Brazil) (University for All Program)

PSF *Programa de Salud de la Familia* (Brazil) (Family Health Program)

QoS Quality of service

RAAP *Red Académica Peruana* (Peruvian Academic Network)

RACSA Radiográfica of Costa Rica

RADEI *Red Avanzada Dominicana de Educación e Investigación* (Dominican Advanced Network for Education and Research)

RAGIE *Red Avanzada Guatemalteca para la Investigación y la Educación* (Guatemalan Advanced Network for Research and Education)

RAICES *Red Avanzada de Investigación, Ciencia y Educación Salvadoreña* (Salvadoran Advanced Network for Research, Science, and Education)

RAU *Red Académica Uruguaya* (Uruguayan Academic Network)

REACCIUN/ CENIT *Red Académica Nacional de Venezuela/Fundación Centro Nacional de Innovación Tecnológica* (National Academic Network of Venezuela / National Foundation Centre for Innovation in Technology)

Red ARANDU *Red Académica para la Educación, la Investigación y la Innovación* (Paraguay) (Academic Network for Education, Research, and Innovation)

Red CLARA *Cooperación Latino Americana de Redes Avanzadas* (Latin American Cooperation of Advanced Networks)

RedCyT *Red Científica y Tecnológica* (Panama) (Network for Science and Technology)

Red GEALC *Red de Gobierno Electrónico de América Latina y el Caribe* (Electronic Government Network of Latina America and the Caribbean)

REFEFO *Red Federal de Fibra Óptica* (Argentina) (Federal Fiber Optic Network)

RENATA *Red Nacional de Tecnología Avanzada* (Colombia) (National Network for Advanced Technology)

RENIEC *Registro Nacional de Identificación y Estado Civil* (Peru) (National Registry of Identification and Civil Status)

REUNA *Red Universitaria Nacional* (Chile) (National University Network)

RIISS Redes Integrales e Integradas de Servicios de Salud (Comprehensive and Integrated Health Services Networks)

RIM Reference Information Model

RIPS *Registro Individual de Prestaciones de Salud* (Colombia) (Individual Record of Health Services Delivered)

RIS Radiologic Information Systems

RNEI *Red Nacional de Educación e Investigación* (Mexico) (National Education and

RNP-OS Research Network)

RNP *Red Nacional de Investigación y Educación* (Brazil) National Research and Education Network

RNP-OS *Organización Social- Red Nacional de Investigación y Educación* (Brazil) (Social Organization- National Research and Education Network)

RTMG Teleassistance for Minas Gerais

RUTE Telemedicine University Network (Brazil)

Salud PET *Política Nacional de Educación en el Programa de Educación para la Salud en el Trabajo* (Brazil) (National Education Policy in the Education Program for Worker Health)

SPA-OAS Secretariat for Political Affairs, Organization of American States

SBIB *Sociedad Brasileña de Ingeniería Biomédica* (Brazilian Society for Biomedical Engineering)

SBIS *Sociedad Brasilera de Informática en Salud* (Brazilian Society for Health Informatics)

SCAD Cooperative Service for Accessing Documents

SCT *Secretaría de Comunicaciones y Transportes* (Mexico) (Secretariat of Communications and Transport)

SDN Software Defined Networks

SDO Standard Development Organizations

SE-ESAD *Sistemas Estatales de Educación Superior Abierta y a Distancia* (Mexico) (State Systems for Open and Distance Higher Education)

SEIS Sociedad Española de Informática en Salud (Spanish Society of Health Informatics)

SELA Latin American and Caribbean Economic System

SENATEL *Secretaría Nacional de Telecomunicaciones* (Ecuador) (National Telecommunications Secretariat)

SENPLADE *Secretaría Nacional de Planificación y Desarrollo* (Ecuador) (National Planning and Development Secretariat)

SES *Sistema Estadístico de Salud* (Argentina) (Health Statistics System)

SESA *Secretarías de Salud de los Estados* (Mexico) (Secretariats of Health of the States)

SGTES *Secretaría de Gestión del Trabajo y Educación en Salud* (Brazil) (Secretariat of Labor Management of Health Education)

SIAS *Sistema Integral de Atención en Salud* (Guatemala) (Comprehensive Health Care System)

SIDRA *Sistema de Información de la Red Asistencial* (Chile) (Health Care Network Information System)

SIG Special Interest Groups

SIGSA *Sistema de Información Gerencial en Salud* (Guatemala) (Health Management Information System)

SIP *Sistema Informático Perinatal* (Ecuador) (Perinatal Information System)

SISA *Sistema Integrado de Información Sanitaria Argentino* (Argentina) (Integrated System of Health Information)

SISPRO *Sistema Integrado de Información de la Protección Social* (Colombia) (Integrated Social Protection Information System)

SIT *Sistema Integral de Salud* (Peru) (Comprehensive Health System)

SIU Sistema de Identificación de Usuario

SMSA *Salud Municipal de Belo Horizonte* (Brazil) (Municipal Secretariat of Health of Belo Horizonte)

SNCDS *Sistema Nacional Coordinado y Descentralizado de Salud* (Peru) (National System for Coordinated and Decentralized Health)

SNI *Sistema Nacional de Investigadores* (Mexico) (National Research System)

SNIS *Sistema Nacional Integrado de Salud* (Uruguay) (National Integrated Health System)

SNOMED Systematized Nomenclature of Medicine

SOA Service-Oriented Architecture

SQL Structured Query Language

SSA *Secretaría de Salud* (Mexico) (Secretariat of Health)

SUBTEL *Subsecretaría de Telecomunicaciones* (Chile) (Under-Secretariat of Telecommunications)

SUS *Sistema Único de Saúde* (Brazil) (Unified Health System)

SUS-BH *Sistema Único de Salud /Belo Horizonte* (Brazil) (Unified Health System, Belo Horizonte)

TENET Tertiary Education and Research Network of South Africa

TERNA Trans-European Research and Education Networking Association

UBS UBS Unidades Básicas de Salud (Brazil) (Basic Health Units)

UNESCO United Nations Educational, Scientific, and Cultural Organization

UNFPA United Nations Population Fund

UNICEF United Nations Children's Fund

UNDP United Nations Development Programme

UNIDO United Nations Industrial Development Organization

UID Unique Identifiers

VHL Virtual Health Library

VSAT Very Small Aperture Terminal

VIPFE *Viceministerio de Inversión Pública y Financiamiento Externo* (Bolivia) (Deputy Minister of Public Investment and External Financing)

WACREN West and Central African Research and Education Network

WAN Wide Area Network

WHO World Health Organization

INTRODUCTION

eHealth, or electronic health, is an important new tool for governments and the private sector that can help develop more efficient and equitable health services. The World Health Organization (WHO) has been working with electronic health since 2005, and defines it as the cost-effective and secure use of information and communications technologies (ICTs) to support health fields, including health care services, surveillance, scientific literature, health education, knowledge, and research. eHealth uses include treatment of patients, research, education of health workers, disease follow-up, and public health surveillance, among others.

Gunther Eysenbach, editor of the *Journal of Medical Internet Research*, provided a contextual definition of eHealth: "e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communications technology."[1]

The Pan American Health Organization, the Regional Office for the Americas of the World Health Organization (PAHO/WHO), is involved in eHealth because, while relatively new, it has great potential for increasing access to health, thereby supporting the PAHO mission of working with governments to improve the health of the peoples of the Americas. PAHO/WHO is interested in the benefits of eHealth for public health and has an innovative, on-line health program. It has been working with the countries of the Americas to obtain updated information and support them in the benefits of using ICTs to improve access to health. This is significant for public health not only because eHealth is one of the fastest growing areas, but also because of its potential to help improve efficiency and equity in the delivery of health services.

Within the framework of the new Strategy and Plan of Action on eHealth for the Americas, approved by PAHO State Members in 2011, the Organization has been working to build a specialized eHealth network and to help national institutions by providing access to evidence-based information on this issue, and by highlighting best practices and successful eHealth initiatives.. The Strategy goals are to improve the access to quality health services through the use of ICTs, to help develop digital literacy, to increase access to evidence-based scientific information, and to facilitate continuing training.

The publication of *eHealth Conversations*, developed with the support of the Spanish Agency for International Development Cooperation (AECID), represents a major step forward for the PAHO/WHO Strategy, since it explores ways of implementing regional mechanisms with free and equitable access to information and knowledge sharing. These initiatives aim to advance the goals of more informed, equitable, competitive, and democratic societies, where access to health information is considered a basic right. This publication is one of the instruments used by PAHO/WHO to develop the initiatives outlined in the Strategy, which coincides with the global eHealth strategy. One of the fundamental needs for the improvement of eHealth is the dissemination of information, and PAHO/WHO is assuming a leading role in this effort. The development of this new electronic publication is a key step in disseminating information that will be useful for decision makers on applying these technologies for the health of the Americas.

This electronic book is one of the products of PAHO/WHO's project: "eHealth Conversations: Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to Health." Participants in these conversations included experts on electronic health and other specialties. Through virtual dialogues, the experts contributed with knowledge and reflections on the present and the future of eHealth in the Americas, analyzed the situation, and made recommendations for the implementation of electronic health initiatives. These recommendations are not only intended for PAHO/WHO, but also for governments and the private sector.

The aim of the project is to guarantee the convergence of local, national, and regional initiatives regarding the adoption and application of ICTs for public health, with special attention on critical issues in this field. It also intends to strengthen individual and collective capacities of health workers and institutions, connecting them in a network of on-line health networks, as well as to reinforce the PAHO/WHO eHealth program.

Through its 12 chapters, *eHealth Conversations* presents the opinions of specialists, further readings, and examples of successful experiences in eHealth. This electronic work provides conclusions of the project, and includes interviews with the authors of the conversations and tweets disseminated through Twitter. The digital audio of the conversations is available on PAHO/WHO's web site. Since the project was based on the components of the Strategy and Plan of Action on eHealth for the Americas, the work addresses issues such as infrastructure, information systems, telemedicine, access to information, policies, education, patient safety, electronic clinical records, standards for interoperability, legal issues, the relationship with eGovernment projects and initiatives, and eHealth management. Each topic was discussed by a group of specialists and the publication features the conclusions and recommendations on each topic.

The chapter on eGovernment recommends that the countries of the Region continue improving the integration between electronic government and eHealth so that access to resources can be more equitable and health care can be improved. When analyzing health information systems, the experts concluded that a good system can offer solutions to the problems faced by health systems in the Region, including fragmented information, lack of accessibility, disaggregation, and inequality in health care. It was also suggested that national institutions, including governments, universities, NGOs, and the private sector should recognize that the access to health information is an essential right and a public asset, and develop strategies to promote and facilitate this access for health workers as well as the general population, to guarantee equitable health access. The chapter about on-line health policies points out that well-implemented and organized policies contribute to improve the well-being of populations and to reduce imbalances and inequities in the access to health systems. Another relevant conclusion was that adequate broadband infrastructures in eHealth, which link providers and health professionals with patients and their families, are essential to improve the health of the countries of the Americas. The chapter on standards for interoperability deals with electronic systems working together, and it recommends promoting national consensus and regional agreements for interoperable information systems at all levels, especially at the semantic level, to facilitate coding and data exchange between systems.

This publication also presents discussions regarding electronic teaching, a relevant tool for training on the eHealth strategy. This approach has major advantages for the development of health professionals, including immediate access to information and knowledge, the promotion of communication between professionals, faster updating of information, better dissemination of scientific information and knowledge, and has a direct impact on clinical practice and the quality of health care. New technologies also facilitate massive dissemination of knowledge and require the promotion of digital literacy as an eHealth strategy. Regarding the advantages of the new management tools, there is analysis on how health systems can use information and communications technologies to guide their actions toward effective and efficient management of resources. Information can also improve the quality of health care and the access to services. On the topic of electronic health records, it was concluded that they are definitely helpful when compared to traditional paper records. Some of the advantages are easy access and availability of clinical information, legibility, and the display of data in different formats, as well as integration with other components of the information system.

Experts reviewed the status of telemedicine in the Region and recommended that PAHO/WHO, through its eHealth Strategy, adopt measures to enforce national programs on good telehealth practices and the integration of advanced academic networks in national programs. They also proposed that PAHO/WHO have representation in national programs, with formal support. Regarding the topic of on-line health and its impact on patient safety, it was stated that the impact of ICTs on the safety of patient care can be very positive but requires education, training, and careful design to help reduce any adverse effects. Finally, the chapter on legal aspects addresses legal questions that emerge in the eHealth field as technological improvements are developed.

Due to the variety and timeliness of the topics addressed, this work is useful for health professionals, decision makers, political leaders, developers of health-related programs, and other players interested in the broad field of eHealth.

These important recommendations and other aspects analyzed in *eHealth Conversations* will help the countries not only to develop and improve their strategic plans on information and communication technologies in the area of public health, but will also strengthen eHealth programs in the Region of the Americas.

General Disclaimer

This publication was developed by the Knowledge Management, Bioethics and Research Department of the Pan American Health Organization (PAHO/WHO), within the framework of the activities of the project "eHealth Conversations: Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to HealthThe information and opinions expressed in this publication are the exclusive responsibility of the authors and may not represent the opinions of PAHO.

Infrastructure

The Basis for Consolidation, Sustainability, and Evolution of eHealth

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SUMMARY

To improve health in the countries of the Americas, a strong, broadband eHealth infrastructure that links providers and health professionals with patients and their families is essential. However, most public health institutions in Latin America and the Caribbean are not yet integrated into national communication networks, and have limited human resources with experience in information technology and communications.

This is one of the key findings of the Conversations on eHealth project, developed by the Pan American Health Organization. In order to expand eHealth technology infrastructure, participants in the project recommend using sustainable models that take advantage of networks at different levels of care. Interoperable networks, including academic and health technology infrastructures, can help integrate national, provincial, and municipal systems.

A good system with broadband connectivity can be used to provide access to specialist care and facilitate collaboration between medical centers and community-based providers, as well as make better educational opportunities available for rural doctors. It also facilitates participation in research, such as clinical trials, and promotes the sharing of national medical records, including images, x-ray, CT scans, diagnostic videos, and other large digital files.

PAHO/WHO already has a Strategy and Plan of Action on eHealth for 2012 to 2017, with the objective of helping to ensure the sustainable development of the Member States' health systems, including veterinary public health. The authors suggest that PAHO/WHO develop training programs in communications and information technologies that can be applied to health and collaborative work environments over the Internet, as well as create network service hubs for eHealth applications, encouraging access to the publication of innovative proposals.

INTRODUCTION

First, it is worth citing the statement of the World Health Organization (WHO) Director of Knowledge Management and Sharing, Najeeb Al-Shorbaji, in the editorial of *PAHO/WHO eHealth Newsletter* (Vol.2, No.1): "Health is a knowledge intensive sector. The World Summit of the Information Society, among other areas, singled out health as one of the major sectors that will substantially benefit from Information and Communications Technology (ICT). One of the biggest risks of eHealth development is to leave it to be driven by technology rather than by health needs and national health priorities."

For many years, health organizations have invested in resources to develop infrastructure and applications according to their automation needs. Presently, the landscape of technological development facilitates the access and acquisition of technology in the international health sector. The challenge is to avoid that eHealth development focuses merely on technical applications; technological infrastructure should also take into account the integration of innovative health service models that satisfy needs for accessibility, safety, quality and cost-effectiveness. This chapter aims at assessing the contribution and the role of the academic networks in the development of sound eHealth initiatives, including solutions favoring the integration of service models that satisfy the health needs of the population of the twenty-first century, as shown in Figure 1.

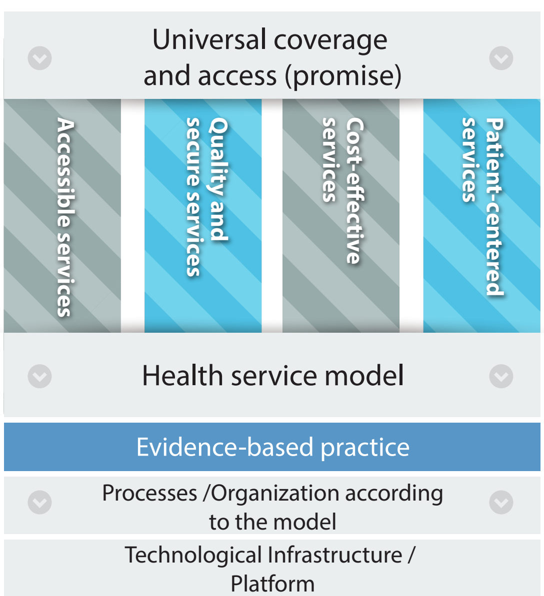


Figure 1. Technology aligned with health priorities and needs.

Ongoing planning of eHealth technological infrastructure, support in establishing regulations that enable interoperability, system improvements, gradual introduction of these systems, and the evaluation of achieved operability, are the fundamentals that can guarantee sustainable improvement, supported by an economic and financial vision and based on demands.

The technological infrastructure implemented in most developed countries during the 1990s integrates health institutions and is used as the basis for health practice, dissemination of recommendations, and health management. In the countries of the Region of the Americas, with a few exceptions, most public health institutions (at different levels) and their internal technological and organizational infrastructure are still not properly integrated in national communications networks. In addition to these challenges, there are difficulties caused by the limited experience of available human resources in ICTs applied to health management.

Figure 2 shows the impact of technological development in people's lives and how this development, when converging in the health area, can contribute to focus services on individuals' needs, thereby achieving the practice of personalized medicine even in complex environments. Academic and educational networks can facilitate the task so that new generations, as well as those who still live in the era of the global village, can take advantage of the benefits of currently available health-related development and knowledge.

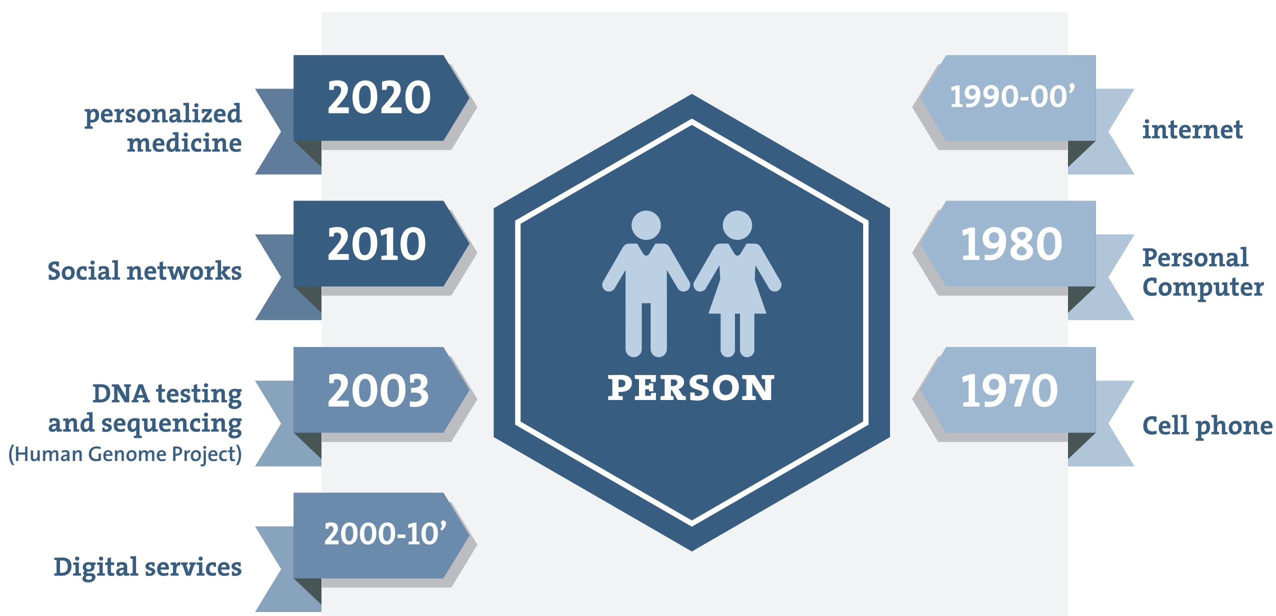


Figure 2. Personalized medicine/ Internet/Personal computer

It is necessary to have the commitment of national authorities in view of the demand for ICT infrastructure implementation if there is to be gradual integration of all health institutions at different levels. This commitment is also needed for organizing and guaranteeing continuing training to include all health professionals in eHealth practices, such as telemedicine and telehealth, among others.

International forums, such as the International Telecommunications Union (ITU) Telecom World, highlight the importance of generating data connectivity for the entire world, both in big cities of developed countries and in small villages of developing nations. One of the indicators is the penetration of (fixed and mobile) Internet connections and the relevant devices for Internet access. Data from the World Bank show that South American countries have very similar numbers of Internet users, except for Brazil, which is more than four times the mean value (Figure 3). These figures can be viewed at http://www.google.com/publicdata.

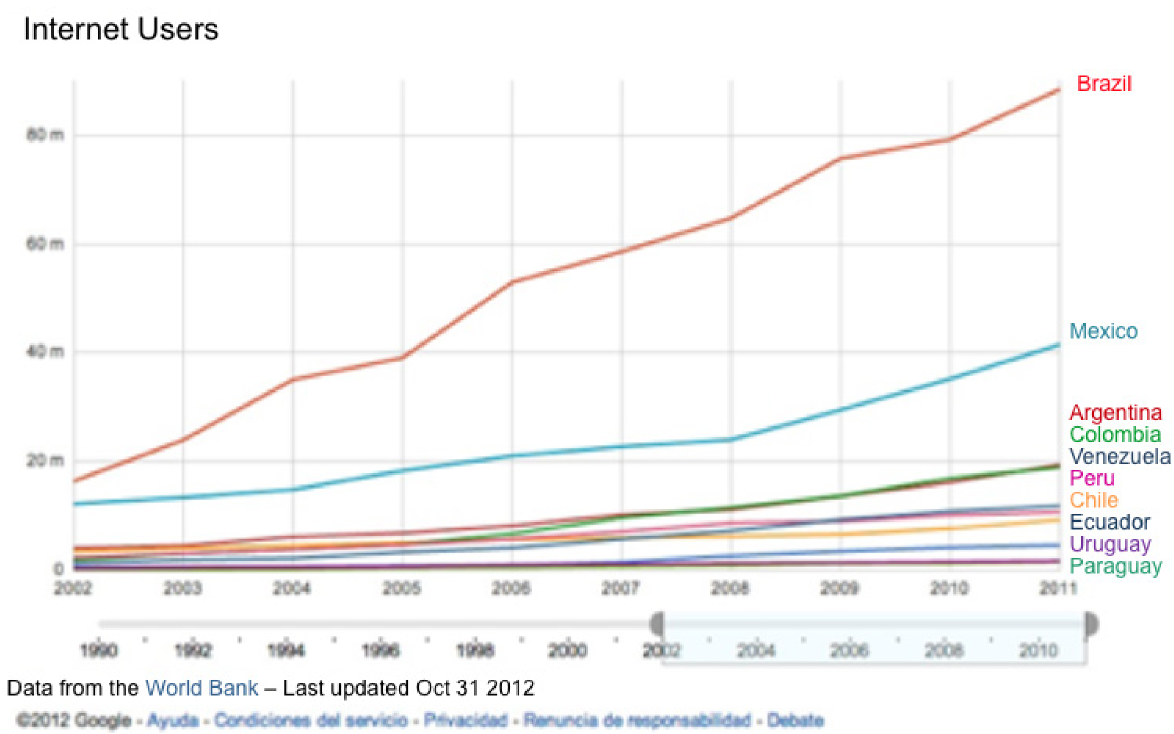


Figure 3. Evolution of Internet users in the countries of the Region.

Figure 4 shows the growth of Internet use in the countries of the Region in the last 10 years. It reflects, in a direct way, the adaptation of the communications and information infrastructure and that it can be used for country plans to incorporate ICTs in sectors such as health, government, and education. An even more effective indicator is the number of Internet users relative to the population (Figure 5), which can be used to estimate the number of people with access to ICTs and to a certain degree, the possibility of their adopting telemedicine.

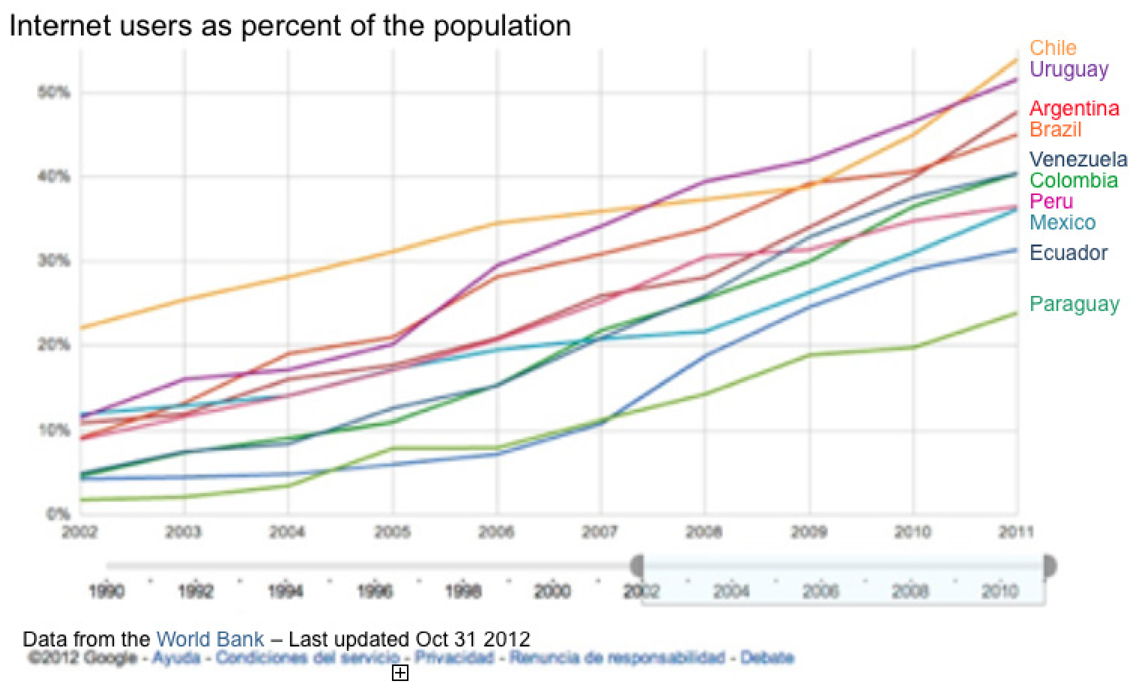


Figure 4. Evolution of Internet users as a percentage of the population in the countries of the Region.

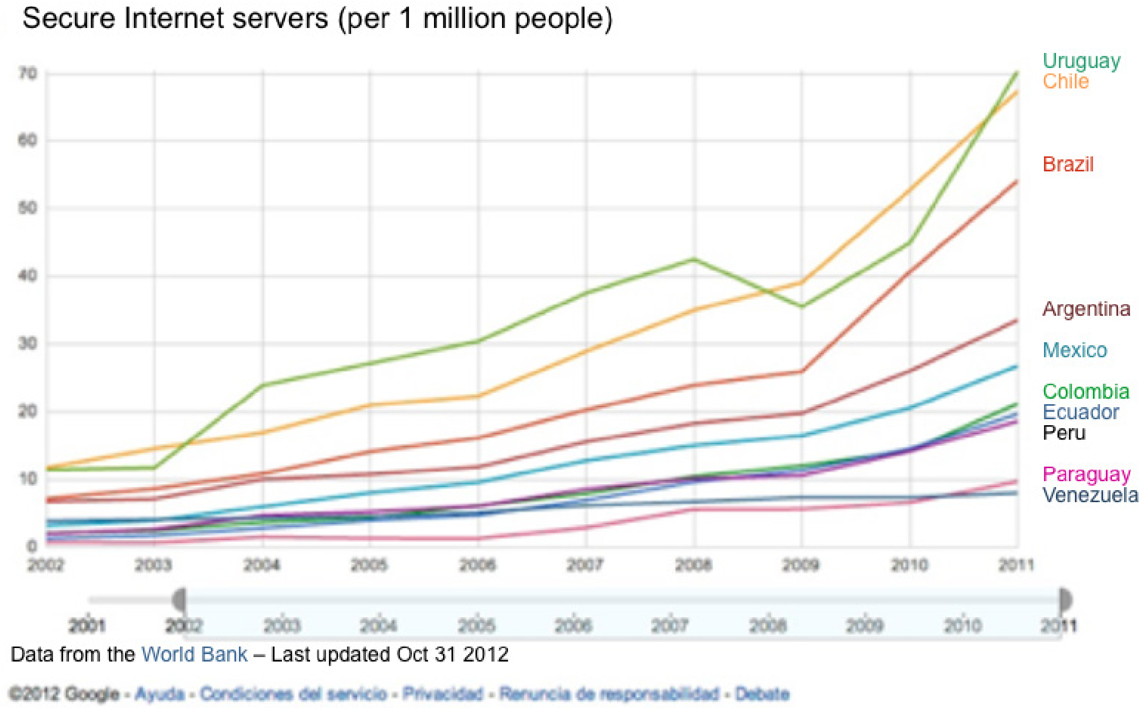


Figure 5. Secure Internet servers per 1 million people in the countries of the Region.

The past 10 years have shown an average increase of 40% in the number of Internet users. The tendency is to increase the covered population every year in the countries of the Region of the Americas shown in the figure. The measurement of secure Internet servers reflects the size of the information business in the network of each country. Figure 5 illustrates a tendency toward an increase in the number of secure servers. Brazil, Chile, and Uruguay report a significant increase in servers per million people and, in fact, these countries have described an increase in the Internet and ICT industry in different areas of government (legal, education, and health).

In parallel with the development of the telecommunications and information infrastructure, the way in which health care infrastructure develops should be analyzed. eHealth is oriented toward improving the effectiveness of human resources in health. It is necessary to take into account that if the number of physicians is low for the current population, an eHealth structure will not yield a different value. Therefore, as governments invest in the improvement of telecommunications infrastructure, they should also invest in training the human resources required in technical areas as well as in health care.

According to data from the World Bank [1], the number of physicians per 1000 people has decreased in some countries such as Colombia, while it remained stable in others and it increased in only a few or none (Figure 6).

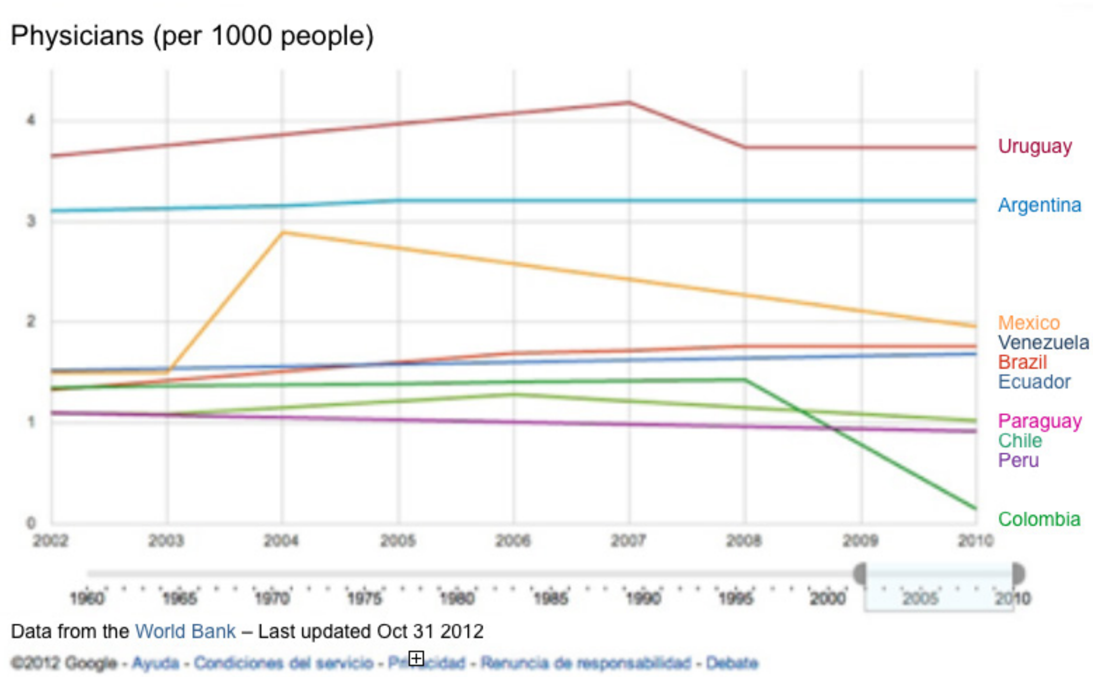


Figure 6. Physicians per 1000 people in the countries of the Region of the Americas.

Figure 7 presents information on the number of hospital beds per 1,000 people in the Region. When comparing this information with the number of physicians per 1,000 people in the Region, the situation is even more troublesome since the number of physicians has not increased.

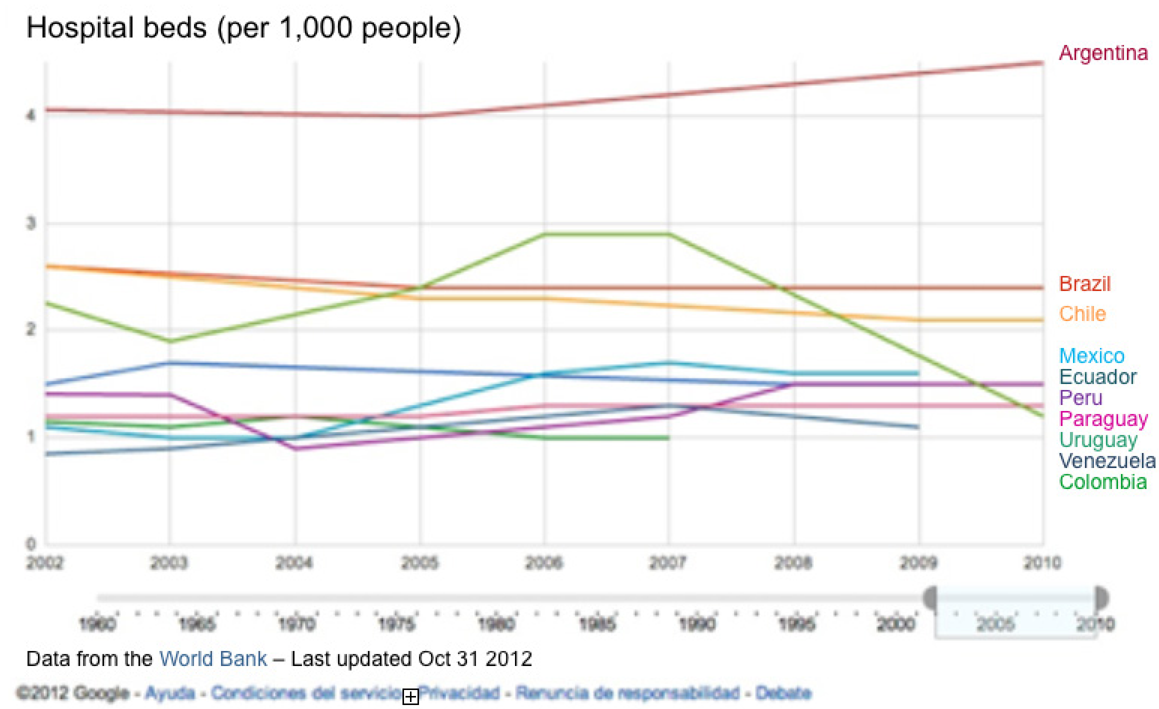


Figure 7. Hospital beds per 1,000 people in the countries of the Region of the Americas.

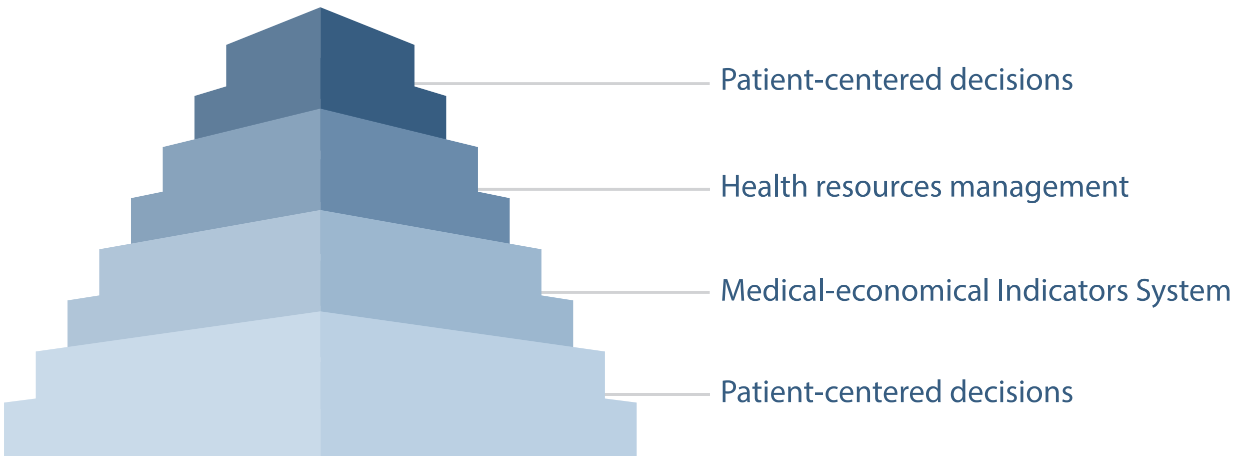
As Figure 7 shows, regarding the number of hospital beds per 1,000 people, the citizens of certain countries have fewer opportunities to receive hospital treatment or to visit a physician or specialist. These conditions can overload the emergency services, since many patients enter into the health system through the emergency room. This situation could be improved if mechanisms for self-care, home assistance, and monitoring of critical health signs were available, with appropriate technology and qualified health workers and technologists, as well as public policies fostering their development.

eHealth provides an environment favoring the interaction of different players (patients, physicians, nurses, drivers, pharmacists, technologists, technicians, managers, and assistants, among others), technologies, for-profit and nonprofit organizations, providers, and universities, as well as the policies, standards, and legal regulations of different levels of health care. The several disciplines working for the health system should act as a unit in which the patients and their families are its focus and target.

Figure 8 illustrates the different knowledge environments developed in academic networks. Their alignment to shared targets in the health context generates a large research and work field where standards and regulations on technological improvements can be defined and used in a safe and cost-effective fashion within the health systems.

Figure 8. Convergence of disciplines in the digital ecosystem.

In order to concentrate services and care in people and patients, it is necessary to design and develop tools and the technological infrastructure that will facilitate resource management as well as track health economic indicators (Figure 9).



Supporting tools:

- Operation: Flexible, timely data and information
- Continuity: Timely medical attention
- Communications: Health-patient professional relationship
- Dissemination: Personalized health contents, health prevention campaigns and programs
- Inclusion: children, young adults, adults and older people
- Decisions: Patient- and person-centered, based on scientific evidence
- Quality: Patient safety
- Research: Data and information repositories

Figure 9. Impact sectors of the health digital ecosystem.

As shown in Figure 10, technological convergence requires the training of interdisciplinary specialists, making it possible to integrate applications and knowledge. The consolidation of health education and academic research networks in the Region has become imperative.

Prepared by @CARES based on Eric Topal, The Creative Destruction of Medicine (2013)

Figure 10. Convergence of progress in medicine and health information technologies.

Infrastructure for eHealth should consider the global growth in the use of Internet and mobile systems guaranteeing safety, operative scalability, and key elements for digital literacy of users. A proper strategy for scalable implementation of infrastructure should consider the contents to be managed, taking into account increased complexity which, in most cases, will demand more services, processing, and broadband Internet access.

MATERIALS AND METHODS

This chapter was prepared based on individual research, development of surveys, and, in particular, the input from network conversations within the framework of the eHealth Conversations convened by PAHO/WHO. Each conversation was led by a coordinator who was responsible for moderating the process, generating open debates on issues raised both by him/her and the participants, suggesting work assignments, and compiling the discussions. Some co-authors submitted documents for discussion on different topics.

Participants communicated through email lists and virtual conferences. The conversation was complemented by the publication of tweets with the hashtag "**#ehealthtalks**," through PAHO's Twitter account on eHealth (@ehealthpaho). Each conversation lasted eight weeks and, based on the issues addressed, a document was prepared including the main recommendations that emerged from the exchange of ideas and experiences.

The conversation on infrastructure was attended by 36 participants from the following countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Uruguay, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Spain, United States, and Venezuela.

STRATEGIC INFORMATION

The PAHO/WHO Strategy and Plan of Action on eHealth

This strategy and plan reflect the importance of infrastructure to the sustainable development of health systems in PAHO/WHO Member States, including veterinary public health.

The strategy refers to infrastructure-related topics. Target 2.1 refers specifically to "improving organizational and technological infrastructure." For that purpose, in 2014 one of the indicators will evaluate the establishment of a strategy for the strengthening and determination of the basic organizational and technological infrastructure in health services (including telephones, Internet, email, database systems, and data storage systems). This conversation will help to guide PAHO/WHO as well as the member States to achieve this goal for the Region of the Americas.

Broadband

Undoubtedly, broadband Internet access in the Region is one of the best drivers for development of eHealth and telemedicine for primary health care and specialties in rural areas, since it allows and facilitates universal access in different ways. For example:

- The delivery of electronic services to the population in the areas of education, health, and management allows optimization of these services and overcomes geographic and financial barriers which limit coverage for the least privileged and most marginal segments of the population;
- In education, broadband facilitates the development of new learning models as well as the expansion of education, reaching places that were impossible to get to in the past;
- In public administration, the use of broadband speeds up service delivery and brings citizens closer to these services. Likewise, broadband favors remote delivery of medical services for diagnosis, treatment, and follow-up.

The communications infrastructure is a key element for the deployment of eHealth services, bringing health closer to different geographical areas that are lacking physicians or specialists, or to hard-to-access places.

Due to its spillover effects for the entire economy, broadband is the platform of a larger system whose effective operation requires the availability of complementary assets, including:

- Access to service
- Terminals with connectivity
- Contents
- Advanced applications
- Adequate capacity for use

At present, the exchange of health information is more focused on providers than on the delivery of health services; therefore, only part of the health problem is about building opportunities to improve the quality of health care. Global and integrated thinking about an advanced broadband infrastructure opens the possibility of offering services to improve the access to health services and the well-being of rural and urban communities.

Broadband is the key element of a new system characterized by key complementary structures for economic and social development.

The expansion of broadband and the capacity to use it are mutually necessary. It is the core of a dynamic that has an impact on society as a whole combined with productive sectors and within a development cycle based on the principles of efficiency, innovation, collaboration, and inclusion that characterize the networks.

According to a report by Dr. Raúl L. Katz [2] from the Columbia Institute for Tele-Information, a 10% increase in broadband penetration may contribute 0.16% to GDP growth in the Region, although it is necessary to consider that for digitization to achieve its full potential, it must comply with multiple conditions regarding ICT infrastructure, such as being:

- Economically affordable (prices);
- Technologically accessible (network coverage);
- Technologically reliable (access capacity and speed).

Without question, having a sustainable communications infrastructure supporting eHealth services would provide advantages both from health improvement and democratization perspectives, and have a direct impact on the progress of the Region. In this sense, it represents an opportunity to make a paradigm shift in the health system that would enable information technology providers, network engineers, health providers, and patients to work together for the improvement of health for all, offering enhanced access to the best available medical care, with no geographical and jurisdictional barriers. In order to improve the health of a country, broadband infrastructure should integrate providers, health professionals, home care providers, patients, and their families. Likewise, health services and the exchange of health information should form part of a reliable and safe network infrastructure. Currently, broadband users face problems such as slower speeds than expected, and are limited by the standard speed offered by the provider. In certain cases, such as during the broadcast of events that are of great interest to the general population, or in the case of natural disasters, both the public and the governments are affected by the saturation of commercial Internet services as a consequence of high demand.

eHealth Technological Infrastructure

This infrastructure represents ICT integration and allows sharing health information in an efficient and secure way. This includes:

- Wired local-area networks (LAN) and wide-area networks (WAN) (using copper, fiber optics, etc.)
- Wireless LAN and WAN networks
- VSAT or satellite Internet communications (these are important in some areas)
- Routing and switching
- Traditional/fixed telephone lines, internet protocol (IP), cell phones/smart phones
- Computer equipment (desktops, tablets, notebooks, etc.)
- Unified messaging services
- Data centers (processing, storage)
- Database servers (relational, file system) and multimedia storage servers (video, picture archiving and communications systems [PACS])

- Virtual services and cloud services (SaaS, PaaS, DaaS, KWaaS)
- Data and network security
- Connection of medical devices and interactive, digital TV
- On-line work and with temporary connectivity

Establishing this physical environment of interconnectivity and electronic information processing (whether in a hospital, national, or global health information network) facilitates the creation of the eHealth model and of the means to disseminate information related to the treatment and care of patients. That is to say, the availability of important information as well as the accessibility, accuracy, and speed of the assistance provided are improved.

eHealth Organizational Infrastructure

In building the eHealth technological infrastructure, it is necessary to first achieve clear political and organizational commitments to provide a satisfactory framework for infrastructure development and sustainability.

In order to guarantee the implementation of an eHealth system, it is necessary to adequately manage the change at the organizational level, taking into account the needs of all players and guaranteeing that they have an active role in the design of new processes. The implementation of the eHealth organizational structure includes all levels of management of health information systems including, but not limited to, the following:

- **Strategy and vision.** The main objectives of any health information system are to improve patient's health, improve public health, reduce costs in order to re-invest in health (sustainability), and provide universal access to health services. Cost-opportunity should also be considered, since the major investment that may be initially required could, in the mid- and long-term, imply better-quality and lower-cost service.
- **Information.** Adequate information should reach the appropriate people at the proper time and place, and delivered in a suitable manner.
- **Education.** Education is vital in reducing the digital gap. It will be necessary to constantly train all the people involved in eHealth so they can be updated in the management of technological components.

- **Management indicators:** These indicators make it possible to understand the way in which new technologies are being adopted in the practice of health care and the improvement of the quality of life. They are necessary for making the best decisions and taking necessary actions in health planning.

Management indicators are important for the definition of the cost-benefit relationship of the processes designed for the eHealth community. Indicators are, or should be, increasingly applied, and, on the other hand, the assessments of social impacts are, or should be, applied in parallel with or after the implementation of new processes and technologies. It follows that future planning should be based on the assessed indicators. Health observatories can use standards for communication, coding, and semantics for decision making.

Technology Acquisition

The acquisition of the technology involved in ICT infrastructure for eHealth requires specifications that are clear, transparent, and with a technical basis that can benefit the different strategies and proposals of technology providers. Therefore, if we are looking for an infrastructure aligned with a knowledge-centered system, capable of sustaining the growth in quantity and complexity of simultaneous processes composed of multimedia tasks, the requirements of a (local, national, regional) data center should be organized by levels of security. They could be the following:

Highest security (data access and update, sensitive patient data):

- A service for patient identification and a system for authorization of the delivery of services;

- SQL (structured query language) relational database management for clinical records and file system for document database;

- Broker HL7 for interoperability of messages, data, and documents, independent from the client's platform. The broker avoids excessive data replication and accessibility, regardless of the geographic location and the server platform used;

- Electronic signature of messages and documents. Currently, there is technology (e.g., identity-based encryption [IBE]) providing encryption and signature mechanisms not based on digital certificates, therefore the electronic signature is referred to generally;

- PACS (picture archiving and communication system). A system for picture archiving and secure communication access.

Medium security (it does not include patient sensitive data):

- Servers and brokers for legal data. These include processes and tasks related to local and international legislation, as well as authorizations.

- Servers and brokers for knowledge management. These provide sources of continuing, general, and contextual training in areas of research and study as well as at the point-of-care. This includes evidence-based information, administrative and accounting data, logistics, etc. It is here that the integration of university networks, virtual health libraries (VHL), and research centers becomes feasible and indispensable. In this sense, it is important to apply universal identifiers for each type of content.

- Servers and brokers for the articulation of business intelligence. These consume major resources, both in broadband and in storage and processing. They include processes that extract management information (without identifying the patient). If connectivity resources are limited, these processes can operate on independent networks and/or on specific schedules to avoid overloading networks used for routine management.

Low security:

- Servers and brokers with object identification repository. These should be of an international nature since it is essential for identification of each of the objects represented in a data sample to be unambiguous. Local replications can be in place, but the global model is validated through the use of this type of repository. Each country, through their eGovernment offices, could publish and update catalogues of exceptions, making reference to the local reality.

- Each country has different sources of open data which may be consulted but not updated. In general, each source corresponds to a ministry or public office. In some cases, these data are not stored or available in a common format (spreadsheets, text, xml, html, pdf, etc.). In order to reuse these data, it is necessary to have at least one server that is equipped with a database and an extraction and conversion broker to perform this task. This is essential for citizen and reference information for any kind of process and task in the eGoverment scenario.

In all the cases of required security, data can only be updated by authorized persons and applications.

Telecommunications Infrastructure

The necessary infrastructure for telehealth is established in the basic models used to develop telecommunications networks. They are made up of hierarchical networks with network elements in the ends and routers in the nuclei. This model has enabled rapid progress in worldwide communications.

To a certain extent, most activities of today's society go through one or more computer networks. Technology is found in home networks, in the implementation of public policy routines through e-government, and in education, where the Internet has become one of the main sources of information for students at all levels.

Internet has become a well-known tool that can be accessed by a significant portion of the population. Digital initiatives have been developed in different areas with the aim of expanding the reach of the Internet to the population of the entire world.

Nevertheless, this success entails a problem for the scientific and research community. Since a large proportion of the society depends on the Internet for daily living, technologies and access to the network have become easy-to-access products and, as a consequence, stability is a essential characteristic of the Internet today. This means that, in general, research using new protocols and technologies is no longer possible through the Internet, due to the risk of interruption.

These problems have led several researchers to argue that the architecture of information networks in general, and of the worldwide network (Internet) in particular, has reached a maturity level that has made them inflexible. The commonly used expression, in many cases, is that the Internet is ossified, making reference to the human aging process when the elastic cartilage is replaced by bone.

With the aim of solving this problem, the network research community has invested in initiatives leading to the deployment of networks with greater programming capabilities, so new technologies can be gradually introduced to the network. The most successful initiative in this regard was, undoubtedly, that of the OpenFlow interface and protocol.[3] With this protocol, routing offers a simple programming interface that allows expansion of access and control of the search table used by the hardware to determine the following step in each package received. Therefore, routing continues to be efficient since it remains a hardware task, but the decision on how each package should be processed can be transferred to a higher level, where different functions can be implemented. This structure allows the network to be controlled in an extensible fashion through applications, expressed in software known as Software Defined Networks (SDN).[4]

From the telemedicine perspective, it is important to pay close attention to these developments, since they are crucial to preserving minimum quality parameters in essential advanced medicine applications for remote technological services. In the same way, it is necessary to conduct a broad discussion with national academic networks to know how this topic is handled in their expansion projects.

Strategy for the Definition of Technological and Organizational Structure

The strategy for the definition of technological infrastructure should be connected to a sustainability model in the area of eHealth actions. Some of the problems in executing these projects has been the lack of long-term financial sustainability. This demands change in traditional architectures. Obviously, new models need to consider important aspects such as privacy, confidentiality, guarantees, mechanisms to ensure quality of service (QoS), etc.

From the point of view of organizational infrastructure, it is necessary to consider how to introduce the new eHealth models into the health care system in a natural way, without interrupting current health care processes but, rather, complementing and improving them. To achieve this, it is necessary to take into account regulatory and planning aspects, among others.

Infrastructure is part of the health environment. Some mistakes have been made when equipment is purchased without knowing the broadband, concurrence, and scalability requirements, and, in particular, without including, as a condition, the capacity to manage the multimedia structure of the contents to be processed, or compliance with cataloguing and interoperability standards. When these contents and the standards to be complied with are not clearly specified, sellers should suggest proprietary management. Consequently, we consider that a successful project should not start by selecting the equipment but it should rather be based on the type of information to be processed and the way in which it will be disseminated and shared.

The Role of Academic Networks

The improvement of academic networks from the point of view of ICT infrastructure is global, as well as the acknowledgement of their relevance to integration of public policies. In the Region of the Americas, the participation and integration of academic networks in universities, university hospitals, and research and education institutions to support global, national, provincial, and municipal health actions is essential for the development of the ICT infrastructure. This represents an example for integrated and networked articulation and permanent consolidation of the sustainability, expansion, dissemination, organization, application, management, and evolution of knowledge.

Academic networks stand out for their constant quest to establish governance models that facilitate the sharing of infrastructure and services to support collaborative research between national, regional, and international researchers, as well as their permanent contribution to the development and implementation of the necessary infrastructure for network operation. Methodologies have also been developed for the follow-up and measurement of the relationship between each network and its users.

Almost every country of the Region has already established national networks of education and research. These networks contribute to the integration of national, regional, and international knowledge, according to their current expansion capacity.

In the 2011 RedCLARA (Latin American Cooperation of Advanced Networks) report on national networks for education and research in Latin America, [4] the following key factors were highlighted for network development:

- Legal organization and relationship with the government
- Connection, acceptable use, and security policies
- Kinds of users and their relationship with required connectivity
- Capacity of the networks and connectivity services
- Traffic and performance
- Service levels
- Security
- Services, including: storage, voice over IP, videoconferencing, collaborative tools, cloud storage, e-education
- National computer service
- Funding
- Work team

Advanced academic networks means the networked organization of high-connection capacities of research and education institutions and communication channels with other networks, with the aim of creating a more robust Internet service. These networks are essential for encouraging and integrating national scientific communities with each other and with research and education institutions and foreign researchers, in addition to fostering the development of services and novel applications for high-performance networks.

Integration and joint work with the ministries of health are still objectives to be achieved since, regardless of the ICT and telehealth infrastructures of the ministries, as in the case of Canada Health Infoway, the contribution of the national networks for research and education may support a faster, scientifically supported integration of health care, education, research, management, and assessment, mainly in the countries of the Region.

The integration between the ministries in charge of health issues with academic networks might favor universal health access through remote health care, education, research, management, and assessment.

Since the 1990s, integration operations have been in place in the networks of some research and education institutions with communication needs. Table 1 shows the improvement of academic networks in the Region, some that are specific to the health area, and contacts.

Chart 1. Academic Networks in the Region of the Americas

Country	Network	Contact	E-mail	Web Site
Regional	RedCLARA	Luis Nunez	luis.nunez@redclara.net	www.redclara.net
Regional	C@ribNET	Colleen Wint-Smith	colleenwintsmith08@gmail.com	http://www.ckln.org/home/content/cribnet
USA	Internet2	Daniel Casares	dcasares@internet2.edu	www.internet2.edu
Canada	Canarie	Jim Roche	jim.roche@canarie.ca	www.canarie.ca
Argentina	INNOVA|RED	Julian Dunayevich	julian@innova-red.net	www.innova-red.net
Chile	REUNA	Paola Arellano	Info@reuna.cl; direccionejecutiva@reuna.cl	http://www.reuna.cl/
Colombia	RENATA	Bibiana A. López / Camilo Jaimes Ocaziónez	direccion@renata.edu.co; comunicaciones@renata.edu.co; academia@renata.edu.co	www.renata.edu.co
Costa Rica	CONARE	Alvaro de la Ossa	delaossa@cenat.ac.cr	www.conare.ac.cr
Ecuador	CEDIA	Juan Pablo Carvallo	juanpablo.carvallo@cedia.org.ec	www.cedia.org.ec
Guatemala	RAGIE	Luis Furlan	furlan@uvg.edu.gt; luis.furlan@ragie.org.gt	www.ragie.org.gt
El Salvador	RAICES	Rafael Ibarra	ribarra@uca.edu.sv	www.raices.org.sv
Mexico	CUDI	Carlos Casasús	ccasasus@cudi.edu.mx	www.cudi.mx
Peru	RAAP	Carmen Velezmoro	carmen.velezmoro@raap.org.pe	www.raap.org.pe
Uruguay	RAU	Ida Holz	holz@seciu.edu.uy	www.rau.edu.uy
Venezuela	REACCIUN/CENIT	Lic. José Sosa	jsosa@cenit.gob.ve	www.cenit.gob.ve

Bolivia	ADSIB	Sergio Toro	storo@adsib.gov.bo; contacto@adsib.gob.bo	www.adsib.gob.bo
Panama	RedCyT	Julio Escobar	jescobar@senacyt.gob.pa	
Paraguay	ARANDU	Carlos Filippi	director@cnc.una.py	www.arandu.net.py
Dominican Republic	RADEI	Rafael Bello Díaz	rbello@ucsd.edu.do	http://www.seescyt.gov.do/Documentos%20Mix%20 2010/Publicacion%20RADEI.pdf
Brazil	RNP	Luiz Ary Messina	messina@rute.rnp.br	www.rnp.br

The infrastructure for eHealth (hardware + software + "humanware") should contribute, beginning with its architecture, to the sustainable integration of knowledge, attracting all users of the eHealth environment as an extension of mutual benefit and collaboration. In multidisciplinary and open standards of global consensus, almost all knowledge-building components and their interoperability have been defined. Therefore, the language offered should enable any user to learn, publish, and interoperate by adding his/her contributions. If the university can trace the contribution and experience of one user, academic credits could be granted since no technological barriers exist for that. Knowledge-centered (scalable, concurrent) infrastructure rather than one centered in fixed data guarantees the success of the eHealth environment.

Profiles of Specialists *1

Francis Frederick Tusubira

He is general director of the UbuntuNet Alliance for Research and Education Networking, is a member of Electrical Engineers (United Kingdom), and Chartered Engineer. He currently chairs the National Information Technology Agency of Uganda and is founding member of the Uganda Communications Commission. He is a member of the South Africa Tertiary Education and Research Network Council, which is part of the South Africa National Research and Education Network.

Thomas Fryer

Since 2008, he has been responsible for International Affairs of Delivery of Advanced Network Technology to Europe. He supports the international dialogue between the community of the pan-European Information Network (GÉANT), and its global partners, in particular with the Latin American Cooperation of Advanced Networks, where he has contributed to the ALICE2 project. He also supports collaboration of GÉANT with its global partners in North America and Sub-Saharan Africa.

Villie Morocho

He has a PhD in software engineering, and is a systems engineer and expert in strategic project management. He carries out research on information technologies, communication, telehealth, mobile technology, and digital television. He worked as Executive Director of the Ecuadorian Consortium for Advanced Internet Development (*Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado*).

Florencio I. Utreras

He has a PhD in engineering with a specialty in applied mathematics. Currently, he is Executive Director of the Latin American Cooperation of Advanced Networks and formerly held the same position in the Red Universitaria de Chile. He recently led the ALICE2 Project funded by the European Commission, and has participated in several projects funded by the European Commission's 7th Framework Program, the Organization of American States, and the Inter-American Bank.

Nelson Simões

He is a computer engineer and is currently General Director of the Social Organization "National Research and Education Network," which is part of the Ministry of Science of Technology of Brazil and develops technological projects in advanced research and education networks. He leads the high-performance national structure for communication and collaboration, which encompasses the 600 major higher education, research, and innovation organizations of Brazil. He also chairs the Latin American Cooperation of Advanced Networks.

PAHO specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to contact them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness or authenticity of the information published herein and reserves the right to change, restrict or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

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Web sites *2

GÉANT Network
TThe GÉANT network is a pan-European communication structure at the service of the research and education community. Co-funded by the National Research and Education Network (NREN) and the European Commission, the GÉANT and its project (GN3plus) are already in their third generation and connect 38 European NRENs, in addition to NORDUnet.
www.geant.net

Internet 2
Internet2 is a community of research leaders networked with academic institutions, industry, and the government, that create and collaborate through novel technologies.
www.internet2.edu

Red CLARA, Uruguay
The Latin American Cooperation of Advanced Networks (RedCLARA), is an international, nonprofit organization that was formed in 2003. It works to establish Latin American collaboration in advanced telecommunications networks devoted to research, innovation, and education. The Red CLARA develops and operates the only advanced Internet network in the Region of the Americas. It is also connected to GÉANT 2 (Europe), through the ALICE Project.
www.redclara.net

National Network of Research and Education (Red Nacional de Investigación y Educación, RNP), Brazil
Interaction between networks is essential for Internet stability. Brazil's National Research and Education Network (RNP) is linked to various network initiatives in that country and the rest of the world. In Brazil, the RNP frequently acts in association with the Ministry of Science, Technology and Innovation (MCTI), as well as with other entities, fostering initiatives of advanced networks. These initiatives promote the development of network infrastructure and applications. Through RedCLARA, the RNP is linked to Internet2 and the GÉANT.
www.rnp.br

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of the opinions, ideas, data or products presented in those sites, or guarantee the validity of the information included thereof. The purpose for offering links to external sites is to inform readers regarding the existence of further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and does not represent the opinions of PAHO.*

Cooperación Latinoamericana de Redes Avanzadas (Latin American Cooperation of Advanced Networks [RedCLARA])

http://www.redclara.net/

RedCLARA is a regional infrastructure that fosters ideas, experiences, plans, and structures in support of increasingly demanding scientific and technological services. It is an international, nonprofit organization and it seeks to be a collaborative system through advanced telecommunications networks for research, innovation, and education. RedCLARA operates the advanced Internet network in the countries of the Region, created by the regional interconnection in 2004. It is linked to GÉANT (pan-European advanced network) through the ALICE Project which, until March 2008, was co-funded by the European Commission through the @ LIS project. RedCLARA is formed by Argentina, Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Guatemala, Mexico, Panama, Paraguay, Peru, Uruguay, and Venezuela. It has an Assembly in which each country has meetings with representatives to define the course of actions and policies.

The institutional government of RedCLARA is made up of the Board of Directors (the highest entity, consisting of a President, Vice President, Secretary, Treasurer, and Director), a Finance Commission (formed by three members of the Assembly who are not part of the Board), and a Technical Commission (including seven members who represent the engineers of the networks connected to RedCLARA, who are in charge of controlling the development and the technical and security implementations of the network). The Executive Secretariat is the entity responsible for executive management of RedCLARA. The initial idea for the formation of RedCLARA emerged in June 2002 at the Toledo (Spain) meeting, organized within the framework of the CAESAR project, funded by the European Commission Directorate-General Information Society Technologies (IST) Program, and included a study which led to the América Latina Interconectada con Europa (Latin America Interconnected with Europe) or ALICE project. At that time, the representatives of the major academic networks of the Region met to form an advanced Latin American network. RedCLARA, together with its European counterparts, are executing the ALICE2 project with the aim of implementing broadband to serve the most demanding applications such as high energy physics, earthquake simulations, eHealth, biodiversity databases, VLBI astronomy, among others.

GÉANT

www.geant.net
The GÉANT network is a pan-European communication infrastructure that serves the European research and education community. Co-funded by National Research and Education Networks (NREN) and the European Commission, the GÉANT and its project (also known as GN3plus) are in their third generation and connect 38 European NRENs, in addition to NORDUnet (a collaboration of NRENs in Nordic countries).

With speeds of up to 500Gbps, the fundamental objective of GÉANT is to offer real value and benefit for society by allowing the research and education communities of Europe and the world to transform the way of collaborating in state-of-the art research.

The GÉANT project advances all aspects of NREN connection:

- Speed and reliability
- Advanced connectivity, network support, and access service to national networks, projects, institutions, and end-users
- Initiatives to address the digital gap of research and education networks in Europe
- Research in technology to ensure that GÉANT continues to be at the forefront in the creation of networks at the global scale.

The GÉANT network and its program of associated activities are co-funded by the EC in compliance with the Seventh Framework Program (FP7) through the GN3 projects (April 2009 to March 2013) and GN3plus (April 2013 to March 2015). The GN3plus contract amounts to 42 million Euros, with collaboration between partners of the project and the EC. The project partners include 38 European NRENs, Delivery of Advanced Network Technology to Europe (DANTE), Trans-European Research and Education Networking Association (TERENA), and NORDUnet.

Apart from its pan-European scope, the GÉANT network has established close links with networks in other regions of the world, including the Region of the Americas, North Africa and the Middle East, Southern and East Africa, Southern Caucasus, Central Asia, and the Region of Asia and the Pacific, allowing the European research and education community to connect with its peers in 66 additional countries.

The EC granted the GÉANT the first award in the Scientific Excellence category for its promotion of technology to overcome the digital gap.

Caribbean Knowledge and Learning Network (CKLN)

www.ckln.org/home/
The Caribbean Knowledge and Learning Network (CKLN) is a regional organization created by the heads of government of the Caribbean Community (CARICOM) on 26 April 2012. The network implemented a study on broadband capacity and a learning network, C@ribNET, which connects all the countries of the CARICOM. C@ribNET is linked to the global research and education community through America's Path (AMPATH) for North America, GÉANT for Europe, and RedCLARA for the Region of the Americas. The EC funded the network with a contribution of 10 million Euros. Today, a population of around 26 million people from 21 Caribbean countries benefits from access to educational content and other knowledge resources both in the Region and in the rest of the world through the development of C@ribNET.

C@ribNET is a fiber optic broadband network set to connect tertiary hospitals, schools, and CARICOM institutions, as well as all those involved in the development of knowledge and research in the Caribbean and, at a second stage, it will connect them with the rest of the world. The aim of C@ribNET is to bridge the digital gap in the region and attain social cohesion for the peoples of the Carribbean by means of digital inclusion.

Internet 2

www.internet2.edu/
The current trend in the United States is to install broadband all over the country with the aim of consolidating an integrated and high-speed national health network. The goal is to allow better access and health care to patients, as well as increase efficiency by improving the capacity to allocate resources and share knowledge. The reduction of disparities in health care will be attained by using telemedicine and telehealth which, thanks to Internet 2, will be available for those rural communities without current access to health services.

The Internet2 initiative will make it possible for electronic medical records (EMR), including imaging, X-ray, tomography, diagnostic videos, and other large files, to be transmitted faster and more easily. In the future, the national medical record can be integrated with advanced broadband networks which are necessary to execute and manage telehealth activities, including remote diagnosis, remote control of the intensive care unit, second opinions, distance medical education, and the like.

Among the different activities performed by Internet 2, the expansion of the broadband planning program can be highlighted. The members of the Ad Hoc Health Community defined, in 2009, the following activities:

- Foster the integration and collaboration between federal programs such as the National Information Health Network proposed by the National Coordinator of Health Information Technology, the bio-surveillance program of the Centers for Disease Control, and other programs for health resources and services, including the Agency for Healthcare Research and Quality, the Indigenous Health Service, the Department of Veterans Affairs, and the Department of Defense.

- Facilitate the integration of the broadband infrastructure with other programs with a similar approach, such as eRate of the Federal Communications Commission (FCC) for schools, the National Telecommunications and Information Administration (NTIA), and the Rural Utilities Service for rural development.

Canada's Advanced Research and Innovation Network (CANARIE)

www.canarie.ca/en/
Founded in 1993, CANARIE manages a high-speed network. One million researchers, scientists, and students from over 1,100 Canadian institutions, universities, research institutes, hospitals, and governmental laboratories have access to this network. CANARIE enables researchers to share and analyze massive amounts of data, like climate models, satellite images. and DNA sequences that can lead to groundbreaking scientific discoveries. CANARIE is a nonprofit organization funded by its members, with major investment in its programs and activities provided by the Government of Canada.

National Network for Education and Research (RNP)

http://www.rnp.br/en
The National Network for Education and Research (RNP) is a social organization linked to the Brazilian Ministry of Science, Technology and Innovation (MCTI). As a pioneer in the use of the Internet in Brazil, the RNP manages the IPE, which is the national academic high performance optical network. The network is present in 27 states and has connected more than 800 institutions. There are approximately 3.5 million users benefiting from an infrastructure of advanced networks for communication, computing, and experimentation, which contributes to the integration of the MCTI, as well as the ministries of higher education, culture, and health, and the members of the RNP Steering Committee.

In January 2006, the MCTI and Brazil's Financing Agency for Studies and Projects (FINEP) created the Telemedicine University Network (RUTE), which initially connected 19 university hospitals. By 2008 this number increased to 38 and in 2011 to more than 75. Today, the RUTE has 76 operative telehealth nuclei, with videoconference rooms and 50 special interest groups in health specialties and subspecialties. There are two to three daily scientific and hands-on sessions in videoconference and the participation of approximately 300 institutions, including in other countries in the Region (see Figure 11). Assistance and continuing education for teams of the Family Health Program in the municipalities are coordinated by the National Telehealth Program, funded by the Ministry of Health.

RNP communications infrastructure is operated by a first level team based in Brasilia; the Operations Management constitutes the second level, based in Rio de Janeiro. In order to ensure the evolution of the network as well as excellent service for the academic community, the RNP elaborated the Multiannual Plan (2012–2016), already in operation, with the following actions:

- 2013–2014: increased availability and capacity levels of the main networked links;
- 2013–2014: improvement in the infrastructure of the points-of-presence (PoPs) located in all Brazilian states and improvement in the level of service to national infrastructure users;
- 2015–2016: increased capacity of all 10-Gbps to 100-Gbps circuits; renewal of RNP five-year old equipment;
- 2015–2016: standardization of processes in all PoPs in order to guarantee the application of best practices in the 27 PoPs.

This Multiannual Plan includes actions that will translate into quantitative and qualitative benefits for the Brazilian academic network, enlisting it for novel applications requiring an increase of broadband.

Figure 11. Broadcasting of cardiac surgery in ultra high definition, Universidade Federal do Rio Grande do Norte (Jornal da Band http://mais.uol.com.br/view/14305556).

INNOVA|RED, Argentina

www.innova-red.net/

Innova|Red is a Project of Innova-T, a non-governmental organization (NGO) founded by the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET). The aim of this national academic network is to provide the educational and research community state-of-the-art means to carry out tasks requiring data transmission. Innova|Red keeps the academic and scientific community of Argentina connected with the international academic community and international research centers.

Several institutions are linked to INNOVA|RED, including: the National Ministry of Health, the Ministry of Science, Technology and Productive Innovation; the Nuclear Medicine School Foundation; the Association of University Interconnection Networks; the University of Buenos Aires; the Argentine Catholic University, the National University of Córdoba; Alma Mater Studiorum Universitá di Bologna; National

University of the Litoral; National University of La Matanza; National University of General San Martín; National University of Tres de Febrero and National University of Rosario.

Innova|Red has recently acquired Indefeasible Right of Use (IRUs) capacities over the High-Capacity Digital Backbone Network (10Gbps). This network is present in the following cities: Autonomous city of Buenos Aires, Wilde, Rosario, Córdoba, Villa Mercedes, San Luis, Mendoza, Malargüe, Bariloche, Neuquén, Choele Choel, Bahia Blanca and La Plata. Besides, it represents a large improvement in the integration of institutions of the system of science and technology to the advanced network.

Recently the MINCYT and the CONICET, on behalf of InnovaRed, signed a cooperation agreement with the company ARSAT, which implements the Red Federal de Fibra Óptica, REFEFO (Federal Network of Fiber Optic) within the framework of the Argentina Conectada program, which will be present in different locations of the country. This agreement will enable, in the long term, to potentiate the action and the scope of advanced networks, providing the Network with higher capillarity. Hence, through this agreement, InnovaRed and ARSAT will join the efforts to design and implement a connectivity network between national hospitals and advanced networks.

Red Avanzada Dominicana de Educación e Investigación (RADEI), República Dominicana

http://www.seescyt.gov.do

RADEI groups all higher education institutions, research centers, innovation and related institutions, by means of the establishment of a telematic network which allows high speed connection, enhanced reliability and transmission of large quantities of information in the Dominican Republic.

The objectives of the RADEI are: satisfy the increasingly demanding needs of the research and education community in the Dominican Republic; develop and incorporate novel Internet applications requiring bandwidth services in order to contribute to the human and economic development of the country; guarantee the fast transmission of new networked services and applications such as Internet 2 to the national Internet community; connect with other advanced networks such as C@ribNET, CLARA, INTERNET 2, GEANT, among others, and contribute to the development and dissemination of science, technology and innovation in the country.

The work committees are: the institutional committee, the technical committee of the network and the committee of applications and contents. The institutions and centers which make up the RADEI are: the Ministry of Higher Education, Science and Technology; the Dominican Institute of Telecommunications¸ the Catholic University Santo Domingo; the Pontificia Universidad Católica Madre y Maestra; UNAPEC University; Ibero-American University; Global Foundation Democracia y Desarrollo; General Archive of the Nation; Autonomous University of Santo Domingo; INTEC University; Technological Institute of the Americas, ITLA and General Hospital Plaza de la Salud.

RENATA, Colombia

http://www.renata.edu.co

RENATA is a technology network that connects, communicates and fosters the collaboration between academic and scientific institutions of Colombia with international academic networks and advanced research centers.

Health institutions connected with videoconference rooms and linked to the RENATA are: Hospital Susana López De Valencia; Centro Médico IMBANACO de Cali S.A; Cardiovascular Foundation of Colombia Instituto Corazón de Ibagué; Cardiovascular Foundation of Colombia Instituto Corazón Manizales; Cardiovascular Foundation of Colombia Instituto Corazón Santa Marta; Foundation Valle de Lili; Departmental Hospital Santa Sofía de Caldas; Hospital Pablo Tobon Uribe; Hospital San Juan de Dios; Hospital San Vicente de Paul; University Hospital San Jorge; IPS Universitaria; Hospital of Villavicencio; Foundation Santa Fé de Bogotá; Hospital Corporation Juan Ciudad-Méderi; University Hospital of Quindío; National Health Institute; Center for Science and Pharmaceutical Research - CECIF; Corporation for Biological Research; Corporation CORPOGEN, and Foundation AFFIC (forensic sciences).

In order to improve in social inclusion and the competitiveness level of the country through ownership and adequate use of ICTs, both in the daily and productive life of citizens and other instances, the national government proposes, for 2019, that “there should not be any citizen in Colombia without the possibility of using ICTs to attain social inclusion and improve competitiveness”, which is the essential objective of the 2008- 2019 National ICT Plan (PNTIC)[5].

Agencia para el Desarrollo de la Sociedad de la Información en Bolivia (ADSIB)

www.adsib.gob.bo

ADSIB is the agency in charge of proposing politics, implementing strategies and coordinating actions oriented towards the reduction of the digital gap in Bolivia, fostering the use of ICTs in all its areas and managing the top level domain for Bolivia, called .bo (dot bo). The Ministry of Health and Social Security is linked to this network.

The institutional strategic objectives are: implement and coordinate actions oriented towards developing the knowledge society in the country; promote the management of policies and strategies in ICTs for the improvement of the State and its relationship with the society as a whole; contribute to the reduction of the digital gap through the development of the knowledge society in Bolivia, using ICTs; optimize the resources coming from international cooperation, based on the development of a systematizing model for the investment in technology in coordination with the ADSIB and the Vice Ministry of Public Investment and External Funding (Viceministerio de Inversión Pública y Financiamiento Externo, VIPFE); seek the well-being and improvement of the quality of life of the Bolivian citizens, through the use of ICTs; contribute to the competitive insertion of Bolivian companies in the domestic and foreign market; contribute to the creative resolution of problems which are affecting State management with the civil society; involve the science and technology organisms in the improvement of medium-, small- and micro-size companies competitiveness by means of the transmission of new knowledge.

Consejo Nacional de Rectores (CONARE), Costa Rica

www.conare.ac.cr

The Consejo Nacional de Rectores regulates coordination issues for the joint exercise of university autonomy in different areas. The institutions linked to the network are: Centro de Tecnologías de Información y Comunicación (Information and Communication Technologies Center); Centro Nacional de Innovaciones Biotecnológicas, CENIbiot (National Center of Biotechnological Innovation); Centro Nacional de Alta Tecnología, CENAT (National Center of High Technology); Ministry of Science and Technology; University of Costa Rica; Technological Institute of Costa Rica; National University and State Distance University.

Red Universitaria Nacional (REUNA), Chile

www.reuna.cl

The Red Universitaria Nacional is a corporation that fosters the development of communities of science, culture and education of the country through a digital platform for national and global collaboration. Its mission is to become a leading platform in Chile that provides advanced, quality, innovative and collaborative support services to entities of the science, culture and education system of the country by means of excellence digital infrastructure and a highly qualified and committed human team.

At present, the REUNA is integrated by 24 institutions, among them 16 universities, the National Commission of Science and Technology, the National Institute of Industrial Property, The Foundation Ciencia para la Vida and the astronomy societies present in the country.

In order to promote the collaboration between national and international education and research communities, the REUNA is globally interconnected to international academic networks, among them, the Latin American (RedCLARA), North American (Internet2 and Canarie), European (GÉANT), Asian (Asian Pacific Academic Network -APAN) and Oceania (AARNET) networks. Thanks to this connection, the national platform expands its scope, accessing a collaboration space with more than one thousand institutions in the Region and thirty thousand in the world. Some future plans include to continue enlarging the deployment of the photonic network, not only to meet the requirements of scientific/academic groups of the Capital, but also in other regional nodes all over the country, as opportunities are created.

Another challenge assumed by the REUNA is to explore the technological tendencies that may represent a benefit for the communities of researchers. In the same line, the concept of software managed networks (virtual networks) is being explored, and the first steps have been taken to try technologies that favor collaboration in telemedicine, supporting the action of the professionals of the area. Particularly, the technology developed by a Japanese initiative is under evaluation, specifically in endoscopic medicine, which proposes the use of the digital video transport system (DVTS) as a very efficient and affordable technical solution.

The following institutions, among others, integrate the REUNA: University of Tarapacá; University Arturo Prat; Catholic University of the North; University of Atacama; University of La Serena; Technical University Federico Santa María; University of Chile; Catholic University of Chile; University of Santiago de Chile; Metropolitan University of Education Sciences; Metropolitan Technological University; University of Concepción; University of Bío-Bío; University of La Frontera;

Austral University of Chile; University of Los Lagos; National Commission of Scientific and Technological Research; Association of Universities for Research in Astronomy; Foundation Ciencia para la Vida; National Radio Astronomy Observatory; European Southern Observatory; National Institute of Industrial Property; Atacama Large Millimeter / sub-Millimeter Array, and the National Astronomical Observatory of Japan.

Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado (CEDIA), Ecuador

www.cedia.org.ec

The Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado (CEDIA) was created to encourage, promote and coordinate, together with the Proyecto Redes Avanzadas (Advanced Networks Project), the development of information technologies and telecommunication and information networks focused in the scientific, technological, innovative and educational development in Ecuador.

CEDIA is part of Red CLARA and is made up of research and development universities and institutions of Ecuador. The institutions linked to the CEDIA include the following: Polytechnic Superior School of Chimborazo; Polytechnic Superior School of the Army; Polytechnic Superior School of the Litoral; National Polytechnic Superior School; Central University of Ecuador; University of Cuenca; National University of Loja; Equinox University of Technology; Private Technical University of Loja; International University of Ecuador; University San Francisco de Quito; Pontificia Universidad Católica del Ecuador in Ibarra; Pontificia Universidad Católica del Ecuador in Santo Domingo; National Higher Studies Institute; Oceanographic Institute of the Navy; Catholic University of Santiago de Guayaquil; State University of Bolívar; State University of Milagro; Regional Autonomous University of the Andes; State Polytechnic University of Carchi; Polytechnic University Salesiana; Technical University of Ambato; Technological University Indoamérica, and, lastly, Technical University of the North.

The CEDIA has developed several telemedicine projects, two of which stand out for their relevance: the conformation of TeleHealth Theme Network of the CEDIA, and TeleSurgery, which was led by personnel from the University of Cuenca.

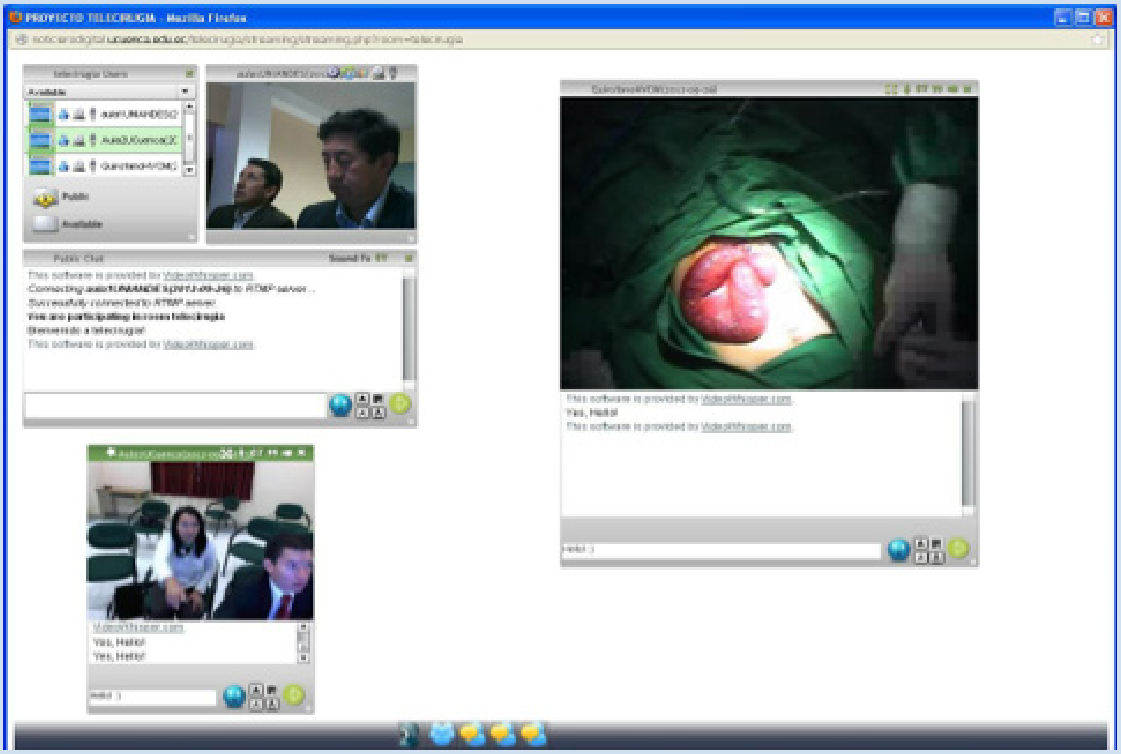

Figura 12. Interface of the telesurgery project.

Red Avanzada de Investigación, Ciencia y Educación Salvadoreña (RAICES), El Salvador

www.raices.org.sv

RAICES is the national network for research and education of El Salvador and is part of the founding group of RedCLARA. It is the local partner of DANTE and CLARA for the ALICE Project and its continuation, ALICE2.

RAICES seeks to foster and facilitate the use of ICTs in all the disciplines of science and technology, so that its members support the tasks of education, research and social projection with quality, efficiency and improved scope, and they can develop collaborative works at national and international level. The institutions linked to RAICES are: Central American University José Simeón Cañas; University Don Bosco; Technological University; University Francisco Gavidia; Catholic University of El Salvador, and University of El Salvador.

Red Avanzada Guatemalteca para la Investigación y Educación (RAGIE), Guatemala

www.ragie.org.gt

RAGIE is a civil non-profit association formed by universities, research institutes and other Guatemalan instances devoted to research and education, which develops projects that use academic networks and telecommunications.

The objective of the RAGIE is to promote the development of the information society and the creation of academic and educational networks in Guatemala, which could be interconnected to similar ones abroad. The institutions related to the RAGIE are: University of San Carlos de Guatemala; University Galileo; University of Valle de Guatemala; University Mariano Gálvez de Guatemala; Pan American University, y Mesoamerican University.

Corporación Universitaria para el Desarrollo de Internet (CUDI), México

www.cudi.mx

The Corporación Universitaria para el Desarrollo de Internet (CUDI) is a civil non-profit association that manages the National Network for Education and Research (RNEI) to promote the development of Mexico and improve the synergy among its members. Its most relevant objectives are the following: having an ICT infrastructure similar to the most advanced networks of the world which support current and future needs of education, research and culture of the country, and to support the education, health and government networks for ITC ownership.

The institutions linked to the CUDI include most universities and research centers and institutions in México. At present, the universities that integrate the CUDI represent more than 85 % of the registration fee of the national higher education system. On the other hand, more than 85 % of research centers and institutes in Mexico are incorporated to the CUDI, and more than 90 % of the researchers of the Sistema Nacional de Investigadores, SNI (National System of Researchers) work in an institution integrated to the CUDI.

Red Científica y Tecnológica (REDCYT), Panamá

The Red Científica y Tecnológica (REDCYT) is an academic non-profit foundation aimed at fostering the development of scientific and technological interest of the country. The REDCYT also represents the physical network that will join research and higher education institutions, providing them with fast access to information and beneficial use of new applications. The institutions related to the REDCYT are: University Santa María La Antigua; University of Panama; Autonomous University of Chiriquí; Inter American University of Panamá; Latin American University of Science and Technology; Inter America University of Distance Education of Panama, and Latin University of Panama.

Red Académica para la Educación, la Investigación y la Innovación (ARANDU), Paraguay

www.arandu.net.py

The Red Académica para la Educación, la Investigación y la Innovación (ARANDU), is a well-known, non-profit association of public utility with aimed at forming an advanced academic network for science, education and technology. ARANDU enables its members to perform collaborative integration and exchange of academic content, apart from providing them access to funding sources for research projects.

Universities and research centers interconnected through the ARANDU will have access to advanced networks such as RedCLARA, GEANT, Internet 2 and APAN. ARANDU seeks to implement a technological infrastructure of high performance networks at the service of research, development, innovation and education in Paraguay. This network facilitates the relationships between researchers and research centers, training, exchange, promotion and dissemination of knowledge, and potentiates internal synergies and international relationships by means of connections to advanced networks.

The institutions related to the ARANDU are: National University of Asunción; Catholic University "Nuestra Señora de la Asunción"; Autonomous University of Asunción; National University of the East; Foundation Parque Tecnológico Itaipu (FPTI); and the Compañía Paraguaya de Telecomunicaciones S.A. (COPACO S.A.)

Red Académica Peruana (RAAP), Perú

www.raap.org.pe

The RAAP seeks to build and manage a network of transportation, services and systems of information to interconnect all the Regions of Peru, integrating education and research institutions in an advanced high-performance network, and to potentiate research and exchange of information between universities and research institutes of the country and similar ones abroad.
On the other hand, the RAAP seeks to integrate the research communities of the regions of Peru with other blocks such as the Region of the Americas, Europe, USA and Asia, through the inter-regional connection with the research networks of these regions (e.g., RedCLARA, GÉANTt, Internet2, Canarie, APAN, etc.).

Among other objectives, the RAAP also seeks to develop joint projects to significantly improve the use of ICTs in academic activities and research in the country.

The institutions linked to the RAAP include universities such as the National University Mayor de San Marcos; National Agricultural University La Molina; National University of Engineering; the Pontificia Universidad Católica of Peru, and the Peruvian University Cayetano Heredia.

Red Académica Uruguaya (RAU), Uruguay

www.rau.edu.uy

Some of the objectives of the RAU are: to connect national academic institutions, (public and private) universities, and research centers of Uruguay; to promote the development of academic and scientific networks where necessary; to plan and develop a national network; to encourage the collaboration with similar initiatives and connect the RAU2 with the countries of the Region of the Americas.

The RAU videoconference services, are, initially, reserved for all those activities that provide the framework for advance networks.

The objectives of the RAU are:

- Connect all academic entities of the country with each other and with other national, regional and international networks;
- Educate university professors in the use of new ICTs, supporting their multiplying effect;
- Sponsor the development of each node, promoting its development as manager and user of information;
- Support the consolidation of a documentary infrastructure;
  Train users and managers of information;
- Develop, strengthen and expand distance education programs;
- Boost the creation and development or regional and international networks.

The RAU lines of action are:

- Maintenance of communication and security in the network;
- On-line start-up of project, agreement and bibliographic databases of the University of the Republic;
- Intermediation with information networks:
  -Selection of sources that assist to gather information
  -Provision of links
- Training of users;

- Offer of resources for optimization in the use of new ICTs;

- Creation and development of teaching material based on the new ICTs;

- Support to the improvement and development of telemanagement of the administrative structure of the University of the Republic.

The institutions linked to the RAU are the following: Laboratorio Tecnológico del Uruguay, LATU (Technological Laboratory of Uruguay); Catholic University of Uruguay; Universidad de la República, UdelaR (University of the Republic); University of Montevideo (UM); University ORT of Uruguay; Oficina Regional de Ciencia y Tecnología de la UNESCO para América Latina y el Caribe, ORCYT (UNESCO Regional Office of Science and Technology for Latin America and the Caribbean); Honorary Commission for the Fight Against Cancer; Dirección Nacional de Ciencia, Tecnología e Innovación, DINACYT (National Direction of Science, Technology and Innovation), and Institute Pasteur of Montevideo.

Red Académica Nacional de Venezuela, REACCIUN (National Academic Network of Venezuela)
Fundación Centro Nacional de Innovación Tecnológica (Foundation National Center of Technological Innovation), Venezuela

www2.reacciun.ve

www.cenit.gob.ve

The REACCIUN seeks to contribute to the development and strengthening of the national capacity of scientific, technological, educational and productive sectors, and to social ownership of technologies by building a research, development and innovation network, together with the National System of Science, Technology and Innovation. Some of its objectives are: to potentiate the development of infrastructure of the academic network together with social networks at the service of transformational drivers of the country; contribute to the consolidation of a research, development and technological innovation system to meet the needs and requirements of the country.

Some of the institutions linked to the network are ministries, universities and other organisms, including: Ministerio del Poder Popular para Ciencia y Tecnología, MCTI (Ministry of Popular Power for Science and Technology); Ministerio del Poder Popular para Salud, Universidad Nacional Experimental Rafael María Baralt, UNERMB (Ministry of Popular Power for Health, National Experimental University Rafael María Baralt); Universidad Nacional Experimental de los Llanos Occidental Ezequiel Zamora, Universidad Central de Venezuela, UCV (National Experimental University of the Llanos Occidental Ezequiel Zamora, Central University of Venezuela); Universidad Centroccidental Lisandro Alvarado, UCLA (Central Occidental University Lisandro Alvarado); Universidad Nacional Abierta, UNA (National Open University); Universidad Nacional Experimental Rómulo Gallegos, UNERG (National Experimental University Rómulo Gallegos); Universidad Nacional Experimental Simón Rodríguez, UNESR (National Experimental University Simón Rodríguez); Universidad Nacional Experimental de Guyana, UNEG (National Experimental University of Guyana); Universidad Nacional Experimental del Táchira, UNET (National Experimental University of Táchira); Universidad Nacional Experimental Francisco de Miranda, UNEFM (National Experimental University Francisco de Miranda); Universidad Nacional Experimental Sur del Lago, UNESUR (National Experimental University Sur del Lago); University Simón Bolívar (USB); University of Carabobo (UC); University of Oriente (UDO); University of the Andes (ULA); University of Zulia (LUZ); Fondo de Investigación y Desarrollo de las Telecomunicaciones, FIDETEL (Telecommunications Research and Development Fund); Fondo Nacional de Ciencia, Tecnología e Innovación, FONACIT (National Fund of Science, Technology and Innovation); Observatorio Nacional de Ciencia, Tecnología e Innovación, ONCTI (National Observatory of Science, Technology and Innovation); Higher Studies in Public health Institute Dr. Arnoldo Gabaldón.

Conclusions

- Telecommunication infrastructure facilitates collaborative building of solid, secured and accessible knowledge repositories, as well as broad spectrum and scope medical services.

- The agreed establishment of the national telecommunication infrastructure supported by academic networks represents the base for the consolidation, sustainability and evolution of eHealth.

- The huge development of communication, the available resources for knowledge management in the eHealth scenario and the already set standards at international level enable, for the first time, the effective contribution to equity and democratization in the access to the very extensive value chain involved by any player.

- At present, academic networks, with its universities, university hospitals, health research and education institutions represent the best practices for the integrated networked articulation and sustainability in the evolution of knowledge and its application.

- Active participation of aligned and priority areas of the Ministries of Health with National TeleHealth Programs and their best practices is essential.

- The investment in health telecommunications and information infrastructure should be supplemented with a training program for use and adaptation of the best practices to potentiate the investment and the impact generated in the Region.

- In an innovative way, human beings should be included in infrastructure models, since it should not be assumed that having networks that connect several points means having connectivity. It is important that the adequate applications exist on these communication networks, with the adequate health personnel for the delivery of a health service.

- In order to improve the health of the nation, bandwidth infrastructure should be built with the objective of integrating providers, health professionals, house healthcare providers, patients and their families.
- Health services and the exchange of health information should be integrated in a reliable and secure network infrastructure.
- Infrastructure should be at the service of decision making in real time.
- Telemedicine networks in the university setting are the major and best field for education on these paradigms.

Recommendations for National Institutions

- Consider specialists of advanced telecommunication infrastructures of academic networks as collaborators.
- Create a national bandwidth policy specifically focused on health and education needs.
- Implement a telecommunications infrastructure that allows the gradual integration of all health institutions at different - national, provincial and municipal - levels.
- Organize and guarantee the application of ongoing training to allow the insertion of all health professionals to eHealth, telemedicine and telehealth practices.
- National institutions should promote a constructive work environment between physicians, health workers and communications and programming technicians.
- *Use the bandwidth connectivity to:* 1) provide access to specialized care, as well as the resources and expertise in healthcare; 2) foster and facilitate the collaboration between medical centers and providers of community-based secure networks; 3) provide better opportunities for the education of rural physicians; 4) facilitate the participation in research activities, such as clinical trials; 5) facilitate the integration of bandwidth infrastructure with other similarly focused programs, such as educational, safety and health programs; 6) improving the access to healthcare in urban and not urban areas, and 7) share use of the national medical record, including imaging, x-rays, tomographies, diagnostic videos and other large-size files.

- Before the purchase of infrastructure, its role in the integral organizational strategy should be carefully planned. Therefore, it is advisable that providers be aware of the type of information to be processed and the standards that should be complied with. Likewise, they should provide all the information on their products in a digital format easily accessible for users.

Recommendations for PAHO/WHO

1. Establish actions tending to connect representatives of telecommunication infrastructures from the Ministries of Health, advanced academic networks and other interested parties, as an essential part of eHealth Conversations.

2. Establish actions tending to connect representatives of national teleHealth programs of the Ministries of Health, advanced academic networks and other parties interested in telemedicine and teleHealth, as an essential part of the eHealth Conversations.

3. Develop training programs on the ICTs applied in health and in settings of collaborative work about the Internet.

4. Understand and promote the eHealth scenario as a full ecosystem, where all the experiences and human improvements converge.

5. Create clusters with network services for eHealth applications, managed by PAHO.

6. Reduce bureaucracy and encouraging the access to the publication of novel proposal by any person with aggregated value.

7. Develop last-mile self-management plans of telecommunications infrastructure to solve failures and configurations, to guarantee the functioning of the network and telemedicine applications, where the patient is.

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ANNEXES

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- Amanda Gómez
- Luis Nunez, RedCLARA
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Entrevista de los autores

Conversaciones sobre eSalud: Infraestructura

http://www.paho.org/ict4health/podcast/Entrevista-Infrestructura.mp3

Available in Spanish only

Podcast - Recomendaciones en eSalud presentadas en audio digital

http://www.paho.org/ict4health/podcast/Infrestructura.mp3

Available in Spanish only

Messages for Twitter on #infrastructure

A bandwidth infrastructure that integrates providers and health workers with patients is essential for health improvement.

The experience of the human resources available in ICTs applied to health management is limited in Latin America and the Caribbean.

Infrastructure is essential for the implementation of effective products and services in a safe and scalable manner.

It is advisable to create a national bandwidth policy specifically focused on unique health and education needs.

Implementing a telecommunications infrastructure will allow to integrate health institutions at national, provincial and municipal level.

For eHealth improvement, the participation of infrastructure specialist of the National Research and Education Networks #RIEN is essential.

For eHealth improvement, the participation of infrastructure specialist of the Ministries of Health is essential

Specialists should first define which the necessary eHealth technological and organizational infrastructure is.

It is necessary to align the definition of infrastructure with the integration of all telecommunications components for health.

The integration of advanced academic networks plays a key role to guarantee the evolution of knowledge to eHealth.

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General Disclaimer

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Health Information Systems

Current Implications and Future Challenges

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Pablo Pazos Gutiérrez, Victor Osorio, Alfredo Horoch,
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SUMMARY

Health systems in the Region face problems of fragmentation of information, lack of accessibility, disaggregation, and inequality in healthcare, but good health information systems can provide solutions to some of these problems.

That is one of the findings of an expert panel that reviewed the current status of the systems, and concluded that most projects to systematize and computerize health information in the countries of the Region of the Americas are still in their infancy.

Since clinical information systems provide solutions to improve health care, these should cover all processes of the chain of care: primary care, social care, specialist care, and public health. But due to the lack of standards, many of these are isolated systems that cannot connect to each other to exchange information, and some use outdated technologies with limited functionality.

Experts suggest disseminating details of the components of health information systems that should be considered when planning a digital agenda at the institutional, regional, or national level. They say it is important to encourage the building of multidisciplinary teams to address digital agendas, and train personnel in health information systems through graduate courses and specific careers.

Some examples of successful information systems include the Health Care Information System Network (SIDRA) in Chile, the Itálica Project of the Italian Hospital in Buenos Aires, Argentina, and the Agency for the Development of Electronic Government and the Information and Knowledge Society (AGESIC) in Uruguay. Brazil has a proposed set of standards and the necessary legal framework in this area that will serve as an example for other countries.

To guide PAHO/WHO and its eHealth strategy, the group recommends the creation of spaces to facilitate learning and discussion on the scope and strategy of health information systems among governments, universities, and service delivery systems. It also recommends circulating various strategies for health information systems as useful tools and working with specific education programs to enhance the development of human resources with competencies in those systems.

INTRODUCTION

The incorporation of information and communication technologies (ICTs) into health care systems allows the fulfillment of both social and financial goals, especially in the Region of the Americas. There is a need in these countries to increase the population's capacity to have access to timely and quality health care, to facilitate continuity in health care, as well as to control increasing costs, to optimize processes, and to reallocate resources.[1] Some countries of the Region have already implemented agendas to develop health information systems in order to assist in meeting the objectives of the health care system of quality, efficient, humane, timely, and equitable care. The definition of the health information system for a country requires, therefore, the characterization of the health care system, its structure, objectives, and priorities.

There are a variety of opinions and perspectives which define the health care system. [2,3] Many of them are based on perceptions of the relationship of people within a society, and, mainly, the health care system the society has decided to provide to itself. Thus, some countries have universal and free systems funded by general taxes; others have universal systems based on employee taxes; other, more liberal systems, provide no guarantee for common universal access; others are more fragmented and include different proportions of the aforementioned schemes. Some countries have a federal structure which assigns the responsibility for health care to provinces or states.

Therefore, when discussing health information systems in a region the dialogue was general in order to allow for the different characteristics of the countries of the Region. Nevertheless, there are certain software elements, technologies, and human resources which have been identified as components of a health information system, and which should be taken into account and defined by governments when developing strategic planning in this area. Governments could regulate, facilitate, or provide these components, according to each country's model.

On the other hand, when discussing governmental responsibilities, reference is made to the system's resource planning and management, definition and regulation of laws, regulation of the health sector, funding the system with public resources, hiring services in public and/or public-private networks, and the direct provision of services through public and university networks.

According to each country's model, State participation and, hence, the functionality of its components, may vary drastically. State participation may include using the information for payment control, epidemiology management and focus, and providing solutions in the delivery area with a public network responsible for serving the majority of citizens.

Overall, three types of strategies for planning health information systems have been used: top-down, bottom-up, and middle-out. [4,5]

- Top-down: a clear example of the top-down strategy is that implemented by the United Kingdom, which established the information system that health care organizations and professionals use in the whole country. Due to the difficulties experienced by this computerization project in the country (lack of integration with inherited or legacy systems and failure to adapt to work flows), the top-down modality has lost many supporters.

- Bottom-up: when adopting this strategy, each institution complies with its government's regulations and laws and autonomously and independently chooses a solution. This overcomes the difficulties of the top-down model but there is a risk that the institutions will not observe interoperability patterns and standards which facilitate the exchange of information, thus weakening the national information system.

- Middle-out: this methodology approaches the needs of health professionals, the ICT industry, and the government by creating a set of common technical objectives and standards that can be helpful for everyone. This development of common objectives, development of standards, and support for implementation is dependent on all the necessary resources available. Specifically, the government plays a leadership role, as the case in Australia, where investments were allocated to standards development at a national level, long before the development or purchase of any system was considered. This type of strategy increases the ability to share information and provide higher quality data.

However, some functions have the potential of serving in any of these strategies and would be of significant help for interoperability, making some independently built, high-cost applications more accessible. Examples include: voice recognition service, terminology services for auto-coding of data entered in the information system, and knowledge databases to support systems for decision-making (for example, warning on toxic doses or drug-drug interactions, among others).

MATERIALS AND METHODS

The chapter was prepared using individual research, surveys, and, particularly, the input from network interactions within the framework of the eHealth Conversations project, developed by the Pan American Health Organization/World Health Organization (PAHO/WHO). Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by both the moderator and the participants, suggesting work assignments, and keeping records of the conversations. In addition, some authors submitted documents for discussion on different issues.

This conversation used the virtual campus offered by the Hospital Italiano de Buenos Aires (HIBA), which has the following working tools.

- General discussion forum: allows active exchange of ideas on different topics to be addressed according to the conversation assignment. Each message in the forum forwards an e-mail to the participants.

- Wiki: allows for the joint creation of the document.

- Resource library: devoted to sharing support documents used for opinions and/or deliberation. This section includes journal articles, chapters of manuals and books, or full texts.

The discussion forum was divided into three sections: 1) introduction of each participant, 2) situation of the health information systems in the countries of the Region, and 3) what components should an integrated health information system include. The conversation was complemented by the publication of some tweets with the hashtag "#ehealthtalks," in PAHO's Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks, and, based on the issues addressed, a document was prepared including the main recommendations that emerged from the exchange of ideas and experiences. The conversation on health information systems was attended by 104 participants from the following countries: Argentina, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Islamic Republic of Iran, Mexico, Peru, Puerto Rico, Spain, United States, Uruguay, and Venezuela.

STRATEGIC INFORMATION

Of the computerization projects submitted, there are lower or higher levels of national improvement, and in some cases, of success, but most are at an early stage of development. The failure to implement standards results in isolated systems that are impossible to interconnect for the exchange of information. Also, systems with high maintenance costs make necessary flexibility more complicated. On the other hand, some systems have obsolete or declining technologies, with limited functionality.

In general, the health information systems of the Region have a master patient index (MPI), a clinical data repository (CDR), and clinical record systems. In addition, they have monolithic administrative systems with basic terminology supported in code tables, and a small number of services available to external systems due to limited integration.

For these reasons, the health information systems have serious problems in obtaining the quality and timely information needed to understand populations and make decisions based on such information.

The conversations on the HISs focused on which the necessary components would be for the strategic planning of an information system. The following aspects were mentioned:

1. **Governance and Management of ICT Services:** this component is addressed by the experts who plan business objectives in order to obtain the best results and to avoid considering ICTs as an excessive expenditure.

2. **Strategic Planning and Project Management:** these structures define and manage scope, project costs, quality, time frames, human resources, risks, purchases, and communications.

3. **Organization and Change Control:** this component analyzes the organizational structures and the magnitude of change; it identifies the leaders and, based on all this, it defines leadership, training, and support strategies to facilitate and sustain organizational change. [6]

4. **Specialized Human Resources:** this includes the development and training of multidisciplinary teams, medical health professionals, health agents, administrators, medical records and information technology professionals, who understand the subject and thereby support change.

5. **Infrastructure:** this represents all the technological support used by the health information system to execute its functions. This component may be subdivided into three large areas: communications technology used to provide connectivity to the systems, the hardware, and, finally, the software used to support processing of institutional information.

6. **Administrative Systems:** they include systems devoted to managing different areas such as patient management, resources, products, medical records, accounting and finance, facilities, and professionals integrated with clinical systems.

7. **Clinical Departmental Systems:** they are located in auxiliary clinical areas and record and support clinical processes in order to improve productivity. Examples are laboratory information systems (LIS) and radiologic information systems (RIS) which are integrated in the clinical health care systems.

8. **Interoperability and Standards:** this component includes the interfaces that connect two or more systems for the exchange and use of information. Standards are necessary for the exchange, understanding, and use of data.

9. **Electronic Medical Record:** it represents carefully aligned systems which should be highly integrated. This component requires a significant investment of time, money, process changes, and reengineering of the human factor. [7] The electronic medical record is the system used by the health team to record health care activities. It should be the primary site for uploading all clinical information.

10. **Personal Health Record:** the information of all the components regarding the patient and his or her needs is collected in the personal health record, with the aim of providing tools for patient empowerment. [8]

11. **Terminology Service:** this component allows an adequate balance between the choice of entering narrative texts and the benefits of structured data entry into the information systems by health care professionals.

12. **Health Information Security:** this component ensures the necessary authorizations to access clinical information, in accordance with national legislation.

13. Decision Support System: this includes the software designed to help health care workers in clinical decision-making. [9] Examples include graphics with background information, warnings, and reminders.

14. Aggregated Information: this component manages the information of a group of people and, by means of aggregated data, infers information on statistics and trends to generate multiple interventions. [10] In institutional information systems, this component provides capabilities for clinical management of populations under its responsibility and reaches its full potential in regional or national plans for public health.

Localization of Specialists *1

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PAHO/WHO Specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to get in touch with them, please forward an email to: ehealth@paho.org.

*1 *The list of specialists published here is the result of the recommendations during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published here and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

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Web sites *2

PAHO/WHO Regional Health Observatory

This portal provides data, statistics, information products, and analytical results on regional, national, and local health priorities, organized by topic. It provides reports on health issues and access to statistical databases.
http://www.paho.org/hq/index.php?option=com_content&view=category&layout=blog&id=2395&Itemid=2523&lang=es

ECLAC @LIS2: Alliance for the Information Society

The Alliance for the Information Society, phase 2 (@LIS2), is a European Commission Program that promotes the development of a sustainable, competitive, innovative, and inclusive information society. This site includes several documents describing health information system experiences in the Region.
http://www.eclac.cl/socinfo/default.asp?idioma=IN

Health Information Systems Programme (HISP) Collaborative Network

HISP is a collaborative network aimed at improving health care in developing countries through research and application of health information systems. The core of the program is the development of open source software to strengthen national health information systems.
http://healthmarketinnovations.org/program/health-information-systems-programme-hisp

European Committee for Standardization (CEN)

CEN is an international nonprofit organization that provides a platform for the development of European standards and other technical specifications. This allows the exchange of information among the 33 member countries in Europe and those using the standards developed by this association.
www.cen.eu/cen/Pages/default.aspx

Clementina Foundation

This is a center for the debate and elaboration of proposals for public and semi-public policies relating to technology. It integrates all sectors and stakeholders so that the productive network and society as a whole can increase the competitiveness of their systems.
http://www.fundacionclementina.org/

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of the opinions, ideas, data or products presented in those sites, or guarantee the validity of the information included thereof. The purpose for offering links to external sites is to inform readers regarding the existence of further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and does not represent the opinions of PAHO.*

Sistema de Información de la Red Asistencial (SIDRA) (Health Care Network Information System), Chile

http://www.salud-e.cl/sistema-de-informacion-de-la-red-asistencial-clave-para-la-modernizacion-del-sector-publico-de-salud/

is the result of major efforts from different players of the health sector and the longstanding evolution of the information systems fostered by the health care services and the Ministry for the implementation of digital technology throughout the health sector. It is aimed at implementing the modules that allow reinforcing the health care network activities, supporting the operational management at each level focused on improving the comprehensive attention of public health system users.

The Itálica Project, of the Italian Hospital of Buenos Aires, Argentina

http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=ver_curso.php&id_curso=13384#.UPRfRB0sB8E

This project focuses on the proprietary design and development of a health information system aimed at improving health care processes, education and research, and hospital network administration and management. It is designed with standards to facilitate interoperability.

Agencia para el Desarrollo del Gobierno de Gestión Electrónica y la Sociedad de la Información y del Conocimiento (AGESIC), (Agency for the Development of Government Electronic Management and the Information and Knowledge Society), Uruguay

http://www.agesic.gub.uy/innovaportal/v/19/1/agesic/que_es_agesic.html

This organization reports to the Presidency of the Republic of Uruguay and operates with technical autonomy. Its aim is to improve services, including health services, for citizens, using the potential provided by ICTs.

The Brazilian experience (ECLAC)

http://www.cepal.org/cgibin/getProd.asp?xml=/publicaciones/xml/4/45524/P45524.xml&xsl=/dds/tpl/p9f.xsl&base=/dds/tpl/top-bottom.xsl

The Brazilian experience is documented as part of a series of publications, published by ECLAC, aimed at disseminating the requirements and experiences of applying ICTs in the health area. It explores different types and levels of interoperability and standards application. Using Brazil's experience, it describes steps taken to generate a series of standards and the necessary legal framework, serving as an example for other countries.

Conclusions

- The health information systems of the Region should improve regulatory frameworks, levels of standardization, compatibility, human resource training, and technological infrastructures, among other aspects.
- Modern information systems consist of several components and the true challenge is to achieve adequate coordination and interrelation of each of them.
- The different components are not only formed by software pieces but also by human and technological resources which should be considered as subsystems in the health information system. These should be analyzed holistically, so that they cover all the processes of the health value chain (primary care, socio-health care, specialized care, and public health).
- There is no single formula to implement integrated health information systems that optimize health care and management. Although detailed components should be taken into account, execution will depend on the eHealth strategy of the institution and/or the country.

Recommendations

Recommendations to provide direction for national institutions (governments, universities, NGOs, the private sector) and international organizations.

- Disseminate the components mentioned herein for consideration during the planning of a digital agenda in the institutional, regional, or national realm.
- Train specialized human resources in health information systems by means of specific courses and postgraduate careers.
- Foster the creation of multidisciplinary working teams to address digital agendas.

Recommendations to provide direction for PAHO/WHO and its eHealth strategy

- Facilitate the creation of learning and discussion forums among governments, universities, and service delivery systems on the scope and strategy of health information systems.

- Help in the dissemination of diverse governmental strategies such as those herein explained so that the health information system becomes a helpful tool which enhances the objectives of the health system.

- Collaborate with specific educational programs on information systems to improve the development of competent human resources.

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ANNEXES

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Video interviews with author(s)

eHealth Conversations: Health information systems

http://www.paho.org/ict4health/podcast/Entrevista-SIS.mp3

Available in Spanish only

Podcast--Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/SIS.mp3

Available in Spanish only

Twitter Messages on Health Information Systems

WHO defines #eHealth as the use of information and communication technologies for health management.

The health systems of the Region are facing fragmentation, accessibility, disaggregation, and inequity problems.

Clinical health information systems provide solutions to improve health care.

The health information systems of the region need regulatory frameworks, standardization, compatibility, human resource education, and technological infrastructures.

Modern health information systems are composed of multiple components. We should achieve adequate articulation and interrelationship between them.

Health information system components: software pieces and human and technological resources analyzed holistically.

Health information system components should be analyzed in context.

Health information systems should cover all the processes of the health care value chain: primary care, socio-health care, specialized care, and public health.

Multidisciplinary working teams, including specialists in health information systems, are necessary.

The implementation of a health information system implies a significant culture change; in the absence of clinical leaders, the chances of failure increase.

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General Disclaimer

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Telemedicine

New Treatments, Sustainability, Management, and Evolution of Networks

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SUMMARY

Telemedicine, or the provision of health services using information technology and communication, especially where distance is a barrier to receiving health care, creates a new range of possibilities, allowing services and patients to interact and communicate on health issues. It also can provide diagnostic and therapeutic services based on system images and access to knowledge databases, education, and training.

A panel of experts recently reviewed the current status of telemedicine as part of the eHealth Conversations project organized by the Pan American Health Organization/World Health Organization. The group recommended that PAHO/WHO, through its eHealth strategy, should work with countries and health ministries to implement national programs on best practices in telehealth, and to integrate advanced academic networks. It was also suggested that PAHO/WHO have representatives in the national telehealth programs as a way of providing them with formal support.

The experts urged actions to strengthen and expand the use of distance communication methods to obtain data from its operational units, to manage and implement national health plans, and to evaluate and recommend procedures.

After studying the issue, the panel concluded that telemedicine and telehealth activities are not only useful in supporting distance education, collaborative research, and remote health care, but also facilitate management and evaluation of their implementation and evolution. It pointed out that the participation of health professionals in practical and scientific virtual sessions would promote the expansion of knowledge, use of best practices, integration of professionals, and the formation of consortia.

The panel stated that partnerships between academic institutions, government, and businesses are critical to development and innovation, and the integration of research and teaching institutions in advanced academic networks helps to increase quality and lower costs.

INTRODUCTION

Najeeb Al-Shorbaji, Director for Knowledge Management and Sharing at WHO, in the editorial of the PAHO/WHO bulletin, stated: "Health is a knowledge intensive sector. The World Summit for the Information Society, among other areas, singled out health as one of the major sectors that will substantially benefit from the development of information and communications technology (ICT). One of the biggest risks of in developing eHealth is to let it be driven by technology rather than by health needs and national health priorities."[1]

On 31 January 2013, Dr. Carissa F. Etienne, took office as Director of PAHO, the Regional Office of the Americas for WHO, stated: "We are also blessed with new tools and technologies to help us listen, share, and communicate. Let's explore together new partnerships to use these evolving technologies such as social media and e-health to engage with all our stakeholders and constituents."

In the countries of the Region, most public health institutions (at different levels of health care) are not yet adequately integrated into the national communications network, nor do they have adequate internal technological and organizational infrastructure. Some exceptions to this are institutions, usually private, with a high level of aggregated knowledge and applied technology.

This is a unique moment for obtaining such infrastructure and, at the same time, encouraging health care and disease prevention actions through telemedicine and telehealth applications. Cultural barriers still exist but can be overcome by training available human resources, improving their limited expertise with ICTs.

Successful experiences and best practices have been identified and they will show the way forward.

MATERIALS AND METHODS

This chapter was developed from individual research work, development of surveys, and, in particular, the input from network conversations within the framework of the eHealth Conversations sponsored by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open dialogue on issues raised both by him/her and the participants, suggesting work assignments, and compiling the discussions. Some authors submitted documents on different topics for discussion.

The participants in this conversation communicated through email lists and videoconferences. The conversations were complemented with the publication of a series of tweets with the hashtag "**#ehealthtalks**," through PAHO's Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks and, based on the topics addressed, a document was prepared including the main recommendations coming from the exchange of ideas and experiences. The base document on telemedicine was saved in the Google Docs tool, so participants could include their input directly in the document.

The conversation on telemedicine included 71 participants coming from Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Spain, United States, Uruguay, and Venezuela.

STRATEGIC INFORMATION

PAHO/WHO Strategy and Plan of Action on eHealth [2]

The PAHO/WHO strategy and plan of action on eHealth shows, among its key actions and specific objectives, the importance of telemedicine as a contribution to the sustainable development of health systems in Member States, including veterinary public health.

The strategy makes several references to telemedicine, but item 3.3 refers specifically to the identification of a legal framework to support the use of ICTs in health and facilitate the exchange of clinical information at national and regional levels by electronic means. This legal framework will promote the validity of telemedicine and telehealth actions and will take into account the protection of personal data. For that purpose, items 3.3.2 and 3.3.3 stipulate that by 2017 a legal framework should be available that facilitates the exchange of national clinical information, by electronic means, in national and regional settings.

This conversation will be used as a guide both by PAHO/WHO and its Member States to achieve this objective in the Region of the Americas.

Definition of Telemedicine and Telehealth

One of the outcomes of the conversation was the definition of telemedicine as the rendering of remote medical services. Generally, ICTs are used for its implementation. The word comes from the Greek (tele), which means “distance,” plus medicine. A broader WHO definition of telemedicine and telehealth includes remote assistance, distance and continuing education, and collaborative research. Some of the revised definitions are given below.

Telemedicine, a term coined in the 1970s which literally means “healing at a distance,” implies the use of ICTs to improve patient outcomes by increasing access to medical attention and information. Recognizing that there is no one definitive definition of telemedicine (a 2007 study found 104 definitions of the word), WHO has adopted the following broad description:

“The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities." [3]

Cybermedicine and telehealth are two other terms commonly used for this application but they are not necessarily synonyms of telemedicine; in spite of the fact that the technologies involved are essentially the same, the purposes are somewhat different. Telemedicine is most commonly used to describe applications related to health care while telehealth includes other functions such as education and training, health promotion, public health, health services management, retrieval of technical information, etc. On the other hand, cybermedicine refers to the intersection of health with bioengineering, intelligent implantable hardware, process automation, robotics, biosensors, nanotechnology, etc.

In Colombia, the 1419 Law of 2010 establishes the guidelines for telehealth development as follows: "To develop telehealth in Colombia, as a support to the General System of Social Security in Health, based on the principles of efficiency, universality, solidarity, comprehensiveness, unity, quality and the basic principles provided for in this law." [4] It also defines the following terms:

Telehealth: the set of activities relating to health, services, and methods carried out at a distance with the help of ICTs. It includes, among others, telemedicine and tele-education in health.

Telemedicine: delivery of health services at a distance including the components of promotion, prevention, diagnosis, treatment, and rehabilitation, provided by health professionals who use information and communications technologies to enable the exchange of data. The aim is to facilitate access and opportunity in the delivery of services to the population with limited supply and/or access to services in their geographical area. The above does not relieve health care providers and third-party payers from prioritizing the delivery of personalized health care in the framework of the General System of Social Security in Health.

As discussed in the conversation, telehealth can be defined as a telemedicine solution which includes organizational and/or procedural aspects relating to the conventional medical practice, through the use of ICTs (e.g., electronic medical record), or as an extension to all health areas (dentistry, nutrition, psychology, sports medicine, public health, nursing, etc.).

In that sense, the following differentiation of telemedicine is commonly accepted:

- Asynchronous telemedicine, also called store and forward;

- Real-time telemedicine, commonly associated with emergency medical practice, can be classified as: telemedecine for primary/basic, or first level care;

- Home care telemedicine or telehomecare.

If real-time primary health care (PHC) telemedicine is equipped with the necessary procedures and tools, such as appointments and agenda management, we are referring to the concept of programmed PHC telemedicine. This, together with organizational and/or procedural aspects (e.g., e-health planning and electronic medical records) will result in a programmed telehealth solution applied to primary care or rural environments where human, technical, and material resources are usually scarce.

In general, the potential of telemedicine is not understood: its long-term impact on health is frequently confused with the emphasis on limited applications, short-term policies and regulatory problems, difficulties in the application, and unrealistic expectations. The general perception and most versions of telemedicine applications are biased by its use in a physician-centric context or a physician-patient relationship, without considering the broader context of health services, health managers, and numerous potential uses not yet tried.

Telemedicine opens a whole new range of possibilities by allowing services and patients to interact and discuss health issues in person using asynchronous techniques and thus releasing services and patients from the need and limitations of synchronous meetings.

The necessary components to ensure optimal function of medical information and services, making appropriate use of ICTs, are the following:

a) National health information infrastructure;

b) Telecommunications and information infrastructure, including interface equipment for health applications;

c) A set of definitions, standards, technologies, and applications to support communication, information and knowledge;

d) Creation of users, represented by professionals, organizations, patients and other stakeholders, who determine required functionalities, access, and budget;

e) Policy, regulations, legal and financial issues, including regulations for practice, licenses, liability, privacy, confidentiality, and reimbursement;

f) Proper attention to multiple market issues, particularly those related to developers of basic technology, health care practitioners, regulators, professional associations, information technology services, and providers of health care solutions, as well as business strategy, market development cycles, the transfer of products, and maintenance.

Telemedicine is achieved by using ICTs and network communication systems, such as intranets, extranets, and Internet public space. These allow communication between health professionals, patients, and other stakeholders in remote clinical consultation and treatment services; epidemiological and administrative data management and communication; provision of diagnostic and therapeutic services based on system imaging; integration of distributed services; access to knowledge databases; continuing education and training by means of interactive communications media; health promotion; and management of physical and financial resources.

Telemedicine and Telehealth in National Research and Education Networks and Regional Networks

National research and education networks (NREN) and regional networks may play an important role in the integration, expansion, organization, application, management, sustainability, and evolution of health knowledge. In addition, these networks can strengthen the relationship between ministries of health and different levels of health care and continuing education.

These networks strengthen the integration of health professionals, students, residents, professors, and researchers through practical and scientific sessions in different health specialties and subspecialties, facilitating continuing education, service support, the formation of advanced consortia, and collaborative research.

Some academic networks have already succeeded and shown the efficacy of these actions by connecting health research and education institutions, as seen in Table 1.

Table 1. Regional and national academic networks *

Country	Academic Network	Contact	Internet site
Regional	RedCLARA	Luis Nunez	www.redclara.net
Regional	C@ribNET	Colleen Wint-Smith	http://www.ckln.org/home/content/cribnet
Argentina	INNOVA|RED	Alejandro Ceccatto	www.innova-red.net
Bolivia	ADSIB	Sergio Toro	www.adsib.gob.bo
Brazil	RNP	Luiz Ary Messina	www.rnp.br
Canada	Canarie	Jim Roche	www.canarie.ca
Chile	REUNA	Paola Arellano	http://www.reuna.cl/
Colombia	RENATA	Bibiana A.López / Camilo Jaimes Ocaziónez	www.renata.edu.co
Costa Rica	CONARE	Alvaro de la Ossa	www.conare.ac.cr
Dominican Republic	RADEI	Rafael Bello Díaz	http://www.seescyt.gov.do/Documentos%20Mix%202010/Publicacion%20RADEI.pdf
Ecuador	CEDIA	Ville Morocho	www.cedia.org.ec
El Salvador	RAICES	Rafael Ibarra	www.raices.org.sv
Guatemala	RAGIE	Luis Furlan	www.ragie.org.gt
Mexico	CUDI	Carlos Casasús	www.cudi.mx
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Paraguay	ARANDU	Carlos Filippi	www.arandu.net.py
Peru	RAAP	Carmen Velezmoro	www.raap.org.pe
United States	Internet2	Michael Sulivan	www.internet2.edu
Uruguay	RAU	Ida Holz	www.rau.edu.uy
Venezuela	CENIT	José Sosa	www.cenit.gob.ve

*These networks have been identified by participants in the conversation.

National Telemedicine and Telehealth Programs in Ministries of Health of the Region

Situation analysis of telemedicine and telehealth in the countries of the Region: a systematic review

In developing countries, telemedicine is important for the improvement of the health system: it influences the supply of, and access to, services by speeding up diagnoses and treatments and overcoming geographical distance. It also contributes to professional training. However, its potential has not been well captured yet, and its incorporation has been slow.6

WHO considers that the use of telehealth resources is broad, but unequal around the world. In less developed regions and in countries with limited infrastructure, adoption of these resources has been lower than expected. Even where activities are underway they are below their potential. Another issue is that the content of implemented applications is dissimilar.

In 2010, the WHO Global Observatory for eHealth made a systematic review of discussions related to telehealth. Following are the lessons learned:

- Collaboration, participation, and capacity building are key elements for the success and sustainability of telemedicine initiatives;
- The commitment of organizations and individuals in telemedicine initiatives of developing countries should be viewed in the local context in which they are working, i.e., available resources, needs, weaknesses and strengths;
- The use of simple solutions that have been found to be adequate in a clinical or community context optimizes cost-benefit relations and minimizes the complexity of management;
- Evaluation is crucial for scalability, transference, and continual improvement of telemedicine quality. This can also include documentation, analysis, and dissemination;
- The social benefits of telemedicine contribute to community health and human development and constitute important objectives.

In a 2009 survey, WHO analyzed the most frequent uses of telemedicine, as well as emerging and innovative solutions in the world with the purpose of fostering their advancement in developing countries. Regarding the current state of telemedicine services, it was confirmed that:

- The delivery of telemedicine services depends on income level. In high-income countries, the level of incorporation is higher than in the others. However, major differences in medium-high, medium-low, and low-income countries were not seen.

- The telemedicine service with the highest rate of incorporation is radiology, among the four fields investigated (teleradiology, teledermatology, telepsychiatry, and telepathology), with significant differences among the countries, depending on the income level. The content of the applications used in more developed countries is mainly oriented toward diagnosis and control, while in the others it is used to connect basic services with the other levels of health care.

With reference to factors that improve telemedicine development, it can be observed that:

- Around 30% of the countries have a national telehealth agency, i.e., a national entity responsible for the design and implementation of telehealth projects. This percentage is slightly higher in the Region of the Americas and more than 30% of the Region's countries have telehealth policies or strategies that vary according to the income level.

- Regarding participation of scientific institutions involved in telemedicine development solutions, 50% of the countries of the Region responded positively. Only 20% responded that they have evaluation of processes.

When listing the main barriers for telemedicine development, it was observed that the most prevalent is the consideration that telehealth activities imply high costs. Developing countries point to high cost, poor infrastructure, and lack of technical expertise. Developed countries indicate that the main concerns are legal issues involving privacy and security, priorities of the health systems, and lack of demand.

The following actions are recommended by WHO in view of the detected barriers:

- Elaborate a long-term strategic plan for the development and implementation of eHealth services, including telemedicine;
- Create a National eHealth System, with the participation of the ministries of health;
- Establish a policy for the area based on the participation of all the players, i.e., the community, health professionals, academic institutions, managers, and the political sector;
- Support and encourage research in telemedicine initiatives and evaluations including methods and strategies for knowledge dissemination;
- Invest in cost-effective and versatile solutions that are adaptable to ICTs and local infrastructure;
- Build a forum made up of the ministries of health, the ICT sector, the education sector, and other stakeholders in order to discuss how telehealth can improve health care;
- Train human resources in the telehealth area.

In turn, the International Development Research Centre refers to the importance and the need of the health sector to interact with the global planning process of the ICTs to help overcome the digital debt. [6] The five key aspects for the establishment of ICT policies are:

- Infrastructure development
- Universal and equitable access to ICT services
- Promotion of competition in the market
- ICT as a means to reach national financial and social objectives
- Promotion of private investments in the sector

The health sector has an important role in the discussion on ICTs and it should:

- Actively participate in debates about ICT policies in order to better understand the needs of the health sector;
- Underline the benefits for the health community because, ultimately, ICT represents a benefit for the general public;
- Invite ICT vendors to develop equipment and systems to satisfy the needs of developing countries, that is, low-cost, long-lasting, and easily maintained products;
- Work together with nongovernmental organizations and the civil society interested in improving the access of the public to ICTs;
- Learn about issues such as costs, infrastructure development, Internet access, content in local language, and privacy protection.

When discussing the strategies to promote eHealth and telemedicine policies in developing countries, the reasons for not adopting eHealth are identified as follows: decision makers have no clear understanding of the benefits; no evidence of benefits; financial restrictions; resistance; lack of skills; and inertia of the health system.

The above indicates the importance of being aware of eHealth benefits and usual applications, technical requirements, and ethical and legal aspects of using these resources in the health area. Researchers and local academic institutions may play an important role in those functions.

When Wootton [6] talks about issues related to the incorporation of telehealth resources in the developing world, he states: "it is clear that the use of telehealth resources in those nations is limited and it is important to understand the different aspects related to the access to ICTs and their effective use."
Some criteria are interrelated:

- Physical access to technologies
- Adoption of technology
- Accessibility and use of technology
- Human resource education and training

- Locally relevant content, applications, and services
- Incorporation in daily routine
- Socio-cultural factors
- Confidence in technology
- Local economic environment
- Macroeconomic environment
- Regulatory structure and legal aspects
- Political will and public support

These conditions are necessary but not sufficient for the incorporation of telehealth. There are other barriers for using telehealth: organizational factors (changes in the way hospitals and physicians work); human factors (lack of adequately skilled workers); and medical and legal regulations, including ethical aspects.

In recent years, the Region has shown improvements in telemedicine. According to the EUROsociAL project,5 the European Union (EU) initially worked to develop telehealth in the countries of the Region. The document states that the different socio-economic and infrastructue conditions, together with the demographic dispersion, particularly in remote, poor, and hard-to-access areas, make the use of ICTs one of the most promising solutions for improving the quality of health care and access to health services, without an increase in the cost of the services.

The report also establishes that the use of ICTs in primary health care (PHC) may help solve a number of problems that different health systems are facing, such as:

- The permanence of professionals in remote and isolated areas;
- The difficulty of keeping those professionals up-to-date at the technical level;
- Access to specialized professionals in those regions;
- The lack of real-time standardized and integrated clinical data;
- The availability of health information for the population and the shortage of accurate information for rapid decision making in the health sector, among others.

When referring to the need for incorporating telehealth resources in PHC, the EUROsociAL project underlines that when choosing the technology and methodology for incorporating the use of ICTs in PHC, taking the following issues into account is required:

- It is necessary to offer a system that helps solve health professionals' daily problems, thus facilitating its integration.
- Systems should conform to the experience of users and the local technological reality. Technology should be a means, not an end. The goal should always be the improvement of a population's health care rather than technological implementation.
- Implementation and maintenance of a system cannot be entirely virtual. In-person meetings are very important to build reliable relationships.
- It is essential to demonstrate that the use of ICTs in PHC may reduce the costs of the health system.
- The use of ICTs in PHC represents a new form of working that many health professional are not comfortable with. [5]

The EUROsociAL project was relevant for the Region since it allowed an initial analysis of the development of telehealth in connection with PHC, and it established a permanent forum for the exchange of experiences in the telehealth area.

Little by little, different structures of the Region that focus on planning and development are starting to expand to include telehealth. An important initiative for the promotion of telehealth development in cooperation with entities planning these activities in the Region of the Americas is taking place. Namely, based on its experiences the European Community has joined with the Economic Commission for Latin America and the Caribbean (ECLAC) in the @LIS project, which is in its second stage. ECLAC aims to identify the current status of the Region in regard to ICTs, and to try to find the best options and create appropriate strategies to take advantage of the real potential of ICTs in a cost-effective way. Improving quality of health care, reducing costs, and optimizing processes requires the incorporation of ICTs into public health policies in each country.

At the end of 2001, the European Commission approved the Alliance for the Information Society (@LIS) Program, with the purpose of establishing a dialogue and collaborating on the definition of political and regulatory frameworks. During the first stage of @LIS, which continued until 2007, one of the objectives was to support a number of projects to demonstrate the advantages of the applications of the information society in four areas: local governance, education and cultural diversity, and public health inclusion. At the same time, it tried to establish a dialogue on policy and regulatory matters, both in the policy and technical sectors, involving the governments, the private sector, and the civil society. The following European Union (EU) @LIS projects are the most relevant.

RedCLARA - This network's connection to the GÉANT was executed by the ALICE (América Latina Interconectada con Europa; Latin America Interconnected with Europe) project, with the goal of providing dedicated Internet connections for research and education communities in the Region and between those communities and Europe.

BHTelesalud (Telehealth Health Care Network) - This was an alliance between the city of Belo Horizonte, Universidade Federal de Minas Gerais (UFMG), the Ministry of Health of Brazil, and the EU, Finland, Denmark, and Italy; the project was started in 2003 and ended in 2006. The main goal was to use ICTs and telehealth resources to promote the connectivity of municipal health of Belo Horizonte with experts of the UFMG.

T@LEMED - This telehealth project is devoted to taking care of remote and rural populations of Brazil and Colombia. The objectives are to implement and enforce a health care model based on ICTs and telehealth systems, providing diagnostic support and evidence-based treatment, and promoting education, technological exchange, and economic growth using ICTs.

Health for All in Latin America (HfALA) - Centered on Vitória da Conquista, Salvador Bahía, and Belo Horizonte , Minas Gerais, in Brazil, the project's objectives are to improve the quality of service offered to citizens, especially in peripheral areas, by increasing the capacity to solve health problems at health centers by using e-Learning tools, and to promote continuing professional education. The aim is to collaborate with the dissemination, promotion, and adaptation of best practices in primary care teams; the dissemination and adaptation of practice-based guidelines; and the creation of effective communication networks among health professionals, allowing improved communication among community-based teams.

During the second stage of @LIS, 2009 to 2012, one of the lines of action was to establish "an inclusive political dialogue and experience exchange," in collaboration with ECLAC. Its purposes are: 1) to include the topic of the information society in the political agendas of the countries of the Region; 2) to encourage resources for research and development in this area; and 3) to improve participation of the civil society in the creation of public policies. It also intends to reinforce the social, political, and technical relationships of the Region with Europe and support the countries of the Region of the Americas in the creation of strategies for the information society, such as the eLAC Regional Plan of Action.

Regional Plan of Action on the Information Society in Latin America and the Caribbean (eLAC)

The eLAC was developed in 2005 by the countries of the Region to build political consensus and a common strategic vision, redefining the goals of the global plan agreed upon in the World Summit on the Information Society, held in Tunisia in 2005. From the start, the eLAC proposed that ICTs are tools for economic development and social inclusion for Latin America and the Caribbean. During three stages, eLAC 2007, eLAC 2010, and eLAC 2015, its objectives relating to telemedicine were to:

- Improve the connection of health centers and hospitals to the Internet;
- Promote training programs in these institutions;
- Promote and strengthen national health services networks as well as regional health information networks.;
- Improve the integration of ICTs into the health sector, including training for health workers;
- Develop national and international networks as a requirement for telemedicine and distance education services;
- Form a "working group" with focus on diagnosis, identification of best practices, and the creation of recommendations to contribute to the development of eHealth;
- Promote integral and integrated management of health based on ICTs, with emphasis on bandwidth connectivity in every hospital and public health facility, and improve interoperability and telehealth, paying special attention to unique electronic clinical records and to management systems;
- Develop interoperability for regional epidemiological cooperation, strengthening the use of ICTs for improved coordination of decision-making processes in different health systems.

In 2009, an eHealth group was also formed within the framework of the Latin American and Caribbean Economic System (SELA), as part of the Permanent Secretariat. Recommendations regarding telehealth were made:

- Intensify and accelerate the process to systematize eHealth and telemedicine information so that different players and stakeholders can have relevant information available in a timely manner;

- Remove the market paradigm that has traditionally prevailed in the configuration of eHealth and telemedicine systems, and replace it with a vision that gives priority to the needs and demands of the population for health care;

- Promote universities of the Region as developers of innovative technological solutions for the sector, oriented toward the strengthening of health management systems in the countries.

In 2010, the Inter-American Development Bank (IDB) participated in the debate on the development of telehealth activities in the countries of the Region through the "Regional protocol for making public telehealth policies for Latin America" project, coordinated by Brazil, with the participation of 16 countries. Different initiatives were developed with the aim of contributing to telehealth development actions in the Region. Six technical groups were formed involving the participating countries, and focusing on the following issues:

- Regional standards of minimal requirements for data transmission and infrastructure;

- Strategies for the promotion, prevention, and assistance of certain telehealth services;

- Regional guidelines for telehealth management;

- Strategy for a network researching telehealth issues;

- Training and certification model for telehealth workers;

- Innovation in telehealth: main issues.

Within the framework of the project, a model was developed that includes comparison variables to track the process of telehealth activities development in the Region of the Americas, with consensus by the countries included in the project. This tool provides a view of the development of telehealth activities in participating countries, as well as to act as a reference point for necessary action regarding telehealth development in the countries, integrating the six components mentioned above.

In addition, a Latin American telehealth network is being developed that includes special interest groups in different health specialties and sub-specialties, connecting researchers of different countries in different areas.

Two additional relevant initiatives are being organized in the scope of the project. The first was the execution of a training course in telehealth, with the participation of 16 ministries of health and universities of the countries of the Region, focusing on the development of telehealth actions. The course was attended by 401 strategic performance professionals who coordinate the telehealth areas of the ministries and universities of the Region. As a final outcome, the course participants suggested improvements in national telehealth projects or proposed creation of these projects in countries where telehealth was not yet implemented. Both in this process and in telehealth training there is much discussion on the development of telehealth in the Region, both in the production of contents using 3D modeling, animation, and videos created by professors of different universities of the countries of the Region, as well as in discussions and tasks undertaken.

The second initiative was the organization of the Latin American Committee for Best Practices in Telehealth in Latin America, which included the ministries of health and universities of 16 countries, ECLAC, PAHO/WHO, and the American Telemedicine Association, Latin American and Caribbean Chapter (ATALACC).

The IDB project organized a discussion on the main guidelines for the development of telehealth in the Region. These include:

- Incorporate telehealth resources in PHC, which is the major structure and coordinating entity of the patient health care process. Where health systems are in the process of being built, giving priority to the incorporation of telehealth resources for PHC may contribute to the improvement of health actions in different countries;

- Adapt telehealth resources assigned to PHC to the epidemiological and developmental profile of the region;

- Foster distance education taking advantage of the structure of telehealth projects;

- Get involved in the process of planning the incorporation of ICTs in the countries;

- Join in processes of telehealth experience exchange;

- Carry out pilot or demonstration projects. The pilot project experience of the public sector in institutions, municipalities, or states, taking the experiences of other countries, allows nations that have not yet started national projects to build a solid foundation for next steps;

- Plan expansion or institutionalization processes, defining the role of the institutions;

- Foster the organization of telehealth in institutions with their own teams, and strengthen telehealth education;

- Support the processes involved in the regulation of telehealth and the establishment of standards;

- Build innovation policies. This is where the Region has made the least improvement and it is a strategic issue for the countries of the Region. It is necessary to modify the process by which most of the equipment and several applications used are brought from other continents. It is observed that even countries with projects in a stage of consolidation, such as Brazil and Mexico, have not advanced much in this area;

- Use the infrastructure to foster cooperative research, setting up telehealth university networks;

- Establish mechanisms for the assessment of projects;

- Perfect management processes.

Based on advances in the process of developing telehealth activities, in 2010 PAHO/WHO took the critical step before the Ministries of Health in the Region and launched the Strategy and Plan of Action on eHealth.

Development of Telemedicine Projects in the Region: Milestones

The discussion about the organization of telemedicine projects in the countries of the Region was started in the 1990s, when processes were very fragmented and isolated. At present, there is significant ongoing development in different countries for the incorporation of telemedicine. There are few studies on the development of telemedicine actions in the Region of the Americas as institutional policies. The approach here is to describe the current stage of development of national telemedicine projects in the Region, assigning periods for their development.

In order to carry this out, an instrument was developed to gather semi-structured data from responsible leaders in the telehealth area working with 20 ministries of health of the Region. The focus was on the existence of national telehealth projects, historical factors, general characteristics, and specific objectives. These data were compared to the results submitted by a working group during the telehealth training course carried out as part of the IDB's Regional Protocols of Public Policies project. Participants included 401 telehealth professionals from 16 countries of the Region, including directors of the Ministries of Health and the most prominent universities. The issue addressed by the working group was the current situation regarding the inclusion of telehealth resources in their countries. A time-line was designed on the development of telehealth actions in the Region and systematized data allow a general overview on the development of national telehealth projects in the Region of the Americas. Table 2 shows the key initiatives for the development of telehealth in the Region, including time of execution of National Telehealth Projects/Programs (NTP).

Table 2.
Main milestones in the development of telehealth in the Region

1968	Dr. Ramiro Iglesias (Mexico) receives the first electrocardiogram; National Aeronautics and Space Administration (NASA)
1985	Mexico: Support to emergency measures in disaster situations, using telemedicine.
1986	Argentina: Red Nacional de Encuesta (National Network of Surveys, PAHO) 2,000 hospital units connected.
1993	Mexico: *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (Institute of Security and Social Services of State Workers, ISSSTE) starts the telemedicine project.
1996	Costa Rica: National Telesalud Program. Later, this program developed more slowly.
1998	Argentina - Hospital Garrahan connects with Patagonia to make distance consultations.
2000	Argentina: First Latin American Internet Congress of Medical Informatics. Launch of the National Telehealth Project in Argentina, but this does not materialize.
2001	Peru: First telemedicine project implemented in Loreto, transmitting voice and data (Alto Amazonas).
2002	Panama: National Telehealth Plan Brazil: Project Virtual Man, University of São Paulo (USP).
2003	European Community Program @ lis: Telehealth Healthcare Network, T@LEMED, EHAS, RedCLARA, Health for All. Brazil: BHTelessaúde, T@lemed and HealthNet in Minas Gerais, Rio Grande do Sul, Espírito Santo, Pernambuco. Argentina: Zaldivar Ophthalmology Institute; Experiences in Telemedicine.

2004 RedCLARA - Europe / Region of the Americas.

2006 Colombia: Telemedicine in remote health care services.
Brazil: University Telemedicine Network (RUTE)/ National Network of Education and Research (RNP) begins to connect 19 university and teaching hospitals.
Ecuador: National Telehealth Program.

2007 Brazil: National Telehealth Program.
Brazil: The Ministry of Science and Technology approves the connection of more than 38 university hospitals.
Colombia: National Telehealth Program.
European Community: Eurosocial Project.
Phase I of eLAC 2007 – Regional Plan of Action on the Information Society in Latin America and the Caribbean (Rio de Janeiro, American Telemedicine Association, Latin-American & Caribbean Chapter, ATALACC).

2008 Phase II eLAC 2010, San Salvador.
Latin American and Caribbean Economic System (SELA): First Seminar on Telehealth.
Creation of the ECLAC Advisory Commission on e-Health.

2009 Colombia – National Network of Advance Technology (RENATA) starts connecting 21 hospitals and health institutions.

2010 Brazil: Begins the Project for Regional Protocols of Telehealth Public Policies in the Region, with the IDB.
Brazil: Creation of the journal: *Revista Latinoamericana de Telehealth*.
Brazil: 47 RUTE/RNP telemedicine nuclei connected, inaugurated, and operating. Thirty special interest groups in health specialties.
El Salvador: National Telehealth Program under development.
Quito, Ecuador: Creation of the Latin American Association of Telemedicine and Telehealth.
PAHO/WHO and Amazonian Treaty Cooperation Organization (*Organização do Tratado de Cooperação Amazônica*, OTCA): Pan-Amazonia Telehealth Plan.

2011	Creation of PAHO/WHO e-Health group. Strategy and Plan of Action on e-Health approved by PAHO/WHO member countries. Brazil: Ministry of Science, Technology and Innovation approves telemedicine nuclei. RUTE/RNP in more than 75 teaching hospitals.
2012	Guatemala, Bolivia, Peru, and Venezuela start setting up National Telehealth Programs. Brazil: National Telehealth Program reaches 12 states and 1,200 municipalities. Brazil: 68 RUTE/RNP telemedicine nuclei are connected, inaugurated, and in operation; 50 special interest groups in health specialties. Latin American Committee of Best Practices in Telehealth in the Region, PAHO, ECLAC and IDB. Based on the strategy and plan of action on e-Health, PAHO/ WHO implements 12 eHealth Conversations in a number of virtual sessions with stakeholders specializing in networks and eHealth. The topics of the conversations are: 1) Infrastructure, 2) Information systems, 3) Telemedicine, 4) Access to information, 5) Policies, 6) Education, 7) Patient safety, 8) Electronic medical records, 9) Standards for interoperability, 10) Legal issues, 11) Relationship with projects and initiatives of eGovernment, and 12) eHealth management.

Taking into account the characteristics of these milestones, three main stages can be identified in the process of telehealth development in the Region. During the initial period, the first steps are highly structured based on a process of experience exchange in the countries of the Region with the United States. During this period (1970s to the end of the 1990s), the experiences of Mexico, Panama, and Costa Rica are the most significant. Table 3 includes the main characteristics of the national telehealth programs of the first period.

Table 3.
Countries in the first phase of Teleheath development in the Region, describing the existence of NTPs and their main characteristics

Costa Rica

National Telehealth Project: Yes.

Telemedicine and videoconference equipment in 29 (regional and national) hospitals and in the Ministry of Health and Social Security.

First Year of Telehealth Service: 1994

Teleconsultations (particularly, teledermatology)

Videoconferences

General Objective:

Provide broad, timely, and equitable health care coverage to the Costa Rican population, improving access to high quality, specialized medicine, overcoming the distance and time barriers by using telemedicine.

Specific Objectives:

Facilitate access to the highest level of health services to remote populations.

Provide health workers with the possibility of providing direct health care to patients by remote means.

Reduce time and waiting lists for appointments with specialists.

Reduce the number of patients transferred to metropolitan areas.

Conduct electronic mentoring, debates, and conferences for health workers at the three levels of health care, simultaneously and interactively.

Reduce the costs of health care, institutional planning, and medical and educational programs.

Promote generalized use of this tool in the sector and increase the efficacy of health care

Panama

National Telehealth Project: Yes.

Teleradiology and telepathology (two hospitals connected to three remote locations). Telehealth for remote areas: one hospital connected to six telehealth locations in indigenous areas.

Telemedicine for prisons: one hospital connected to the two main prisons of the country

First Year of Telehealth Service: 2002

Radiological images and telepathology.

Teleconsultation in some regions.

Telemedicine in prisons: otoscopy, ophtalmoscopy, vital signs sensor, blood pressure, cardiac rhythm, temperature and electrocardiogram.

General Objective:

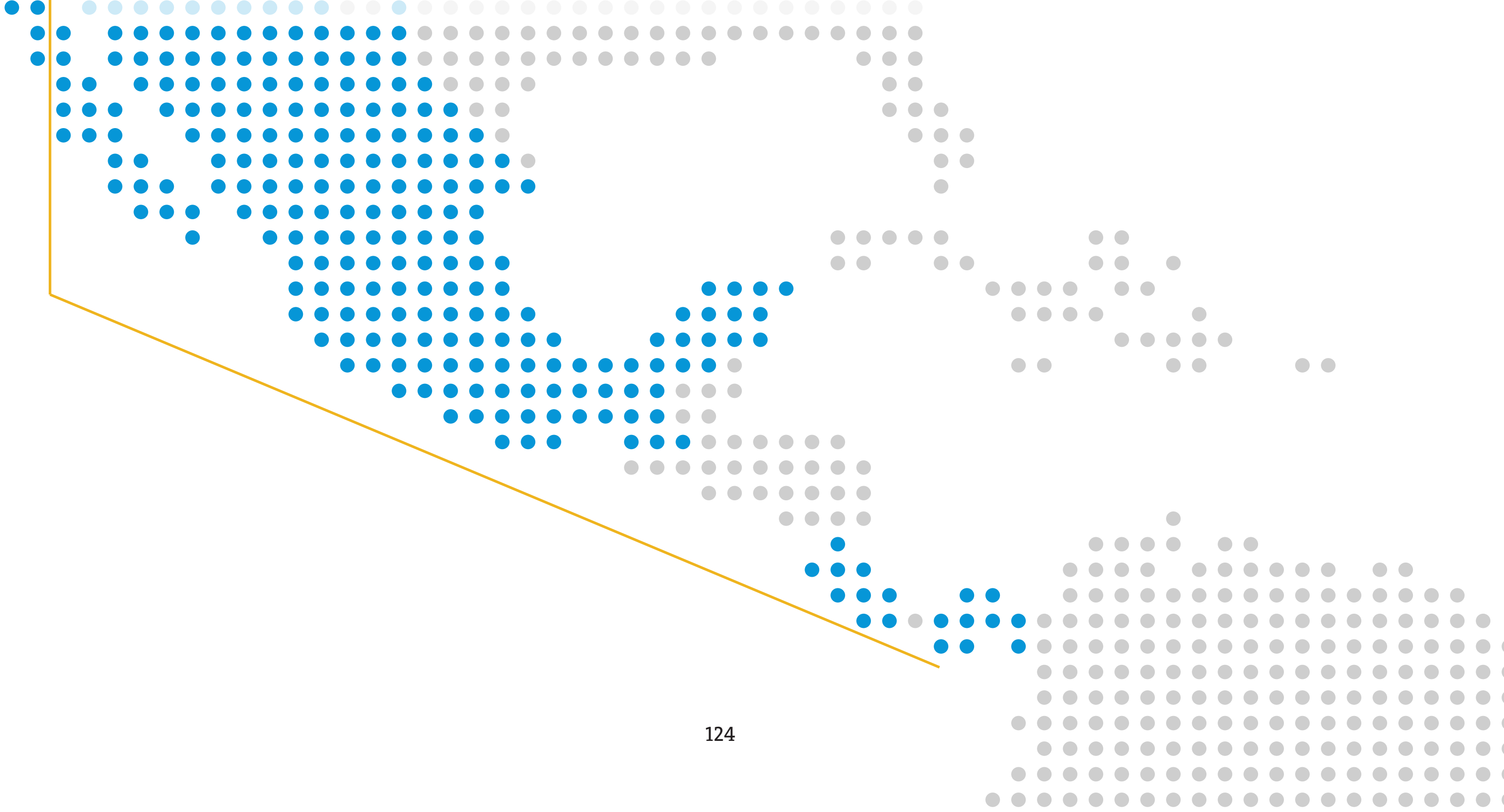
Increase the expansion and quality of health care services in the Republic of Panama, including remote areas that are difficult to access.

Specific Objectives:

Offer telemedicine services in teleradiology and telepathology for remote regions.

Connect remote locations in the mountains with indigenous populations, where there are no doctors, with physicians and nurses by means of teleconsultation.

Offer telemedicine services in different areas for the two main prisons in the country.



Mexico

National Telehealth Project: Yes.

First Year of Telehealth Service: 1995

Teleconsultation in PHC

Distance course

2007, Specific Action Program in Telehealth

Teleradiology; echography; real-time consultation; tele-education network

General Objective:

Contribute to the universality of health care through the development and integration of a national telehealth system which favors the access and delivery of distance, quality, efficient, and patient-centered health services.

It should be pointed out that Mexico was the first country in the Region to introduce telehealth resources in the health care process. In 1995, Mexico launched the first national telehealth project in the Region, focusing on distance achievements and continued to innovate in the area of teleconsultations. In 1996, Mexico carried out the first robotic surgery. In 2009, the country reached the leading position in telemedicine and now has the experience to use the standards employed in the field of medical informatics. The Mexican national telehealth project continues to be an example for the other countries of the Region, with cumulative results in a continuous process of expansion.

In 1996, Costa Rica started its telemedicine project in the context of significant development of the health system with a focus on PHC and at a time when the system was a regional model as expressed by key health indicators. The telemedicine project has been ambitious; nevertheless, it experienced a lack of continuity over time.

Since 1986, Argentina has been connecting its hospitals through important development in medical informatics, initially supported by Canada and later by PAHO/WHO. By the end of the 1990s, 2,000 health institutions were interconnected and some had gained experience in teleconsultations.[7] In 2000, Argentina presented its national telehealth project, the culmination in a process of incorporation of ICTs in health. Notwithstanding, this important project was not viable, which affected the entire process of development in the area of telehealth in Latin America.

Panama was the first country in the Region to start, in 2002, a national telehealth project in the field of radiology and pathology. In 2005, it expanded its telemedicine project to rural areas and prison populations. This initial process takes advantage of interinstitutional relationships established between the Ministry of Health and the telemedicine program of Arizona (U.S.), the University of Arizona, Tucson, Arizona, and ATALACC. At present, radiology is carried out using telehealth in the country.[8]

It can be observed that early initiatives in telehealth development in the Region are still extremely isolated and fragmented, and there is a major influence from the development of telemedicine in the United States.

Table 4 highlights the main characteristics of national telehealth projects during the second period.

Table 4.
Countries of the second period of telehealth development in the Region, describing the existence of NTPs and their main characteristics.

Brazil

National Telehealth Project: **Yes.**

2007–2010: 900 basic health units connected to nine university telehealth nuclei.

2011–2012: An additional 67 telehealth services are created within the structure of the Unified Health System (SUS), with the participation of basic health units.

First Year of Telehealth Service: **2007**

PHC teleconsultation

Teleconferences

Distance course

Electrocardiogram (in some facilities)

Non-mydriatic retinography (in some facilities)

X-ray, ultrasound, gyneco/obstetric/abdominal imaging (in some facilities)

General Objective:

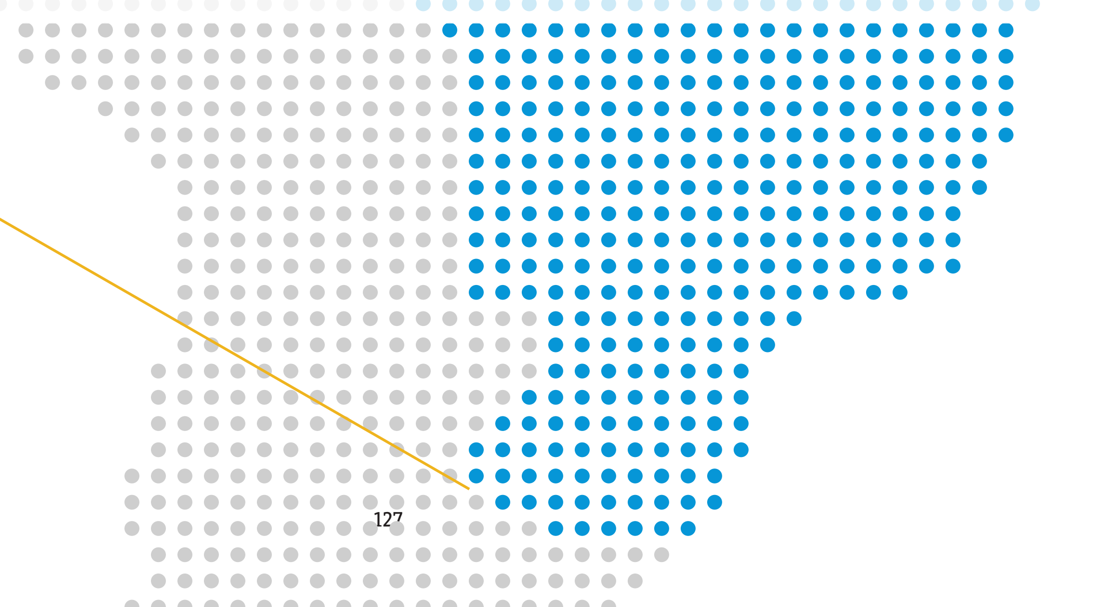
Integrate family health teams of different regions in the country with university reference centers to improve the quality of the services delivered in PHC, reducing health costs by means of professional training, reduction of unnecessary transfers of patients, and increased activities to prevent diseases.

Specific Objectives:

Structure educational consultation and second opinion service among PHC professionals and higher education institutions.

Establish an informatics and telecommunications infrastructure for professionals of the Program for Family Health (PFH).

Use multimedia for continuing distance development of professionals of the family health teams.



Colombia

National Telehealth Project: **Yes.**

2007-2008: 44 low complexity HCFs* with basic telemedicine and 11 medium-complexity HCFs* for intermediate telehealth care.

2008-2009: 30 additional HCFs*

2009-2010: 30 additional HCFs*.

First Year of Telehealth Service: **2007**

Teleconsultation. PHC.

Teleconferences.

Distance course.

Telemedicine for semi-intensive care (in some facilities).
TeleECG (in some facilities).
TeleXR (in some facilities).

General Objective:

Telehealth policy is aimed at improving health conditions and is directed toward the entire Colombian population, particularly in areas that are remote and isolated from health institutions of intermediate and high complexity. The main focus is on people in vulnerable social and economic conditions.

Specific Objectives:

Improve access to timely and quality services.

Improve the resolution capacity of health facilities, particularly those in remote places.

Train human resources using e-Learning.

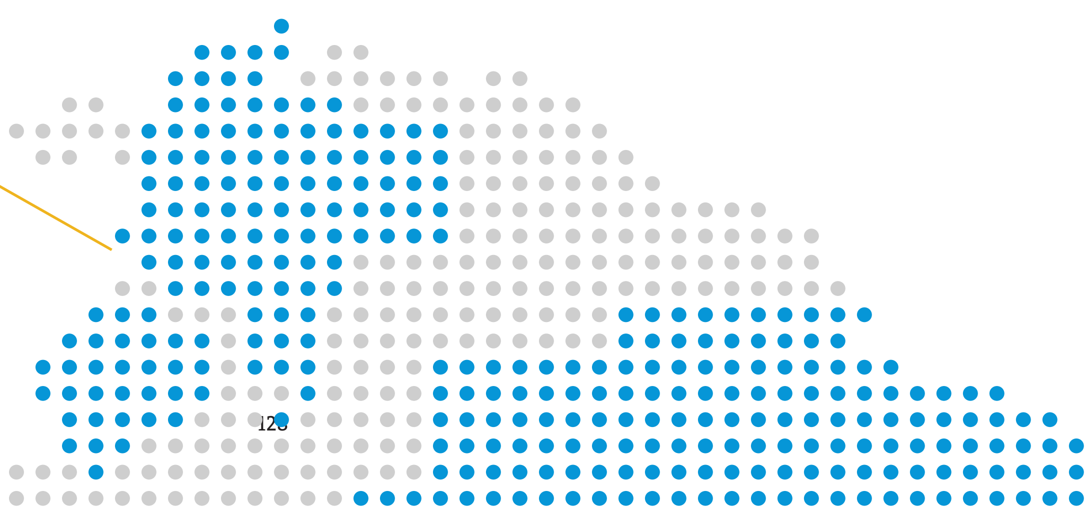
Improve the technological infrastructure and promote the adoption of international standards.
Contribute to the improvement of institutional management.

Improve the access of the population to health-related contents.

Improve and strengthen intra-and intersectoral coordination.

Promote research on eHealth in the country.

Develop mechanisms to monitor, follow-up, and assess execution of the plan.



Ecuador

National Telehealth Project: Yes.

First Year of Telehealth Service: 2009

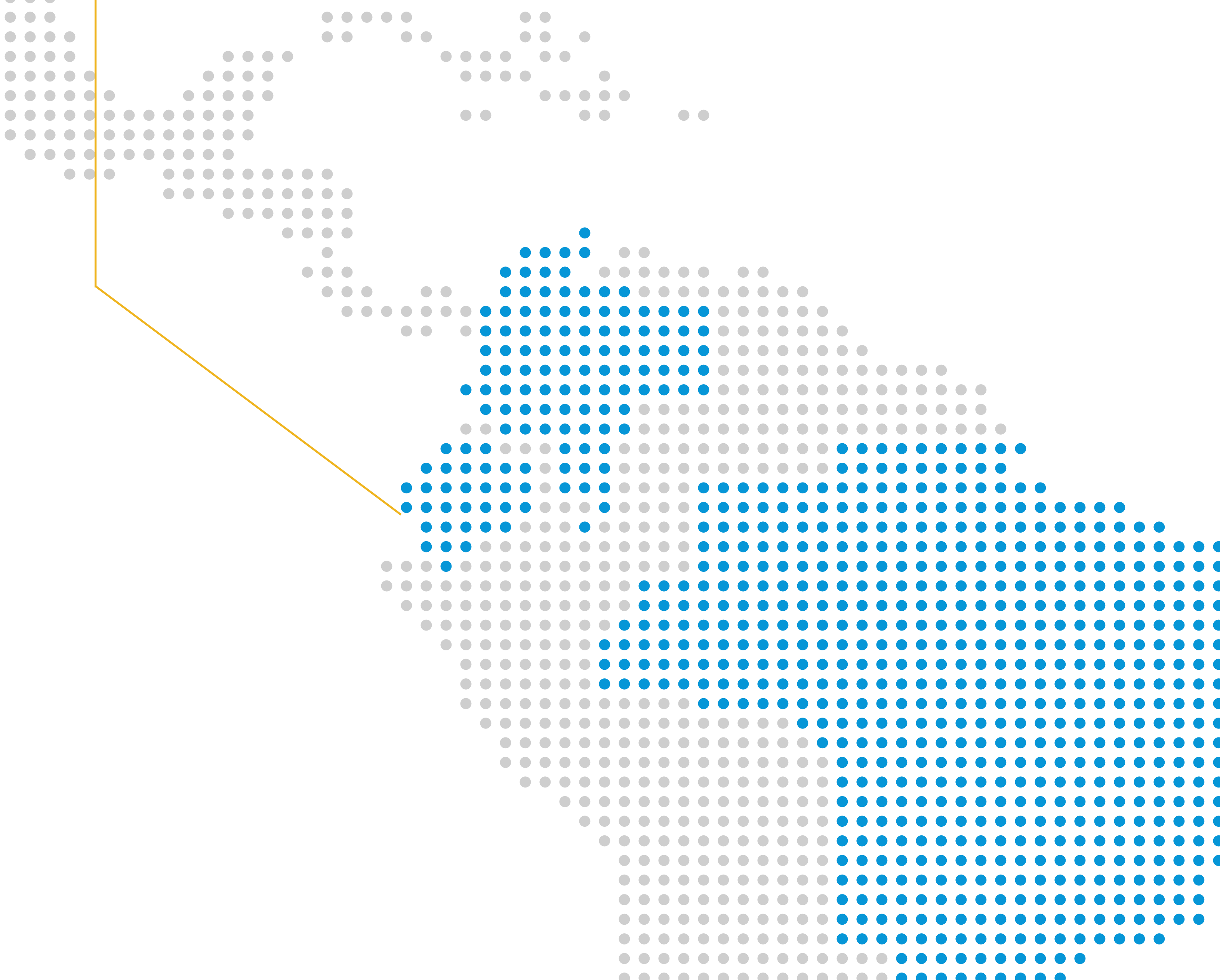
Teleconsultation. PHC.

Videoconferences

Distance course.

General Objective:

Strengthen the health care model through a referral and counter-referral network from the PHC, in second and third level hospitals, using telematic tools. This will contribute to free and universal access to the National Health System (NHS) for the whole Ecuadorian population, through clinical and specialty distance consultations, or for urgent, diagnostic, or second opinion consultations.



Source: Project on Regional Protocols for Public Policy Development of Telehealth in Latin America, Inter- American Development Bank.

*Health care facilities include hospitals, clinics, clinical laboratories, and other health facilities.

In 2000, a new stage began when European countries allotted resources for telemedicine demonstration and experience exchange projects between Europe and the countries of the Region of the Americas. For example, the EUROsociAL project is a permanent forum for the exchange of experiences in this setting.

As a consequence of this intensive process, many countries would take the first steps toward a national telehealth program, including Ecuador in 2006, and Brazil and Colombia in 2007. This provided important experiences in telehealth in general and also focused on teleconsultations linking PHC teams with remote experts.

The experiences of national telehealth projects in Colombia and Ecuador are noteworthy. Both projects gave priority to remote areas facing difficult issues regarding technological infrastructure, particularly in the Amazon region. The Colombian experience is also significant regarding the use of telehealth care resources in the intensive care unit (ICU), remotely connecting to experts of large health facilities assigned to the University of Caldas, National University of Colombia, and the Cardiovascular Foundation. The experience also included the transmission of X-ray and ECG.

The Brazilian telehealth project, as well as the Mexican experience, represent milestones in the development of telehealth in the Region. Noteworthy actions in Brazil include:

- Due to its initial size, 900 municipalities offered telehealth connections for PHC;

- The interaction established between universities and the health services include education components (distance learning and teleconferences) and health care;

- The development of a project in the state of Amazonas;

- Since 2006, the University Telemedicine Network (RUTE) has interconnected 19 university and teaching hospitals, and today has 73 telehealth nuclei in operation, with two to three daily video sessions and teleconferences. There is participation from 50 special interest groups and some 300 institutions. The network receives financing from the Ministry of Science, Technology, and Innovation through the National Agency of Research and Funding of Studies and Projects (FINEP), coordinated by the national Network of Research and Education (RNP);

- Ongoing exchange of experiences has been established with the countries of the Region. This process involved numerous initiatives: the formation of the laboratory of excellence and innovation in Latin America, responsible for structuring the Regional Protocols of Public Telehealth Policies for Latin America Project, funded by the IDB; the launch of the Latin American Telehealth Journal; organization of Pan-Amazonia telehealth under the executive coordination of Fiocruz; and the creation of RedCLARA of the @LIS Program in 2003, which boosted the creation, interconnection, and expansion of the National Academic Networks of Latin America and the Caribbean.

Since the consolidation of the Brazilian experience, the development of teleheath actions has been driven by the dynamics and experience of the countries of the Region of the Americas. This began a new phase, with the conditions for the creation and development of multilateral actions to incorporate telehealth programs in planning and coordination activities. Consideration of primary health care, which is important to the organization of health systems, is integrated in a significant manner in developing telehealth actions.

Efforts to institutionalize telehealth in multilateral organizations have progressively increased, and began with the organization of telehealth seminars in the framework of the Latin American and Caribbean Economic System (SELA) in 2009.

In order to improve the exchange of experiences in ICTs and telehealth and to contribute to a process of reflection and analysis for making policies in this area, an ECLAC eHealth advisory group was organized in 2010, within the framework of the second phase of the @LIS European Community/Latin America Program. It is important to highlight that this is an institutional process in Latin America and it has made important contributions, such as organization of workshops devoted to policies, publications, and support to ongoing initiatives, thereby setting the programmatic foundation for the development of telehealth in the Region.

The first contributions of the ECLAC eHealth commission will take shape in the framework of eLAC 2015, the Regional Plan for the Development of the Society of Information in Latin America and the Caribbean.

In this context of institutionalization in Latin America, PAHO/WHO took an important step in 2011 with the adoption of the Strategy and Plan of Action on eHealth approved by Member States. The objective of this strategy is to contribute to the sustainable development of health systems for member countries. It seeks to improve access to and quality of health services through the use of ICTs, digital literacy, and ICT education, and the implementation of different methods, all of which will enable progress toward more informed, equitable, competitive, and democratic societies. In this type of society, "access to health information is a fundamental right of the people." [9]

Objectives of the PAHO/WHO Strategy and Plan of Action on eHealth are to:

- "Endorse and promote the formulation, execution, and assessment of effective, comprehensive, and sustainable public policies on the use and implementation of information and communication technologies in the health sector.

- "Improve public health through the use of tools and methodologies based on innovative information and communication technologies.

- "Promote and facilitate horizontal collaboration among countries for development of a digital agenda health for the Region

- "Support knowledge management, digital literacy, and education in information and communication technologies as key elements for ensuring the quality of care, health promotion, and disease prevention activities, guaranteeing training and better access to information in an equitable manner." [9]

Both ECLAC and PAHO/WHO reinforce the objective of development of telemedicine within the context of national health projects, guided by primary health care. As of 2010 and 2011, several countries in the Region, including El Salvador, Peru, and Venezuela, started to elaborate a NTP or to create the conditions to make this process happen. In spite of the fact that Peru had described a NTP in 2004, it has not been implemented yet. Other countries are at the early stages of elaboration and development in this area: Guatemala, Costa Rica (resuming the process of the national project), and Bolivia. Table 5 lists the status of the main projects in the third stage and their characteristics.

Table 5. - Countries in the third period of development of telehealth actions in the Region of the Americas, describing the existence of NTPs and their main characteristics

El Salvador

National Telehealth Project: **Yes.**
Initial stage.

First Year of Telehealth Service: **2011**
Teleconsultation, PHC.

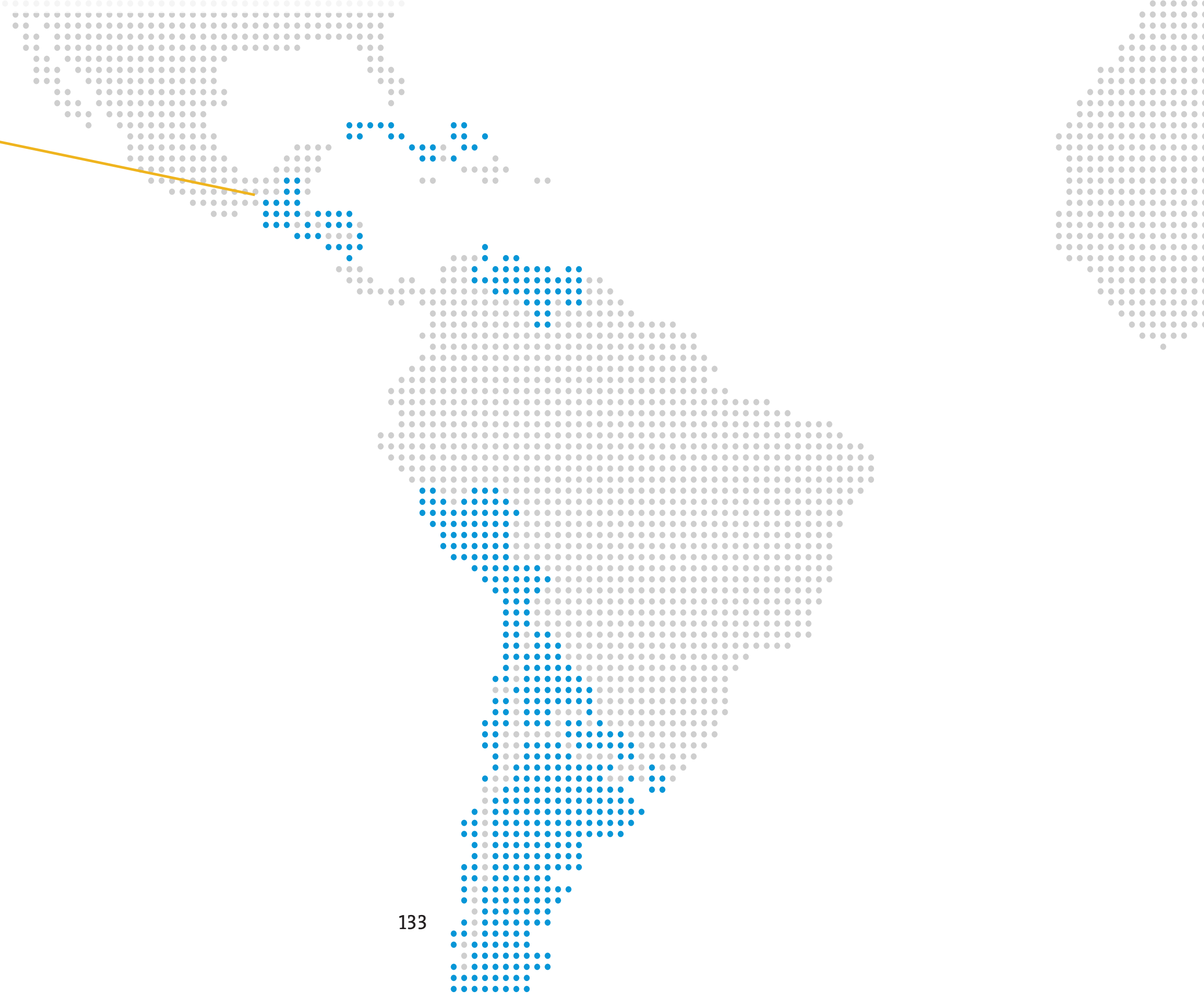
Videoconferences.

Distance course.

General Objective:
Implement several education projects, as well as health advice for family health care teams.

Specific Objectives:
Develop a national platform with free software to allow easier intercommunication among teams and specialists.

Improve communications among different facilities, both in terms of bandwidth and number of facilities connected.



Peru

National Telehealth Project:

It is formulated but at an early stage of implementation.

First Year of Telehealth Service: 2000

Objetivo general:

Develop, implement, and disseminate an integrated telehealth system with the aim of improving and increasing the delivery of health services for the benefit of the general population, with emphasis on those in marginal and remote locations.

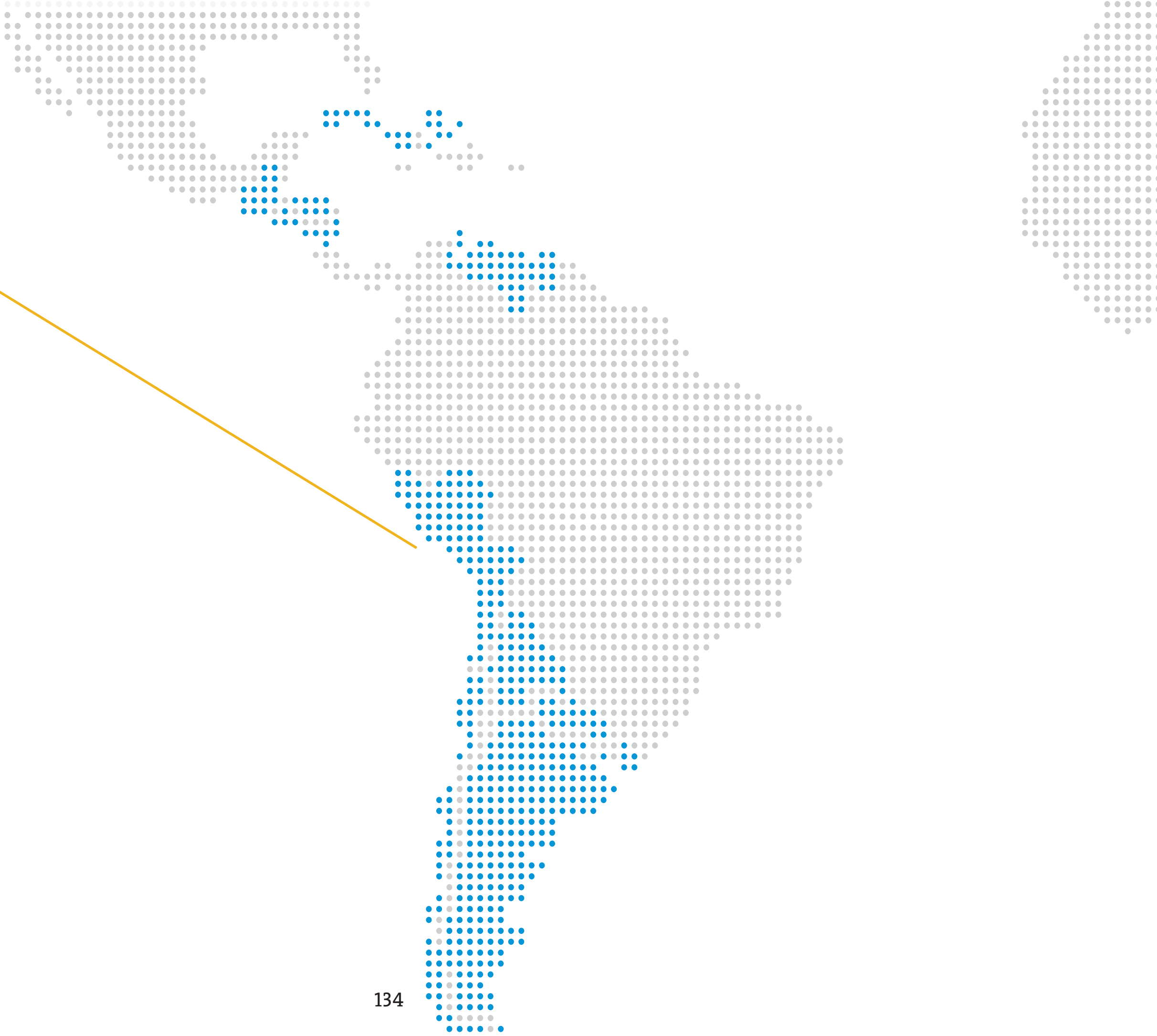
Specific Objectives:

Promote the implementation of the national telehealth network and its subsequent development, integrating health facilities.

Implement comprehensive health care programs with emphasis on rural or scattered populations through the national telehealth network.

Implement information, education, and distance communication programs for health professionals and the population, through the national telehealth network.

Strengthen and improve the management processes of the national health system, improving its performance through the use of the national telehealth network.



Venezuela

National Telehealth Project:

"Telehealth for Strengthening the Primary Health Care in Rural Areas of Venezuela"

Rural outpatient facilities with satellite connectivity in the States of Amazonas (11), Delta Amacuro (6), Bolivar (9), Portuguesa (6), and Zulia (1): total 33.

Two training rooms and virtual triage: Hospital Universitario de Caracas and Hospital de Puerto Ayacucho, State of Amazonas

First Year of Telehealth Service: 2011

General Objective:

Increase the resolution and care capacity in rural remote areas through the establishment of a telemedicine system or ICT-assisted medical consultation through the Simón Bolívar Satellite.

Specific Objectives:

Develop an application for the consultation process based on the integrated electronic medical record.
Guarantee connectivity and effectiveness of rural outpatient facilities.
Provide technical and clinical training.
Define and evaluate the consultation process.

Guatemala

National Telehealth Project:
In the first phase of development

Argentina

National Telehealth Project: No

Bolivia

National Telehealth Project:
In the first phase of development

Chile

National Telehealth Project: No

Uruguay

National Telehealth Project: No

Paraguay

National Telehealth Project: No

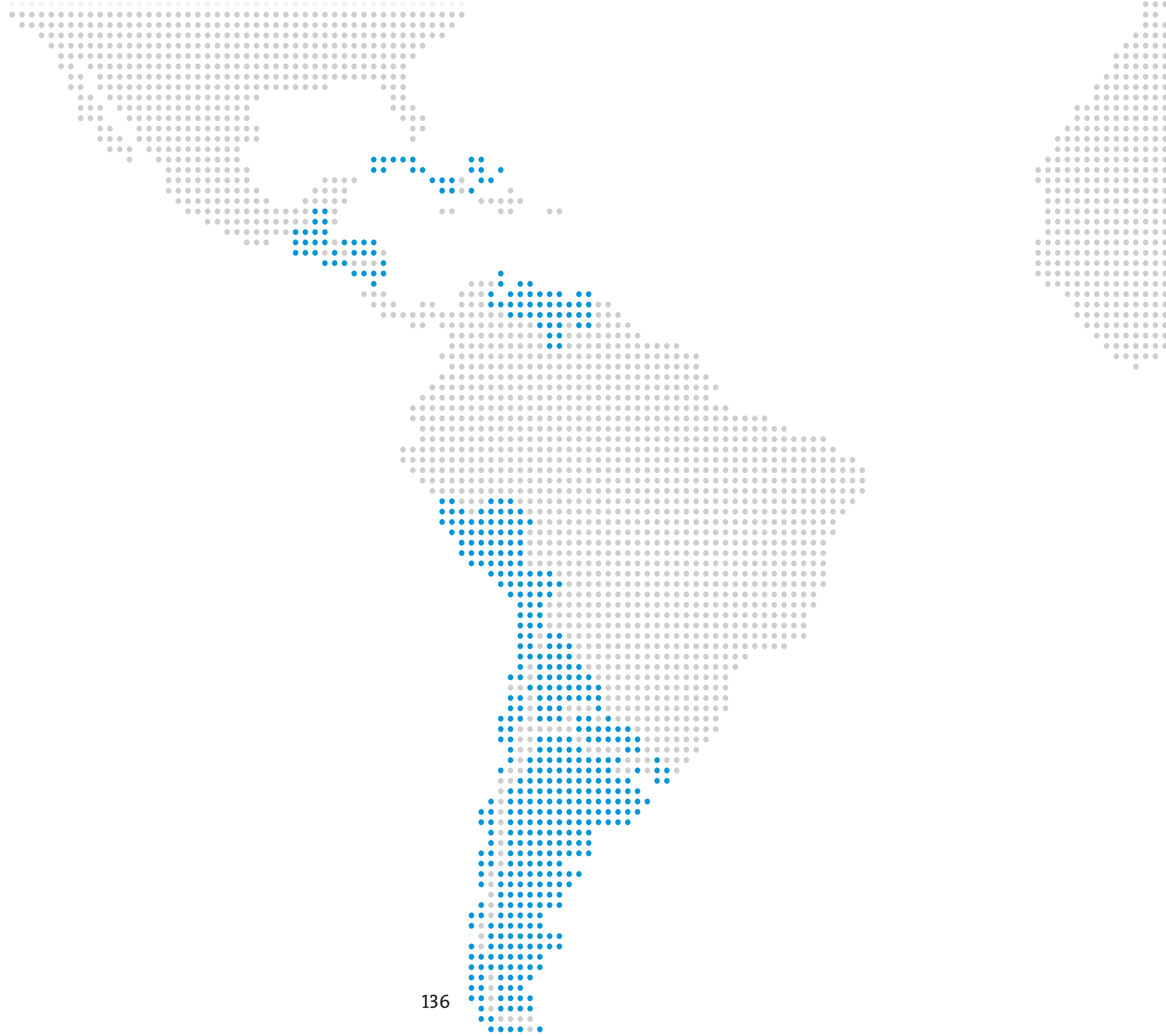
Honduras

Dominican Republic

Haiti

Nicaragua

Cuba



Source: Regional Protocols of Public Policies for Telehealth in Latin America Project, Inter-American Development Bank.

At present, there is an accelerated process for the development of national telehealth projects, driven by the initiatives of a different group of Latin American countries, and facilitated through coordination of PAHO/WHO, ECLAC, and the IDB, with active participation of countries which have better organized telehealth projects, especially, Mexico, Colombia, and Ecuador. ECLAC and PAHO/WHO have published on telehealth activities in the Region; PAHO/WHO is in charge of the discussion forums on telehealth issues; training for participation of all the countries and universities of the Region is organized by PAHO/WHO and IDB. Organization for the best practices committee of the Region in telehealth, also organized by PAHO/WHO and IDB, began the certification process in 2012 with participation of countries and major organizations in the Region. Nevertheless, there are still countries that lack a national project for telehealth.

Countries with national telehealth projects are Brazil, Colombia, Costa Rica, Ecuador, Mexico, Panama, and Peru. Bolivia, Venezuela, El Salvador, and Guatemala are in the process of developing projects. The remaining countries of the Region have national initiatives in place. The main activities center on teleconsultation in primary health care, and connection to higher levels of care or universities.

Conclusion: the countries of the Region are gradually taking ownership of the development of telehealth actions.

National Telemedicine and Telehealth Initiatives

Mexico [10-13]

The National Telehealth Program (NTP) was elaborated in collaboration with the members of the Interinstitutional Committee for e-Health, which includes representatives of the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social* [IMSS]), the Institute of Social Security and Services of State Workers (*Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* [ISSSTE]), the Health Secretariat (SoH), the National Health Institutes (INNS), and the Secretariat of Telecommunications and Transport (SCT) through the Coordination of the National e-Mexico System, academic institutions such as the National Autonomous University of Mexico (UNAM), the National Polytechnic Institute (IPN), the Center for Research and Advanced Studies of IPN (CINVESTAV), the Benemérita Autonomous University of Puebla (BUAP), and NGOs such as the University Cooperation for the Development of the Internet (CUDI), the Altius Foundation of Anáhuac University, the Southern Medical Foundation (*Fundación Médica Sur*), among others.

This program defines eHealth as "the use of information and communication technologies for the delivery of health services including applications of telemedicine, tele-education and telemonitoring." Telehealth is considered to be only one part of eHealth.

Objectives:

- Mexico should use telemedicine and tele-education in the national health system as elements to facilitate access to and improve the quality of medical care;
- Contribute to national health system objectives of effective coverage of its services through the use of telehealth for preventative and health care support in priority programs;
- Foster the establishment of telehealth infrastructure through satisfactory selection, incorporation, and use of biomedical technologies linked to information and communication technologies in support of medical care needs in the national health system;
- Promote and coordinate actions to fit the ethical, legal, regulatory, and organizational framework for safe and permanent execution;
- Collaborate and carry out initiatives for the development and training of human resources who support and provide telehealth services;

- Support the access of health professionals and the population to health knowledge through the creation of tele-education services to improve the quality of medical care.

Selected Results

Significant improvements have been achieved in the implementation of telehealth services in the country; of the 32 federal states (including the Federal District of Mexico), 14 participate in distance medical care, while 23 have programs of health tele-education.

Consensus has been achieved on regulatory frameworks, health care models, operative models, and ethical issues that should be attended to when using these technologies. Ongoing training of personnel has been a priority for these programs; during the last six years more than 20 training workshops and seminars have been developed for training, awareness, and exchange of experiences.

- In federal states, telehealth projects provided coverage for over 19 million people;
- Article 32 of the General Health Law was amended to include telemedicine practice, supported by the creation of the Official Mexican Standard for Distance Medical Care (currently under development);
- The telehealth observatory was established;
- Ethical standards for telemedicine practice were created;
- Teleconsultation was included in the official information systems;
- More than 407,000 teleconsultations took place in the ISSSTE between 2007 and 2012;
- More than 27,000 teleconsultations took place in the Secretariat of Health in 2012;
- More than 3,000 health professionals received training;
- Some 30,000 physicians and nurses used the tele-education network between 2007 and 2013.

Website:* http://www.cenetec.salud.gob.mx

*Website citations were provided by participants in this conversation; they are external to PAHO/WHO and their mention does not imply any endorsement by PAHO.

Brazil [14-17]

Brazil's telehealth program was established on 4 January 2007 by decree GM/MS N° 35, which created the Brazil Telehealth Networks as a pilot project that included nine specific initiatives. The focus was to strengthen the Family Health Program, a category of primary health care. [18]

The use of ICTs in different application areas became a reality. The Brazilian government implemented the National Bandwidth Plan (PNBL), with the objective of providing universal access to the Internet for the year 2014. This plan has provided universal access to the Internet in all public schools. In the area of health, the federal government is preparing to provide universal access to the Internet in its nearly 60,000 basic health units.

The Family Health Program had 32,000 family health teams in a total of 5,106 municipalities, covering approximately 85.7 million people (46.2% of the Brazilian population).

In February 2010, the decree GMM/MS No. 402 repealed decree No. 35 and expanded criteria of the program, based on the scope of the pilot project.

Teleassistance (teleconsultation and second opinions) and tele-education activities began as a result of demand for teleassistance. As of December 2010, there were 1,150 installed and working units supporting 6,500 family health professionals/technicians in 925 municipalities. These services accounted for 30,845 teleassistance actions and 372,626 supporting tests, as well as numerous tele-education activities in priority knowledge areas.

To date, nearly 8,000 health teams are directly supported by telehealth, covering a significant portion of the Brazilian population. This meets the health care goals of Brazil's Telehealth Program, while the pilot project continues with expansion of the network.

The Brazilian Telehealth Networks consists of 12 telehealth nuclei, deployed in 12 public universities of the 27 states. They are interconnected and include 1,171 basic health units, located mainly in remote regions but also in the metropolitan areas of 12 states.

The successful association with the University Telemedicine Network (RUTE), which has 76 nuclei in all the states, and with the RNP, through the Inter-Ministerial Program (representing the ministries of education, health, science, technology and innovation), signals a step forward in the program. The association supplies the nuclei with the infrastructure for Gbps bandwidth, connecting the university and teaching hospitals.

As of 2011, the Brazilian Telehealth Network program established a third regulatory framework, through Ordinance N° 2546 MS. In addition to expanding the program to the 27 states of the country, this new stage supports not only primary health but also other levels of care, taking into account the integration of health care networks.

Brazilian telemedicine and telehealth initiatives include the joint action of the Brazilian Telehealth Networks program, the University Telemedicine Network (RUTE), and the Open University of the Unified Health System (UNASUS), created in 2010, which gathers a network of public universities that develop open access collaborative courses and learning elements with the aim of promoting continuing education of health professionals according to their needs.

Web sites:* http://www.telessaudebrasil.org.br
http://www.telessaude.uerj.br/resource/goldbook/pdf/2.pdf
www.unasus.gov.br
www.rute.rnb.br

*The websites cited were provided by participants in this conversation; they are external to PAHO/WHO and their mention does not imply any endorsement by the PAHO/WHO.

El Salvador [19-21]

El Salvador participates in the telehealth project coordinated by the University of Minas Gerais, Brazil, together with 11 other countries of the Region. The project is supported by the IDB. El Salvador has been actively involved since 2010; it is now evaluating the progress of human resource education using tele-education and the first telemedicine experiences being developed at the Ministry of Health (MINSAL), in conjunction with the University of El Salvador.

An intensive process is currently underway to improve human resource capacity to achieve the objectives of the National Health Policy, i.e., improving the population's access to health as an essential human right, and, therefore, the population's right to have access to highly qualified health professionals. The first tele-education efforts began in 2011, comprising national and international videoconferences using a free software platform. Likewise, the first telemedicine experiences are being promoted between national reference hospitals and regional hospitals, which will decrease the time to diagnosis and treatment through consultations between specialized physicians of the Comprehensive and Integrated Health Services Networks (*Redes Integrales e Integradas de Servicios de Salud* [RIISS]).

These advances are part of the changes fostered by the Ministry of Health which, in its capacity as governing body of the National Health System, and within the framework of the government's 2009–2014 work plan, promotes the policy of social protection, which includes health policy. In June 2009 the Ministry began a profound restructuring of the health system in the country, defining eight core strategies that will, by the end of 2014, lay the foundations for a transformed National Health System. One of its priorities is the qualification of human resources, with a focus on the formation of strategy panels that will assist in the restructuring process. The training of 540 health managers at all managerial levels of the Ministry will end by 2013; the training is provided through the FORMINSAL platform.

Web sites:*http://www.salud.gob.sv
http://www saber.salud.gob.sv

*The websites cited were provided by the participants in this conversation; they are external to PAHO/WHO and their mention does not imply any endorsement by PAHO/WHO.

Guatemala

In 2012 there was interest in creating a national e-Health commission that would record, promote, and disseminate current and future e-Health efforts and projects in the country. During the same year, several officers of the Ministry of Health in Guatemala participated in the distance course on telehealth, delivered by the IDB/ Federal University of Minas Gerais (FUMG) Regional Protocols of Telehealth Public Policies project; some of the course participants would be involved in developing the e-Health commission. By the end of 2012, the Technical Vice Minister received a proposal on public health policies that should be established in the country. The proposal was assessed and re-defined and a final document was prepared containing the most relevant aspects to be taken into account in the country's e-Health policy. These aspects were defined considering all the criteria presented in the abovementioned course.

Early in 2013, actions to form the National e-Health Commission of the Ministry of Health were resumed, and it is expected to expand gradually and include public, academic, and private sectors. This Commission will be formed by the following internal departments of the Ministry of Health:

- Strategic Planning Unit
- Health Management Information System

- Comprehensive Health Care System
- Training and Education Units
- Human Resources Directorate
- International Cooperation Unit
- Vice Ministry of Hospitals
- Technical Vice Ministry

The Commission plans for the year 2013 are the following:

- Attain official status for e-Health public policy in the Ministry of Health of Guatemala;
- Create a ministerial agreement granting official status to the e-Health Commission within the Ministry and administration to guide national policies on e-Health issues;
- Include in the Annual Operations Plan in order to obtain a budget allocation for permanent activities of the Commission for subsequent years.

Panama [22, 23]

The Programa Nacional de Telemedicina y Telehealth (PNTT) (National Program of Telemedicine and Telehealth) of Panama develops several activities, all of them aimed at the application of ICTs for the optimization of health services; application such as Teleradiology, rural telemedicine and telepediatrics are routinely used.

The PNTT was created in 2002, when the Minister of Health, Dr. Fernando Gracia, through the ministerial decree 472 of August 6, 2002, laid the legal foundations of this system supported by the Universidad Tecnológica de Panamá, which offers supportive technical advice.

Telemedicine programs: 2008–2012
Telemedicine and teleradiology applications were successfully developed during this period. In 2012, the Virtual Hospital and the International Telepediatrics Program,were included, the latter with the international collaboration of the Children's Hospital of Los Angeles, California, United States.

Mission
The mission is to develop a health care system using information and communication technologies (ICTs) that will reach all Panamanian citizens and that will cover their health education, prevention of disease, diagnosis, and follow-up needs.

Vision
The vision is to have a National Telehealth Network throughout the country, connecting every health center, rural hospital, provincial hospital, and specialized hospital facility. It will be essentially based on the use of a unique electronic record allowing for HIS-LIS-RIS (hospital information system, laboratory information system, and radiology information system) connections, with information included in facility and backup servers.

General objectives

- Update the health care system to include the use of ICTs, adapting it to the new demographic and epidemiologic environment;
- Improve health conditions of all citizens;
- Help to reduce health inequalities;
- Guarantee adequate treatment in public health services;
- Ensure fair financing for health issues;
- Strengthen the National Health System, particularly those public institutions devoted to primary care and in remote areas.

Specific Objectives

- Train chief and intermediate officers in the basics of telehealth;
- Create a National Health Network System;
- Organize local telemedicine clinics;
- Elaborate protocols for telehealth care;
- Educate and train physicians, nurses, and auxiliary health workers in the use of health technologies and the application of the concepts suggested by PAHO/WHO;
- Organize local teams and telehealth care advisors. Schedule conferences on telehealth integration;

- Manage and organize health information;
- Improve management and control of inventories and cost.

Results
Rural telemedicine operates in the Comarca Ngobe-Buglé indigenous area of Panama and assists a population of 190,000 people who live in remote areas with very limited health services. For the northern area of Comarca, connections are made via satellite, connecting telemedicine clinics equipped with video telephones in the communities of Kusapin, Kankintun, and Santa Catalina with the Rural Hospital of San Félix. In the southern area of Comarca, the communities of Hato Chamí, Hato Julí, and Cerro Iglesias, are connected through Motorola radios with the Rural Hospital of San Félix.

Teleradiology is used in 32 rural hospitals that are furnished with digital x-ray systems connected to a network (some with frame relay and others via satellite) that sends radiographic images to a site in 3Panama City. Radiologists read the images and make their diagnosis in less than 24 hours.

Telepediatrics works as an Internet-based network, which connects telemedicine clinics and continuing medical education centers in two pediatrics hospitals of Panama City, a maternity hospital in Chiriquí, and the Rural Hospital of San Félix. In general, consultations are generated in remote hospitals and are assisted by the telepediatrics team of the Hospital del Niño, the main pediatrics hospital in Panama. The program is linked with the Children's Hospital of Los Angeles, California, where joint activities such as medical opinion, teleconsultations, discussions of clinical cases, telesurgery assistance, lectures, and continuing medical education are carried out.

Web site: *
http://www.minsa.gob.pa/

*The web sites cited here were provided by participants in this conversation; they are external to PAHO/WHO, and they do not imply any support by PAHO/WHO.

Peru [24-29]

The Ministry of Health of Peru (MINSA) has advanced the national telehealth program in Peru as articulated in the National Telehealth Plan (2006) and the Technical Health Standards in Telehealth (2009). The Ministry heads the Advisory Council on Telehealth, created by Decree N° 028-2005/MTC, which is responsible for implementing the National Telehealth Plan, ascribed to the Ministry of Health and formed by several institutions such as the Ministry of Transportation and Communications. The National Telehealth Plan includes projects related to improved access to specialized health services through distance consultations (teleconsultations); continuing distance training for health professionals of the Ministry of Health (tele-education); virtual discussion of clinical cases; and distance support for management (telemanagement) to contribute to the improvement of efficacy and efficiency of health care services. Within the framework of health reform, with the aim of improving efficiency, quality, and access to hospital and specialized services, the Ministry of Health of Peru has increased the use of the installed capacity in the whole country with the implementation of telemedicine and telehealth as a strategy for access to specialized health services in remote areas of the country.

Policy guidelines:

- Promote the application of ICTs in the health services of the country, as a means to contribute to social and human development, improving access to health services and health care quality;

- Foster the decentralization of the health system through telehealth, providing services to the people, regardless of their location;

- Facilitate the articulation and updating of care and administrative processes of the health system by integrating communications and information systems through telehealth;

- Advance the access to health information through telehealth, promoting the development of a health culture regarding disease prevention, rights, and obligations. Policies also seek to strengthen the mechanisms of social control of public health management with the aim of contributing to individual human development, as well as of the society as a whole, and the democratization of the health in the country;

- Contribute to the updating and continuing education of health personal through telehealth by means of distance training programs adapted to specific needs, by level of health care and complexity.

General objective
Develop, implement, and expand a comprehensive health system, with the purpose of improving and increasing the delivery of health services for the benefit of the general population, with emphasis on isolated and marginal areas.

Specific objectives

- Promote the implementation of a national telehealth network and advance its development, incorporating health establishments;
- Implement comprehensive health care programs with a focus on rural and marginal populations through a national telehealth network;
- Put into operation information, education, and communication distance programs for health professionals and the population through the national telehealth network;
- Strengthen and improve management processes of the National Health Service, improving its performance by using the national telehealth network.

Focus of development: Provision of health services

- Deliver health services in isolated areas;
- Decentralize the delivery of health services;
- Improve the decision-making capacity at the primary health care level;
- Improve the continuity of health care.

Applications or services

- Teleprevention
- Telediagnosis
- Telemonitoring
- Teleconsultation
- Tele-emergencies
- Epidemiological telesurveillance

Information, education and communication to population and health workers

- Contribute to the development of human potential in health;
- Establish the culture of health and disease prevention;
- Contribute to the democratization of health.

Accomplishments

- Experience of human resources in telehealth applications (Infosalud-MINSA, Alo-EsSalud, Red de Información Científica-EsSalud, etc.);
- Experience in the execution of telehealth projects (Enlace Hispano Americano de Salud: EHAS-Alto Amazonas, ALERTALima Sur);
- Experience in technological solutions adapted to the Peruvian context to be used in telehealth networks;
- Existence of health infrastructure at the national level;
- Existence of a Virtual Health Library in Peru;
- Existence of telecommunications networks at the national level;
- Current tendency to increase the use and number of Internet booths;
- General policy guidelines to promote widespread access to the Internet;
- Law and Regulation on Digital Signatures and Certificates;
- Existence of a Telehealth Advisory Council.

Web site:* http://www.telesalud.minsa.gob.pe/

*The web sites cited here were provided by participants in this conversation; they are external to PAHO/WHO, and they do not imply any support by PAHO/WHO.

Venezuela [30-33]

Telehealth project to strengthen primary health care in rural areas

Governmental intersectoral coordination between health, science, technology, innovation, and telecommunications in Venezuela has translated into joint activities in several areas. These include widespread connection of health facilities, evaluation of applications currently in use for health care management, training activities in service, and the design and consensus on a work document that lays the foundations of a master plan for the adaptation of the technological platform of the governing health body. In line with the strategy of this plan, the Ministry of Health has developed and executed, beginning in 2011, the project "Telehealth system to strengthen primary health care in rural, marginal, and hard-to-access areas."

Strategy

Contribute to the development of the necessary platform to facilitate the implementation nation-wide of the Health Information and Management System, oriented toward the delivery of timely, reliable, humane, and quality services.

Objective of the project

Create a telehealth system with primary outpatient health care facilities located in rural, marginal, and hard-to access communities, taking advantage of the services of the Simón Bolívar Satellite for interconnection with administrative agencies and regional and national hospitals.

Specific objectives of the project

- Develop a technological platform for the integration of first level health care facilities and the National Public Health System;
- Install training rooms and virtual triage in regional hospitals;
- Connect primary health care facilities and the National Public Health System;
- Train and build human talent through the telehealth platform.

Achievements in application or software

- An application has been designed for distance medical consultations based on the of the Ministry of Health;

- Harmonization achieved for criteria and digitalization of the integrated clinical record and data capture formats for reporting notifiable diseases;

- This application was developed with free software in accordance to Venezuelan legal standards, is compliant with international standards, and is easily managed in web format.

Connectivity and equipment

- Rural outpatient facilities with satellite connectivity in the following states: Amazonas (11), Delta Amacuro (6), Bolívar (9), Portuguesa (6) and Zulia (1). A total of 33 outpatient facilities have been connected for the purposes of this project;

- Two training rooms and virtual triage were installed in a national reference center (Hospital Universitario de Caracas) and at the regional level (Hospital de Puerto Ayacucho, Amazonas).

Training activities and design of virtual learning environments for rural physicians, health community workers, and specialized physicians

- Promotion and use of free software;

- Use of the application for medical consultation and for the surveillance system of notifiable diseases;

- Basic maintenance of equipment.

Ecuador [34-38]

The National Telemedicine/Telehealth Program is framed within the "National Plan for Good Living" with the essential goal of strengthening the health care model through a referral and counter-referral network between primary health centers and secondary and tertiary level hospitals, using telematic tools. This will assist the national health system to be universally and freely accessed by the entire Ecuadorian population through clinical, specialized, distance, and urgent consultations, as well as diagnosis and second opinions. Likewise, it is intended to promote programs in management, training, and bibliography consultation, as well as health promotion, disease prevention, research, and intercultural actions, in order to guarantee the principles of universality, equity, quality, and efficiency of the national health system in its Comprehensive Public Health Network.

The National Telemedicine/Telehealth Program was started by the Ministry of Public Health (MSP), through the Science and Technology Process and the participation and cooperation of different public and private institutions. The program develops projects that will gradually provide coverage to the 24 provinces of the country, supported by interinstitutional agreements between the Ministry of Public Health, the Ministry of Telecommunications (MINTEL), the National Secretariat of Planning and Development (SENPLADES), the National Secretariat of Telecommunications (SENATEL), the Ecuadorian Air Force (FAE), universities, etc. Executing this program implies:

- Having the physical infrastructure and connectivity;
- Equipping the selected health units;
- Providing adequate connectivity;
- Training health staff, support staff, and the community;
- Establishing the network of administrative, technical, and medical operations to explore this new form of management and delivery of health services.

At the same time, it is necessary to develop the legislation for telemedicine, including: law, policy, health care models, standards, guidelines, and procedures.

Implementation stages

Stage 1: the Pilot Project (2009–2011) Morona Santiago/Pastaza/Napo, is under way and near completion. During this phase, isolated and rural areas of the provinces of Morona Santiago (Hospital de TAISHA and San José de Morona Health Center) and Pastaza (Musullacta and Santa Clara health centers, Montalvo) will be connected to provincial hospitals (in Macas, Puyo, and Tena), general hospitals, and specialty hospitals (Eugenio Espejo Hospital, Isidro Ayora Maternity Hospital, Baca Ortiz Pediatric Hospital, and the teletrauma center of the Ecuadorian Air Force). This project is funded by the Telecommunications Fund (FODETEL).

Stage 2: The Sucumbíos/Orellana/Zamora and Galápagos project has been approved and given priority by the SENPLADES with financing from the MINTEL. It will provide coverage, in the 2011–2012 period, to the Amazon region through the Sucumbíos, Orellana, Zamora, Loja and Cuenca project. It includes sites in the Amazon provinces of Sucumbíos (Nueva Loja General Hospital), Orellana (Loreto Health Center, Francisco de Orellana General Hospital "Coca"), Zamora (Zumba General Hospital, Zamora General Hospital), and two reference hospitals in the cities of Loja and Cuenca.

Supplementation of stages 1 and 2: inclusion of new sites in the Amazon and Galápagos, and integration and strengthening of six telemedicine sites managed by the Technical University of Loja and two other sites by the Equinoccial Technology University of Quito.

Stage 3: expansion to the whole country during the 2012–2014 period, under interinstitutional management. Once the system is established nationwide, new rural sites will be gradually included and the equipment and the telemedicine services will be expanded.

Related projects and programs

Ecuador carries out projects and programs that complement and strengthen the actions of the National Telemedicine/Telehealth Program:

- Automation of landmark hospitals of the Ministry of Health. Pilot Project: Hospital de Macas;
- Project for structured wiring (connectivity) in 428 health units located in 15 provinces;
- Participation in the implementation of a national training program in telemedicine, led by the Ecuadorian Consortium for Advanced Internet Development (CEDIA) and the universities;
- Ecuador focal point in the IDB project, "Public Policies in Telehealth:"

- National Connectivity Plan, with priority in health and education;
- National Digital Readiness Program, led by the MINTEL;
- National EURO-SOLAR program will supply 91 rural communities that have no access to electricity with a source of power. Solar kits with photovoltaic solar panels and a wind turbine will be installed for the production of energy; this project is led by the Ministry of Electricity and Renewable Energy (MEER).

Costa Rica [39-41]

Within the context of health sector reform planned in the 1990s, and as part of the use of ICTs to improve the access of the population to health services in the country, the creation of a telemedicine program was planned in 1964 in Costa Rica. The initial objectives of the program, its implementation, and initial results are detailed below, followed by a description of necessary changes to improve the program, as well as the introduction of new equipment, current administration, and present results.

General objective
In its initial stage, the telemedicine program had the following general objective: “To provide the Costa Rican population with increased, timely, and equitable coverage of health care, improving the access to specialized, high quality medicine, overcoming the barriers of distance and time by the use of telemedicine.”

Specific objectives

- Allow populations in remote locations to have access to health services of the highest level;
- Provide the health care staff with the ability to remotely interact in the direct care of patients;
- Reduce waiting times and lists for appointments with specialists;
- Reduce the number of patient transfers to the metropolitan area, preventing the medical, socio-economic, and cultural consequences of this situation;
- Deliver electronic tutorial sessions, conversations, and conferences to the health care staff at the three levels of care simultaneously and interactively. Support democratic participation of communities in the improvement of health;

- Reduce costs for health care, institutional plans, and medical and learning programs;

- Promote the use of this tool at the sector level with the aim of expanding its use and, therefore, efficiency in the delivery of services.

Application areas

- Teleconsultation

- Distance education

- Administrative tools

Initial stages of implementation

During the first stage of implementation of the telemedicine program the purpose was to interconnect the entire hospital network so that secondary level hospitalization and emergency services had the support of specialists working at tertiary level hospitals, thus improving decision-making capacity.

Three stages were devised to that end. In the first, telemedicine and videoconference equipment was installed in eight national and regional hospitals. This was in addition to videoconference equipment in the Ministry of Health, the head offices of the Social Security Fund and the Teaching Center in the same institution. In the second stage, equipment was installed in 10 hospitals, and in the last stage, the 11 remaining hospitals were furnished.

Impact of teledermatology in teleconsultations

Unlike the situation with teleconsultations during the first three years of the telehealth program, there was a remarkable increase in the number of teleconsultations with the implementation of a pilot project in teledermatology in 2004 and 2005. These results set a valuable precedent for a new pilot project, in a different region and in different conditions: the Golfito/Puerto Jiménez project.

Lessons learned for implementation

During the last three years, hard work has been done to encourage the use of the new tool in all the centers. At the same time, work is being done to develop appropriate instruments to measure the use of equipment; this is expected to be completed in the year 2012. Some key issues are mentioned below on the successful implementation of a telehealth program:

- There should be signed commitments from the centers equipped with telemedicine and videoconference equipments;

- Staff at the central level should be devoted exclusively to the general development of the program and its support;
- Telemedicine and technical support coordinators should work in participating sites; high level of collaboration is needed for the development of procedures and protocols;
- Measurable objectives with monthly reports on use should be in place; include the use of the program systems within assessment parameters of hospitals and clinics.

Colombia [6, 42-44]

An important achievement for the country was Law 1419, passed in 2010, which establishes guidelines for the development of telehealth in Colombia. As an advisory organ of the Ministry of Health and Social Protection, this law allows for the creation of a Telehealth Advisory Committee formed by the Ministries of Health and Social Protection, Communications, National Education, Treasury and Public Credit, Housing, Territorial Development and Environment, in addition to permanent representatives from scientific associations, universities, and research centers. Also, the law mandates:

- The creation of a connectivity map according to the priorities in health, education, digital literacy, penetration of ICTs, regional development, and agendas of interest, taking into account the characteristics of the populations, exploring and assessing the types of connectivity designed for the implementation and development of telehealth;
- The allocation of resources to fund investments required in connectivity to develop telehealth in public health institutions in Colombia, according to the recommendations of the Telehealth Advisory Committee;
- That insurers and service providers of the Social Security System in Colombia offer as part of their client service portfolios or capacity, regardless of benefit plans, telemedicine as an adequate, effective, and rational service modality, facilitating free access and choice for the user, which will contribute to its development and sustainability;
- Telehealth knowledge management in building human talent in health.

Telehealth policy
The country has a telehealth policy aimed at improving health conditions and directed to the entire Colombian population, particularly people living in remote, marginal, and isolated areas of Colombia and health facilities of medium and high complexity. The main focus is socially and economically vulnerable people. The policy is to promote the development and use of ICTs in entities of the health sector, with the aim of improving the quality of health care, training of personnel, and institutional management.

Resolution 1448 of 2006 is in force and allows the option of using telemedicine services by providers in the general health social security system. Adaptations are currently being scheduled according to the progress of the country in this area.

The delivery of services under the telemedicine modality is foreseen as an element for authorization of the integrated and comprehensive health care networks (RIISS) and policy making to improve decision making at primary levels of care.

National Telehealth Plan: 2010–2014
The national telehealth plan (Plan País en Telesalud) has been devised, and its objectives are to:

1. Improve access to timely and quality health services;
2. Improve the decision-making capacity in health facilities, especially those in remote areas;
3. Provide training to personnel through e-Learning;
4. Improve the technological infrastructure and promote the adoption of international standards;
5. Promote the adoption of interoperability standards of health information systems;
6. Contribute to the improvement of institutional management;
7. Design and implement the patient-centered information system;
8. Improve access of the population to contents of interest in health issues;
9. Improve and strengthen intra- and intersectoral coordination;
10. Foster and strengthen the export of health services (medical tourism);

11. Encourage research development on e-Health in the country;
12. Develop monitoring, follow-up, and evaluation schemes on compliance with the plan.

Development Strategies of the Plan País en Telesalud

1. Infrastructure
2. Services
3. Electronic clinical record and information management
4. Exportation of health services
5. Knowledge management: eLearning
6. Research, development, and innovation

This plan is being carried out in the framework of the national government's ICT plan and favors the alliance of public and private institutions for better service in hard-to-access regions. Participants in the project include the Ministries of Health and Social Protection and Information and Communication Technologies; the Center for Telecommunications Research (CINTEL); the Telemedicine Center of the National University of Colombia; the Center of Excellence ETI-ARTICA; The University of Santiago de Cali; the Cardiovascular Foundation; the Saludcoop Group; ITMS Telemedicina of Colombia; and the secretariats of health of the regions, among other private and public institutions.

Localization of Specialists *1

Walter Curioso Vilches

Born in Peru, he is a physician and surgeon with a master's degree in public health and a PhD in biomedical informatics. He has authored more than 100 publications related to the use of information and communication technologies in health, mHealth, and telemedicine. At present, he works as Director-General of the General Office of Statistics and Informatics of the Ministry of Health of Peru and is President of the Peruvian Association of Biomedical Informatics.

Shuji Shimizu

A physician and surgeon, he has participated in the joint Korea-Japan project on telemedicine, which has been adopted widely in the Asia-Pacific Region. He is director of the Telemedicine Development Center of Asia at Kyushu University Hospital, as well as member of the medical working group of the Asia-Pacific Advanced Network (APAN) Consortium which promotes telemedicine to connect worldwide centers and deliver continuing medical education.

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A physician and surgeon, he has participated in the joint Korea-Japan project on telemedicine, which has been adopted widely in the Asia-Pacific Region. He is director of the Telemedicine Development Center of Asia at Kyushu University Hospital, as well as member of the medical working group of the Asia-Pacific Advanced Network (APAN) Consortium which promotes telemedicine to connect worldwide centers and deliver continuing medical education.

Andrés Fernández

He is Social Affairs Officer in the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), and also coordinator of Electronic Health Care in the ECLAC-@LIS Project for the development of the information society, co-funded by the European Union. He is editor of the book "S*alud Electrónica: Avances y Desafíos en América Latina y El Caribe*" and of the *Manual de Salud Electrónica para directivos de servicios y sistemas de salud*.

Adrián Pacheco-López

Born in Mexico, he is a biomedical engineer with a master's degree in telemedicine. He serves as Director of Telehealth at the National Center for Health Technology Excellence. He is President of the Mexican Association of Medical Informatics, Secretary of Health Level Seven-Chapter Mexico, and a telehealth specialist. He is professor for the Certificate Program in Telemedicine at the Universidad Autónoma de Puebla and he is online tutor of the course "Modelo de Teleconsulta en Telemedicina." He wrote the recommendations on telemedicine and telehealth for the Secretary of Health.

Héctor Osvaldo Fuenzalida Cruz

He is a physician and surgeon specialized in dermatology and venereology, with a master's degree in medical sciences from the School of Medicine, University of Chile. He is certified in Management of Health Institutions, version XII, from the School of Medical Sciences, University of Santiago de Chile. His work experience includes being the Chief of the Dermatology Services, Hospital Barros Luco; Head of the Outpatient Network Unit, Integrated Division of Health Care Networks; and Undersecretary of Health Care Networks, Ministry of Health.

Ana Estela Haddad

She is associate and adjunct professor at the School of Dentistry, University of Sao Paulo, and served as consultant for the Minister of Education and Director of Management of Health Education in the Secretary of Work and Education Management of the Ministry of Health. She has worked in the department in charge of the national policy on training and continuing education for health professionals, including the elaboration and application of the Brazilian TeleHealth Program.

PAHO/WHO specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to get in touch with them, please forward an email to: ehealth@paho.org.

*1 *The list of specialists published here is the result of the recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

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Web Site *2

Centro Nacional de Excelencia Tecnológica en Salud (National Center for Health Technology Excellence), Mexico

Its primary responsibility is to systematically and objectively disseminate information on medical devices, telehealth, guidelines on clinical practice, and evaluation of health technologies. In this way it can promote appropriate, safe, and efficient use of health technologies as an instrument for decision making for the benefit of the population and the excellence of clinical practice.
http://www.cenetec.salud.gob.mx

Telehealth Program (Brazil)

The Telehealth Program of Brazil offers the following services to professionals and workers of the Health Care network of the National Ministry of Health of Brazil: teleconsultation, telediagnosis, tele-education and training, second opinions.
http://www.telessaudebrasil.org.br

Telehealth in Peru

Telehealth in Peru is becoming a reality, as in other countries of the Region and the world, advancing access to health services at all health care levels, providing technological services, allowing a coordinated and immediate health care response, and establishing rapid and precise diagnosis in case of emergencies. Peru has a National Telehealth Plan, approved by the Supreme Decree N° 028-2005-MTC; and a Technical Health Regulation in Telehealth, approved by the Ministry of Health, Resolution N° 365-2008/MINSA.
http://www.telesalud.minsa.gob.pe/

University Telemedicine Network (RUTE), Brazil

RUTE connects university and teaching hospitals of Brazil and enables the use of applications requiring more network resources. It assists in the exchange of data of telemedicine services; integration of professionals, researchers, residents, and students in daily scientific debates in different specialties; and provides distance services developed in the country's university hospitals for professionals in other cities.
http://rute.rnp.br/eventos

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee of validity of the information included. The only purpose of offering links to external sites is to provide information regarding the existence of further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not represent the opinions of PAHO.*

The initiatives mentioned in this section were selected from the Regional Protocol of Public Telehealth Policies Project for Latin America, supported by the IDB, together with PAHO/WHO and ECLAC, as best telehealth practices.
http://www.medicina.ufmg.br/proyectobid/

National Telehealth Program, Mexico

Centro Nacional de Excelencia Tecnológica en Salud (CENETEC)
http://www.cenetec.salud.gob.mx
The National Telehealth Program was elaborated in collaboration with members of the Inter-institutional Committee on eHealth, which includes representatives of the Social Security Institute (IMSS), Institute of Social Security for State Employees (ISSSTE), National Health Institutes, the Secretariats of Health of the states, and the Telecommunications and Transport Secretariat (SCT), through the Coordination of the National e-Mexico System. Academic institutions represented include the National Autonomous University of Mexico (UNAM), National Polytechnic Institute (IPN), Center of Advanced Research of IPN (CINVESTAV), Benemérita Autonomous University of Puebla (BUAP). NGOs include the University Cooperative for Development of the Internet (CUDI), the Altius Foundation of the University of Anáhuac, and the Fundación Médica Sur (Medical Foundation South), among others.

Educational activities in the context of an academic telehealth nucleus

School of Medicine of the Federal University of Minas Gerais, Brazil
http://www.medicina.ufmg.br/
The Nutel (Telehealth Center) of the School of Medicine of the UFMG, has worked in telehealth education and health care. The activities have been developed through online and offline teleconsultation, web videos and conferences, telesurveillance, distance courses, simulation, design and teleemergency services, as well as technological innovation projects. Regarding distance education, instructional videos, 2D and 3D images and animations have been produced. Nutel participates in the National Telehealth Program of the Ministry of Health of Brazil and is associated with the telehealth municipal health program in the city of Belo Horizonte, Minas Gerais, Brazil. It participates in national and international events and projects, among them, the IDB telehealth project. The center works in the postgraduate area in telehealth in the UFMG. Distance education, web courses, and conferences are considered Nutel's most successful practices, especially for public health professionals in Brazil, as well as the implementation of telehealth resources in the Unified Health System (SUS) of Brazil.

Ministry of Health – Brazil

http://www.saude.gov.br/

The telehealth project was started in Brazil in 2007 with the deployment of telehealth in nine university centers of nine states in the country, which were connected with 900 municipalities within the health system and the participation of 2,700 family health teams. In 2011, the Ministry of Health began expanding the project through the creation of 63 regional and state scientific and technical centers, comprising 3,256 municipalities and 16,836 family health teams. This process implies the institutionalization of telehealth in the Brazilian public network.

Minas Gerais Teleassistance Network: Telehelp network in remote regions

http://www.telessaude.hc.ufmg.br

Hospital Clinic/ UFMG

Since 2006, a collaboration network of the six public universities of the State of Minas Gerais has provided telehealth services to remote areas of the state. In six years of operation, 660 municipalities, equivalent to 821 health service points have been connected to the Teleassistance Network of Minas Gerais (RTMG). This represents coverage for 77% of the 1,916 family health teams of the state, and 87% of municipalities, and a population of less than 14,000 inhabitants.
Only 4% of the cities of Minas Gerais with a population larger than 100,000 inhabitants have coverage; these cities are the most developed and have better health and transportation infrastructure. The State Government is the main source of funding for the service, although the network also receives funding from the federal government, municipal governments, and research funding entities. The RTMG provides services not only for PHC but also covers secondary and emergency networks, and offers teleconsultation and telecardiology services. In its seven years of operation, the RTMG performed 1.2 million electrocardiograms and 50,000 teleconsultations. Economic indicators show a return on investment of $3.45 dollars. The RTMG model, confirmed by the evolution of the research project providing innovation in the public policy of telecardiology in the state of Minas Gerais, Brazil, is an example of sustainable telehealth service.

Economic sustainability of the telemedicine system primarily depends on the efficacy of avoiding referral of patients outside a district. The referral cost represents an important part of the health budget when patients must be transported and treated in big cities. Therefore, the RTMG developed a cost-benefit assessment system which makes it possible to determine the efficiency and effectiveness of telemedicine (telediagnosis and teleconsultation) in reducing the costs of caring for patients, while ensuring better access to the health system.

University Telemedicine Network (RUTE), Brazil

http://www.rnp.br/

National Network of Learning and Research – RNP

The Brazilian telemedicine and telehealth initiative offers videoconference, diagnosis, second opinion, continuing education, and web conferences, by connecting university and teaching hospitals with municipalities and remote regions through the RNP. The initiative operates three important projects nationwide: the University Telemedicine Network (RUTE) (www.rute.rnp.br), the National Telehealth Program applied to PHC (www.telessaudebrasil.org.br), and the Open University of the Unified Health System (UNASUS; www.unasus.gov.br/). These projects are funded by the Ministry of Science, Technology, and Innovation; the Ministry of Education; and the Ministry of Health; local, state, and national health institutions; and international collaboration projects that conduct research, innovation, development, planning, management, education, and assistance.

The deployment of RUTE in Brazil has facilitated the gradual connection of university and teaching hospitals in the communications infrastructure of the RNP, enabling the integration of the health service network in the network for academic collaboration in health. RUTE was started in 2006 with funds from the Ministry of Science, Technology, and Innovation and the support of FINEP and the Brazilian Association of University and Teaching Hospitals. Initially there were 19 hospitals in the network, and currently there are 76 telemedicine nuclei connected to the RNP, with an advanced connection infrastructure in Gbps. These nuclei have been formally accepted in the national registry of health establishments, all are fully operational with certified videoconference rooms. Resources are available until 2016 to integrate, through the RNP communications infrastructure, 150 telemedicine and telehealth nuclei in federal, state, and municipal public university and teaching hospitals.

An important outcome of institutional integration is that since 2007 special interest groups have been created in the following specialties and subspecialties: family health, cardiology, radiology, oncology, nursing, dentistry, multidisciplinary residency, urology, coloproctology, ophthalmology, dermatology, child and adolescent health, orthopedics and trauma, indigenous health, among others. The network now includes more than 300 educational, research, and health institutions, working with 45 special interest groups, with two to three half-day sessions and scientific practices and more than 600 scientific video sessions and web conferences in 2012. The deployment of RUTE is fostering the networked integration of the health community. The progress in telemedicine and telehealth practice in Brazil has been advanced through distance continuing education, new research consortia, collaborative development, and distance assistance. These practices are also integrating institutions of the Region and special interest groups are participating in different specialties.

Tele-education, Health Services in Zacatecas, Mexico

With the collaboration of the General Hospital of Zacatecas, the health services of the State of Zacatecas have offered national and international medical videoconferences, without interruption, since 2006. They are considered pioneers in telemedicine in Mexico and have centers in different institutions, including the following: Technical University of Loja (UTPL), Ecuador; Autonomous University of Nuevo León (UANL), Mexico; four centers located in the state of Guerrero, Mexico; the National Center for Technological Excellence (CENETEC), Telemedicine Oaxaca, Mexico; Teleconsultancy Oaxaca, Mexico; and the General Hospital of Fresnillo, Zacatecas, Mexico. New centers worth mentioning are: the Hospital of Mental Specialties, Calera, Zacatecas; Telemedicine Morelia, Mexico; the Health Center Penjamillo, Morelia, Mexico; as well as the School of Medical Sciences of La Plata, Argentina.

Telehealth, University of Caldas, Colombia

This group conducts telemedicine research and virtual education and delivery of services for the School of Health Sciences of the University of Caldas, in Colombia. It has provided teleconsultation services in 17 specialties for 20 departments in 105 hospitals of the country in agreement with the Ministry of Health and Social Protection, the Social Security Fund for Communications (CAPRECOM), the Government of Caldas, and the Territory Health Directorate of Caldas. As a group, it promotes education and modernization in the health area through the development of ICTs, facilitating access to digital publications by health professionals in municipalities and rural areas of Colombia, based on the epidemiological profile of morbidity and mortality, which contributes to training health professionals. In 2010, Telehealth was acknowledged by the National Academy of Medicine and the Academy of Medicine of Caldas for the work and execution of social projects in telemedicine and virtual education in the country. In addition, it received the Latin American Frida Award /eLAC 2010 for its achievements in the development of the information society in the Region.

National Telehealth Networks Program, Brazil; Amazon Telehealth Nucleus, University of the State of Amazonas

http://www.uea.edu.br/

In Brazil, telehealth has been consolidated through the implementation of the National Telehealth Program (www.telessaude.org.br). in nine states. This is an initiative of the Ministry of Health in collaboration with the Ministry of Science, Technology, and Innovation. The main objective of the program is to provide physicians, dentists, nurses, technicians, and community health workers who are part of family health teams in the most remote regions of Brazil with the ability to exchange information and knowledge through the use of ICTs. The aim is to reduce health costs by means of professional development, reduction of unnecessary transfers of patients, and the performance of disease prevention activities, using knowledge of the most recent advances in ICT, produced in the most important university centers, in order to promote integration and health improvement.

In August 2005, the Amazonas Telehealth Nucleus began its activities, operating through the Amazonas Telemedicine Unit of the School of Health Sciences of the University of the Amazonas State (ESA/UEA). Between 2005 and 2011, 1,741 teleconsultations took place, 12,504 professionals participated in tele-education, and 100,534 supporting tests (tele-electrocardiograms) were carried out through the Amazonas Nucleus. The Amazonas state encompasses culturally diverse areas and populations, such as riverside and indigenous peoples living in remote and isolated areas. When considering the distances and the difficulties relating to the isolation of municipalities, the limited road network, and the almost complete lack of bandwidth connectivity to the Internet in the state, the activities of the Amazonas Telehealth Nucleus/Telehealth Networks Program of Brazil, represent a timely strategy to favor social inclusion and the improvement in the quality of life of the populations of this region.

Telemedicine and Telediagnosis, Dante Pazzanese Cardiology Institute, Brazil

http://www.idpc.org.br/

Through videoconferences developed by RUTE, the Dante Pazzanese Cardiology Institute (IDPC) offers a weekly cardiology forum to discuss issues of interest regarding cardiology and three annual courses, including the intensive course in cardiology (71 courses will have taken place as of 2013), the Autumn Symposium, and Spring Symposium. In collaboration with the Ministry of Health of São Paulo, the Institute supports a telediagnosis project called Tele-ECG. It consists of a traditional ECG module that uses mobile technology in primary health care centers in the state of São Paulo. The project started in 2008 and equipment has been installed in 123 different health centers (information provided by the Health Department). Remote sites perform ECG tests that are transmitted to a medical center through cell phone systems. The data stored in remote IDPC servers is accessed, the medical center analyzes the ECG signals and patient data, the report is transmitted again to the point of origin, informing personnel at the health units on the condition of each patient. At present, they are receiving an average of 800 daily tests and have a database of approximately 420,000 reports. The aim of the project is to have connections with 200 sites.

Tele-ECG

Municipal Secretary of Health of Belo Horizonte

The aim of the Municipal Tele-ECG Health Project of Belo Horizonte (SMSA) is to supply health units of the Unified Health System-Belo Horizonte with their own network and digital electrocardiography in order to provide reports that have been transmitted to the UFMG Hospital.

Cardiovascular disorders are common in the general population and are the main cause of hospitalization and death in the city. The ECG is a simple, low-risk, low-cost, and highly effective diagnostic tool. The Belo Horizonte health system's network performed ECGs in specialized units and in 2008, in order to improve the health care of patients with heart conditions at the primary health level, the municipality deployed the TeleECG in the basic health services.

Digital ECGs were purchased, and equipment (computers and printers) and the network infrastructure were used in the existing health centers. Nurses and nurse technicians were trained in test application, submission and sending images to the Report Center located at the Hospital de Clínicas. Physicians from the family health teams were trained in interpretation and identification of normal individuals through the distance course in collaboration with the School of Medicine of the UFMG. Diagnosis and reports are delivered by the Hospital de Clínicas.

After the test was performed in 21 basic health units, the TeleECG was increased to 158 units, including for basic health units and urgent care centers. Currently, some 8,000 ECGs are performed monthly, of which an average of 3,700 are sent to the central diagnosis unit.

The main advantages obtained with the implementation of TeleECG were: a) convenience for patients, since they do not have to travel to a specialized unit to have the test; b) promptness of decision making and access to approval (up to 15 minutes in a case identified as urgent and up to 48 hours for non-urgent tests); c) access to a specialized center for the discussion of reports, using "chat" software; d) qualification of referrals to specialized units; and e) contribution to continuing education of physicians in basic health units.

Prof. Fernando Figueira Institute of Comprehensive Medicine (IMIP), Brazil

http:// www.imip.org.br

IMIP is the most important philanthropic Unified Health System hospital with full, public health care in Brazil. It provides primary level care through the Community Relationship Program (medical coverage for 70,000 people in vulnerable situations), and the Indigenous Health Program (medical coverage for 76,000 natives). The complex has a high level of complexity and is a regional reference hospital for northeastern states in Brazil. The IMIP was the first northeastern facility to be certified as a university hospital by the Ministry of Education and the

Ministry of Health, as well as the first "Friend of the Child" hospital. The IMIP is a reference center in health care, teaching and research areas, and is accredited by the Ministry of Health as a National Reference Center for Comprehensive Health Care Programs for Women and Children, Collaborating Center of the National Hospital Humanizar, Advanced Center for Supervision and Assessment of Primary Care, and Collaborative Center for Quality Management and Hospital Care, and is the only institution in Pernambuco which is part of the GeAH Network which collaborates in technology and education development in health care and hospital management, supported by the Ministry of Health in partnership with PAHO/WHO.

Telemedicine at IMIP began in 1997 when the pediatric oncology department started to participate regularly in videoconference sessions with St. Jude Children's Hospital (United States). In 2008, it was the nucleus for distance education established within the institution, delivering courses in several areas. In 2011, IMIP created its Telehealth Nucleus, a unit devoted to the delivery of services in teleassistance, tele-education and telemanagement areas, which has promoted interinstitutional collaboration inside and outside the state of Pernambuco. In 2012, it was the first hospital in the Unified Health System of Brazil to join RUTE. Telehealth actions have been mainly focused on the hospital, through sessions with clinical video collaboration, meetings, and scientific management of different medical specialties, social work, nursing, nutrition, and psychology.

Information and communication technologies to improve the quality of maternal and neonatal attention, Ecuador

School of Medical Sciences of the University of Cuenca

http://medicina.ucuenca.edu.ec/

Research was carried out to evaluate an educational strategy in evidence-based medicine to improve the quality of emergency obstetrics and neonatal care, directed to professionals involved in prenatal care, delivery, puerperium, as well as neonate health care. Differences in knowledge and practices in emergency obstetric and newborn care (EmONC) were compared before and after the intervention. An interdisciplinary team from the University of Cuenca and the Ministry of Health designed and implemented an Internet portal that served as an information dissemination center for the virtual teaching of the program contents. This portal facilitated the communication between hospital professionals, the Provincial Directorate of Health, and the School of Medicine. The training helped the staff to develop abilities for the access and management of ICTs, such as: the perinatal information system, virtual libraries, health software, web portal for the project, electronic mail, Internet, among others, to analyze, monitor, and establish priorities in the causes of maternal and neonatal morbidity and mortality and, based on that, improve the coverage and the quality of obstetric and neonatal care.

SOS Telemedicine Program for Venezuela

School of Medicine, Central University of Venezuela

http://sos.ucv.ve

Venezuela is a country with marked inequalities in the availability and quality of specialized medical care in most rural and marginal urban populations. Access and communication are difficult in some regions; deterioration of living conditions has a negative impact on health; and health workers in areas distant from urban centers suffer from isolation and a lack of educational opportunities. This reality hampers patients from receiving equitable, timely, and quality care from the public health system.

The SOS Telemedicine for Venezuela, a program of the School of Medicine of the Central University of Venezuela (UCV), is a network that uses ICTs to equip and connect primary health care centers with specialized physicians from the UCV in order to improve decision-making, provide distance learning, transfer technologies to the regions, build capacity, and assess the benefits of telemedicine in the country.

The SOS Telemedicine for Venezuela methodology includes research in eHealth, tele-education, software and telecommunications engineering, teleconsultation processes, telediagnosis, technological platforms, standards, interoperability, management, management indicators, users' demands, integration with social networks, and cooperation with academic and governmental entities, private companies, and international organizations.

After five years of implementing the telemedicine program, there was a clearly conceived strategy , a supportive social network, financing, a qualified multidisciplinary professional team, and a growing telemedicine network with 35 (outpatient) primary health care centers equipped and connected with the School of Medicine of the UCV (as of January 2013). These outpatient centers are located in island regions, in the Amazon rainforest, and along the Orinoco River (states of Nueva Esparta, Anzoátegui, Amazonas, Miranda) and in the near future will be connected in the state of Zulia (Sierra de Perijá), on the border with Colombia.

The SOS Telemedicine program provides health care workers the services of second medical opinion, Internet protocol (IP) telephone, video on demand, video billboards, and videoconferences. It has its own application for teleconsultation/telediagnosis developed on free software, with 226 medical specialists participating. The program has developed an electronic medical record and a state-of-the art technological platform for telemedicine and tele-education; it has supported 18 telemedicine thesis students, receives the support of university authorities and participation of regional authorities, has launched a YouTube channel with multimedia information about the program (http://youtube.com/TheSOStelemedicina), collaborates with national and international universities, has national and international positioning, and maintains a strong alliance with private technological companies.

Thanks to the telemedicine program, it has been possible to show that with the commitment and participation of different social players and the adequate use of ICTs, telemedicine becomes an alternative and, in many cases, the only option for offering general and specialized distance medical support. It also offers an excellent means of providing continuing medical education, which supports health professionals in their work of delivering quality, timely, and equitable health care for the benefit of patients.

Telenetwork of Human Milk Banks (SIG Tel@rBLH)

The National Health Institute for Women, Children, and Adolescents Fernandes Figueira (IFF/Fiocruz), Brazil

http://www.redeblh.fiocruz.br ; http://www.iberblh.org

The SIG Tel@ rBLH, or tele-network of human milk banks was created in 2009 under the coordination of the Oswaldo Cruz Foundation (Fiocruz) in the Institute Fernandes Figueira (IFF). It is a special interest group pertaining to RUTE, aimed at increasing knowledge exchange and technology transfer in the field of breastfeeding and human milk banks as strategic components to achieve the Millennium Development Goals (MDGs) and, particularly, the reduction of infant mortality. Two activities are worth mentioning:

- Telehealth to improve the life of the children of the Amazon region and Africa. Courses and continuing training is delivered by synchronic and asynchronic videoconferences, aimed at health professionals of the health care network who collaborate from remote locations.

- Telehealth for human milk banks, for the health of women and children. This is the largest network of human milk banks in the world, and represents an international strategy to guarantee the feeding and nutrition of neonates and breastfeeding women and has a direct impact on the health of the population through, for example, syphilis detection in human milk bank donors.

Conclusions

- Telemedicine and telehealth activities allow not only distance education, collaborative research, and distance assistance, but also management and assessment of their execution and progress.
- The participation of health professionals in hands-on and scientific virtual sessions promotes increased knowledge, use of best practices, integration of professionals, and the creation of consortia.
- The actions of the ministries of health to promote and foster the application of national telehealth programs strengthen national health plans.
- Collaboration of health research and education institutions and their inclusion in the actions of the ministries of health promote an increase in the quality of health care together with a reduction of costs.
- In general, the governments of the Region take ownership of developing national telemedicine actions.
- The integration of research and teaching institutions in advanced academic networks contributes to increasing quality and reducing costs.
- The academic-government-business partnerships are crucial for development and innovation.

Recommendations

Recommendations to provide direction for national institutions (governments, universities, NGOs, the private sector) and international organizations

- Strengthen and increase the use of distance communication media in order to obtain data of its operational units, manage and apply the national health plan, evaluate and recommend procedures.

- Participate in advanced academic networks to collect data on the progress of formal and practical knowledge, recommend procedures in theme networks and facilitate the integration of health managers, researchers, professors, residents, students and professionals.

- PNTs should favor distance education, foster collaborative research, coordinate distance assistance and manage and evaluate their execution and progress.

- Universities, university and teaching hospitals, and public and private research centers should submit to the ministries of health their models, progress, proposals and projects for the assessment and consolidation of academy-government-companies consortiums, and their alignment with the demands of governmental priority theme areas.

Recommendations to provide direction for PAHO/WHO and its eHealth strategy

- Undertake all efforts, together with the countries and the ministries of health, to implement national programs on best practices in telehealth.

- Together with the countries of the Region, take action to integrate advanced academic networks and national telehealth programs.

- Maintain PAHO/WHO representation in national telehealth programs, as a means of providing them with formal support

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ANNEXES

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Video Interviews with Author(s)

eHealth Conversations: Telemedicine

http://www.paho.org/ict4health/podcast/Entrevista-Telemedicina.mp3

Available in Spanish only

Podcast--Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Telemedicina.mp3

Available in Spanish only

Twitter messages on #telemedicine and #telehealth

#Telemedicine is based on remote assistance, continuing distance education, and collaborative research.

The term #telemedicine refers to physician activities; #telehealth includes all the areas of health.

Did you know that #telemedicine literally means "cure at a distance"?

#Telemedicine implies the use of ICTs to improve patients' results, increasing the access to medical attention and information.

#Telemedicine should be considered in different ways for every person, it should be patient-focused and not focused on medical practice.

#Telemedicine enables services and patients to personally interact and communicate using asynchronous techniques.

#Telemedicine frees services and patients from the need and restrictions of synchronic meetings.

National #telehealth programs foster ICT collaboration in order to establish the goals of national health plans.

According to WHO, #telehealth resources are used broadly but unequally in the world.

In less developed regions, the use of #telehealth resources has been lower than expected and less than possible.

National research and education networks can sustain and expand health knowledge and its application to health care.

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General Disclaimer

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Access to Health Sciences Information:

A Basic Human Right

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SUMMARY

National institutions including governments, universities, NGOs, and the private sector must recognize that access to health information is a basic right and a public good, and should develop strategies to promote and facilitate that access to health workers as well as the general population in order to ensure equity in access to health.

This is one of the main conclusions of an expert panel convened by the Pan American Health Organization in the context of its Conversations on eHealth project, which is part of PAHO/WHO's eHealth Strategy and Plan of Action. One of that plan's objectives is to improve access to and quality of health services through increased access to reliable, quality information on health education and disease prevention for both the public and health professionals.

The experts agreed that innovative strategies and training are needed to facilitate access to information for health teams, and ways to improve this access in developing countries are needed to reduce gaps and to benefit people in search of affordable quality care. As part of the expansion of access to information, the experts support ongoing efforts to build virtual health libraries (VHL), networks of scientific and technical information, and websites on health that work with available applications and online health services such as mobile devices.

The panel recommended that PAHO/WHO and its Member States should build a common framework for the development of portals with certified public health contents, facilitate access to knowledge tools for decision-making in health policy, and, based on evidence, contribute to local capacity-building for the production and use of the contents of the virtual health library.

PAHO/WHO should also contribute to the expansion of health care coverage in remote areas where the introduction of mobile technologies is key to meeting health needs of rural populations, as well as in health emergencies and in disaster situations.

INTRODUCTION

The conversation on access to information was based on the following questions, among others:

- Why should access to information in health sciences be considered a human right?
- What will happen if health information does not become a formally declared human right?
- In the health sector, professionals "inform" and account for future actions but, in this act of informing, is a genuine communication process established?

If we consider that healthy human development requires emotional maturity, communication skills, and cognitive and social competence, are all people equal from the start? Or, in other words, to what extent does vulnerability, in the form of poverty, emotional deprivation, and lack of opportunity impact on those competencies, one of which contributes to processing information?

As soon as the conversation started, the question, "Why should access to information in health sciences be considered a human right?" was posed. Gro Harlem Brundtland, former Director-General of the World Health Organization, in the Foreword to "Twenty-five questions and answers on health and human rights" points out that "...The enjoyment of the highest attainable standard of health as a fundamental right of every human being was enshrined in WHO's Constitution over fifty years ago.[1] This statement, as well as considering the interdependence of rights, contributes to providing an answer and, at the same time, legitimizes the first question made in the framework of this conversation.

There are complex relationships between health and human rights: "violations or lack of attention to human rights can have serious health consequences[2] and, at the same time, "health policies and programs can promote or violate human rights, depending on how they are designed or implemented."[3]

The above-mentioned concepts help to identify essential aspects of information, and highlight the importance of continuing to monitor and evaluate public policies, with special emphasis not only on the relevance of actions but also on the impact of omissions: What will happen to peoples' health if health information does not become a formally declared human right? This question deserves adequate answers. It is not difficult to imagine a scenario where more pronounced inequities and lack of access to information—both by current and future users of the health system and by health workers—would result in violations to the right to health.

Inform means to "give form to something" or "be aware of." Adults routinely provide as well as receive information, while children and adolescents are exposed to information in their classrooms and through the media. Information contributes to knowledge building and, while necessary, it is not enough to comply with this purpose; it implies, in a certain way, certain asymmetry in knowledge without meaning and sense.

Informing does not always mean communicating since communication implies – as pointed out by Manuel Castellsa – a flow of interaction, "... crossing the border from one mind to another" in a movement in more than one direction, and in which the number of people taking part also exerts an influence. In that sense, Guimarães, Silva, and Noronha point out that there is a wealth of scientific literature which shows that "social networks streamline access to information in addition to allowing identification and acquisition of new competencies and knowledge in the external environment." [4]

The members of the Latin American and Caribbean System on Health Sciences Information, convened in 2012 at the Ninth Regional Congress of Information in Health Sciences (CRICS 9), and the Sixth Meeting of Regional Coordination of the Virtual Health Library. They drafted the Washington D.C. Statement, [5] which underlines the relevance of conceiving information as a public good and facilitating its access as an ethical imperative. It includes the following assertions:

- "Information and knowledge are public assets whose universal and equitable production and circulation represent a challenge to overcome regional inequities.
- "National governments are responsible for guaranteeing free access to information and knowledge to the population.

- “The Virtual Health Library (VHL), the Latin American and Caribbean Health Sciences Literature (LILACS), Health Sciences Descriptors (DeCS), and Cooperative Service for Accessing Documents (SCAD), thanks to the collaboration of the countries of the Region, represent powerful instruments to facilitate free access to high quality scientific and technical information in health and the democratization of knowledge.

- “The Region of the Americas has strategies and plans of action directed toward the production of and the equitable access to information, as well as to bridge the gap between knowledge and decision making in health.”

In the same statement, participants made several commitments; the following can be highlighted:

- “Prioritize broad access to all information and knowledge resources resulting from technical cooperation between the countries of the Region;

- “Raise the awareness of national authorities on the need to promote access to knowledge and incorporate the use of information and communication technologies in health policies and programs;

- “Comply with and promote the dissemination of the PAHO/WHO Research Policy for Health (2009) and the plans of action derived from Regional Strategies of Knowledge and Communication Management (2013–2018), and e-Health (2012–2017), with emphasis on reinforcing the VHL Network;

- “Collaborate with the strengthening of networks of people and institutions to share information and knowledge with the purpose of improving health care and preventing disease and risks, especially in the most vulnerable groups;

- “Foster technical cooperation with academic institutions to promote research and professional training activities regarding information and communications technologies to support the eHealth strategy;

- “Strengthen the regional VHL portal through interoperability, including all health information resources coming from national and regional institutions;

- "Strengthen alliances with editors of scientific journals to increase the visibility of scientific production in the Region, based on quality and reliability criteria, recognizing LILACS as the main source of information of regional scientific literature; and

- "Foster the practice of technical cooperation aligned with strategic programming of LILACS information among the institutions of the VHL Network, as well as the strategies of technical cooperation with the countries of the Region." [5]

Within this framework, access to information comprises a large number of issues that should be considered in strategies to incorporate information access as a basic right. Some of the most important issues are:

1. Open access [6], and quality of information relate to the importance of increased knowledge of health workers regarding the consequences of open access, its particular tools, and sustainability mechanisms.

2. "Quality, opportunity, suitability" are part of the conditions of information that should be present.

3. Although information and access to information represent an essential pairing and an ethical imperative, it is also relevant that information be coupled with and integrated in other health actions.

4. Information can be used as a reason for actions taken and as a way to facilitate transparency.

5. Identifying barriers to the access to information is important in order to overcome them, for example, time restraints, and information that is very extensive or is hard to process due to multiple variables.

6. There is a need to validate contents hosted in the virtual world and to define criteria. Criteria suggested by the National Library of Medicine (NLM), United States, are a good start that can be expanded with the incorporation of new categories.

7. It is important to encourage collaborative efforts from different sectors and assign training in health scenarios that take into account the role of librarians and information specialists.

8. Sustainability of eHealth projects over time should be addressed, and mechanisms to evaluate process, impacts, and results.

9. Tension should be acknowledged between the importance of being informed and the “right not to know,” and between the excess of information that overwhelms, and the scarcity that impoverishes.

10. Determine clear guidelines and regulations which consider privacy of information in the context of the Internet, and review the current regulations.

11. Consideration and development of regulations is necessary regarding the use of information and communications technologies (ICTs) in the context of “acceptable work” [7] of health workers.

During this conversation, a number of challenges were also identified:

- **Integration.** ICTs may facilitate access to information and represent valuable tools for the integration of people, work processes, and organizations;

- **Applicability.** This challenge refers to the ethical application of information, so as to avoid misuse of gathered information. It also refers to not using technologies with non-charitable purposes, or the use of applications which may damage public health;

- **Clarity.** Good practices will specify the purpose of the information generated, the potential users, and possible bias that may result. There should be standards for periodically assessing the sources of information.

- **Equity from the information itself.** Despite the context and without overlooking particular needs, it is important to universalize access to information in order to counteract differences caused by inequalities. Regardless of available resources, knowledge and updating are always valuable resources.

- **Narrowing health gaps.** It is important that open access to information is coupled with training on the mechanisms of gaining access, with the ultimate purpose of narrowing health gaps.

- **Facilitating intersectoral dialogues.** The aim of this challenge is for dialogue to take place with other health entities using a genuine network mechanism. Therefore, it will be contextualized information which, in turn, considers other scenarios as a way to be enriched from those who are already experienced in this field.

- **Myth eradication.** Mobile health technology (mHealth)[8] is an important component of eHealth. Myths surrounding this technology should be clarified, and knowledge should be expanded on the barriers to its widespread use in relation to priorities, infrastructure, knowledge, technology, and availability, etc.

MATERIALS AND METHODS

The chapter was based on individual research, development of surveys, and, in particular, input from network conversations within the framework of the eHealth Conversations developed by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by the moderator and by participants, suggesting work assignments, and compiling notes on the discussions. Some co-authors submitted documents for discussion on different topics.

This conversation used the virtual campus offered by the Hospital Italiano of Buenos Aires (HIBA), which has the following working tools:

- General discussion forum: allows active exchange of ideas on different topics to be addressed according to the conversation assigned. Each message of the forum forwards an e-mail to participants.
- Wiki: this site allows for the joint creation of the document.
- Resource library: this site is devoted to sharing support documents on which opinions and/or deliberation are based. This section includes journal articles, chapters of manuals and books, or full texts.
- Approximately 12 spaces for conversations or debate forums were consolidated as interaction scenarios for a genuine "community of practice."

The conversations were complemented with the publication of a series of tweets with the hashtag "#ehealthtalks," through PAHO's Twitter account on eHealth (@ehealthpaho). Each conversation lasted eight weeks and, based on the topics addressed, a document was produced, including the main recommendations developed through the exchange of ideas and experiences.

The conversation about information access had 92 participants from Argentina, Chile, Costa Rica, Colombia, Cuba, Dominican Republic, Guatemala, El Salvador, Mexico, Norway, Puerto Rico, United States, Uruguay, and Venezuela.

Each of the activity proposals is viewed from the perspective of different players, as are areas of overlap, and contributions of each activity (Figure 12).

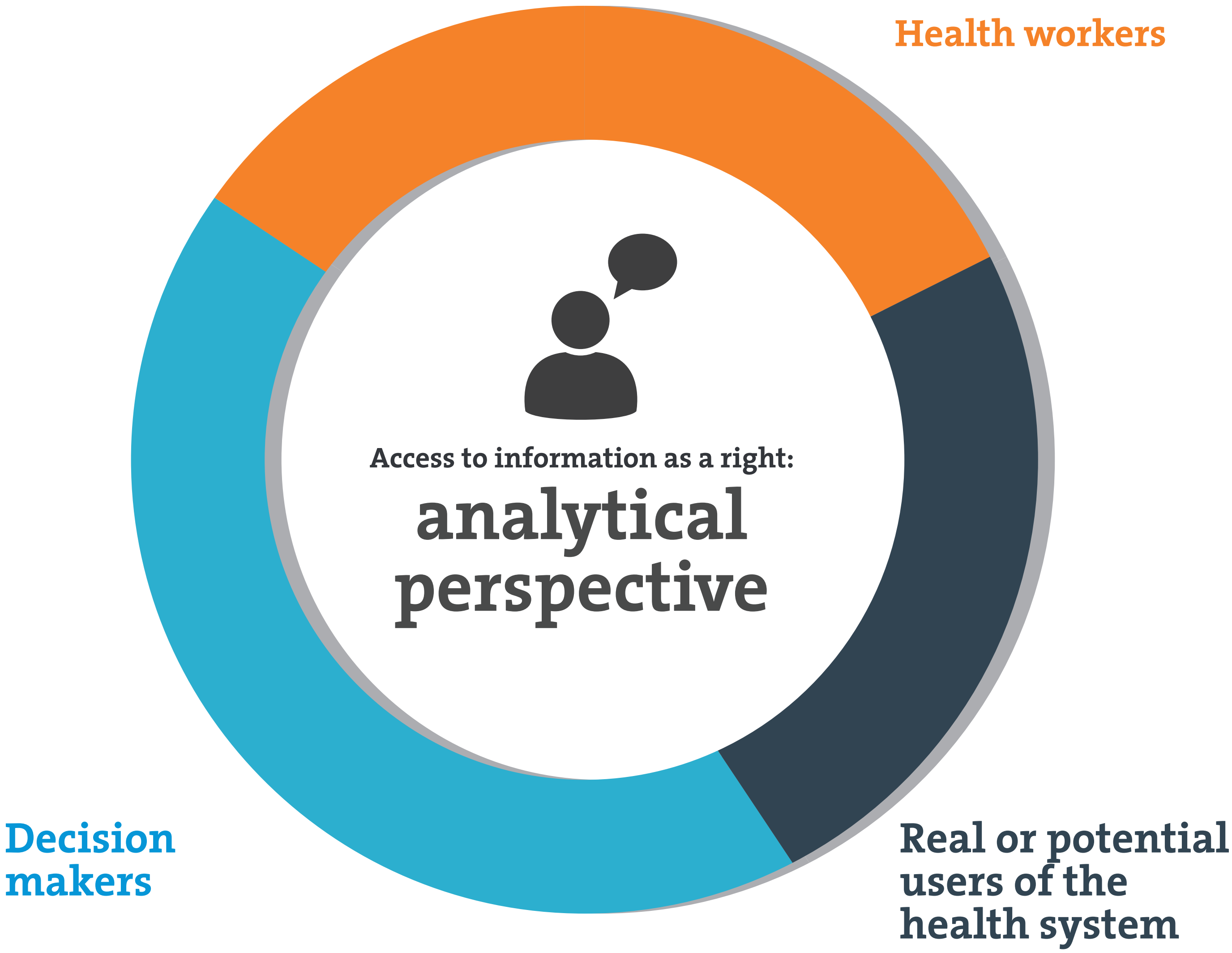

Figure 12. Access to information as a right: analytical perspectives.

STRATEGIC INFORMATION

In 2007, the volume of information produced, captured, and replicated all over the world was equivalent to 281,000 million gigabytes, with a 10-fold increase in five years. In comparative terms, it is possible to say that in 2007 the number of bits in the digital universe was larger than the number of stars in the physical universe. In 2010, digital information created and replicated was approximately 1,203 exabytes (one exabyte equals one billion gigabytes).

In view of the above, and within the framework of the "right to health," inherent aspects of the "right to information" were analyzed during the conversations and are mentioned here.

Relationship between the Right to Information and the Right to Health

The right to information is established in different instruments of human rights, for example, in article 19 of the International Pact of Civil and Political Rights (1966) and its two protocols (1966 and 1989); articles 10, 14, and 16 of the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW); and articles 12, 13 and 17 of the Convention on the Rights of the Child (CRC). [9]

Mary Robinson, United Nations High Commissioner for Human Rights, asserted: "The right to health does not mean the right to be healthy, nor does it mean that poor governments must put in place expensive health services for which they have no resources. But it does require governments and public authorities to put in place policies and action plans which will lead to available and accessible health care for all in the shortest possible time. To ensure that this happens is the challenge facing both the human rights community and public health professionals." [2]

"The Committee on Economic, Social and Cultural Rights interprets the right to health as an inclusive right extending not only to timely and appropriate health care but also to the main determinants of health, such as access to education and information on issues related to health, including sexual and reproductive health." [2] Likewise, the drafting of different norms, laws and declarations –both of local and national and international contexts - clearly establishes the importance of information as an essential component of the right to health. [10]

Accessibility is one of the criteria for assessing the right to health; one of its four overlapping dimensions [2] is the access to information:

- Non-discrimination
- Physical accessibility
- Economic accessibility
- Access to information

Among the key principles and objectives of the rights-based approach to health, WHO highlights the following:

- “Disaggregating health data to detect underlying discrimination;
- “Promoting and protecting the right to education and the right to seek, receive, and impart information and ideas concerning health issues.” [2]

WHO also points to the importance of “... promoting the right of everyone to enjoy the benefits of scientific progress and its applications; the right to education on health issues, particularly in knowing the basic principles of child health and nutrition, the advantages of breast-feeding, hygiene, and environmental sanitation, and the measures to prevent accidents; and to receive support to apply this knowledge.” [2]

Regarding the relationship between health and human rights, the Convention on Human Rights states that “Information is the freedom to seek, receive, and disseminate any kind of information and ideas.” [1]

The “Why” and “What for” in the Act of Informing

In providing answers to the questions “why” and “what for” about the act of informing in health settings, the perspective offered by the ethics of health care provides a solid justification.

The term “ethics of care” refers to “... a contemporary care-centered approach as a basic category of ethics.” [11] Unlike positions based on principles, Salles, et al., assert that “the ethics of care insists on the core importance of cultivating the ability to understand the viewpoints and situations of others.” [11]

In this way, the elements provided by the “ethics of care” could contribute to an increase in horizontal application in this type of relationships. Information in different environments--but especially in health--can be perceived as a bridge, a true instrument of care. Its omission or inadequate expression and transmission can become tools of “non-care” or inadequate and/or poor quality care, a topic which needs to be addressed.

From General to Particular: Information in Health Scenarios and the Role of Different Players

The information provided in health environments shares common traits with information imparted in other routine situations. It is transmitted by words and for the receiver it means, to a certain extent, contact with the outside world, the world outside of the hospital, of the treatment room, and the sick room.

Ivonne Bordelois states: “the word is the essential axis of relationship in our life. Our emotional, political, vital commitments are made up of words.” [12] Nevertheless, for this author, the word exchanged during a medical consultation is surrounded by anxieties and doubts: “Instead of strengthening and expanding professional conscience, massive vocabulary many times acts as a huge wall, an opaque screen, or a system made up of speakers and inhabitants of a hermetic dialect, isolated from the rest of the society, owners of a secret which simultaneously confers power and distance.”

Information received represents only one of the sources that probably lead to knowledge production, since people develop beliefs and attitudes outside the context of health. This might include, for example, advertisements about a product or a new (or not so new) type of intervention, which shapes, establishes, and negates or enables expectations. Making groundless promises about procedures that have not undergone testing opens the debate on the ethics of communication and the social responsibility that the media must observe.

The impossibility of questioning oneself, unanswered questions, or the non-question because silence is preferred, further overshadow certainty and increase doubts about what is known to be hidden or concealed. Thus, the act of informing becomes a window, an opening, or the possibility of a new question, while the non-question closes, prevents, or keeps secret.

Consequently, using open questions represents, in the health context, a critical element, as making questions can invite new questions and rediscover stories, share worries, and avoid the "yes or no" that can cloud the answer.

The empathetic commitment of the professional providing the information may be the key to opening each of these questions, as if they were locks, or to keeping them permanently closed. Therefore, health workers should receive, and at the same time, be an active and committed part of training on the necessary skills to impart information in the proper way.

Information and vulnerability

Important aspects of information have been described, particularly regarding health-related information. Now, the proposal is to go deeper into the particularly sensitive topic of vulnerability of people, with the aim of finding common elements in the relationship between information and vulnerability.

It is appropriate to mention the "vulnerability layers" metaphor framed by Florencia Luna (2009 [13] that considers vulnerability/ies in terms of a fine grained tool rather than in terms of vulnerable populations. The aim will be to analyze the way in which information—or the lack of information when it is particularly necessary—interacts with each of these layers.

In this respect, "information" could be considered, functionally, as a "vulnerability layer" or as a mechanism to counteract the vulnerability of people in health-related contexts, depending on whether it is hindered or promoted and developed. Information as associated to a "layer of vulnerability" refers to the necessary capacities and skills to be able to process, or not, such information. The absence of incentives to develop and achieve those skills, as well as the absence or poor quality of information received, make up a new "layer of vulnerability," [13] established by that chain of omissions and unfair inequalities.

In turn, if we consider that healthy development requires emotional maturity, communication skills, as well as cognitive and social competencies, is every person in the same condition from the beginning? Or, in other words, to what extent do vulnerabilities such as poverty, emotional deprivation, and lack of opportunity impact those competencies, one of which contributes to processing information? Again, information—its presence or absence—may become a vulnerability itself, or be negatively affected by it.

"How and who" listens to and interprets information is a question that should be asked in order to identify the recipient of that information. Information can be delivered in a linear and harmonious way, or, when there are obstacles that will produce a temporary change in course, the delivery may be less linear, and more "labyrinthine." In the case of the latter, it is worth remembering that people may be under treatment for an acute or chronic illness which may partially or totally alter their functional capacity. This condition may consistently make them more vulnerable and affect, in turn, their ability to listen, as well as their interpretation of what they hear. Being aware of this fact is crucial for health team members. Apart from the importance of knowing how to provide information, the urgent and necessary question emerges of how to "listen" and interpret information. Besides auditory capacity, are there any special skills necessary that can be acquired in learning institutions or within the family?

Emotions have a history that is recreated in successive and repeated experiences of health and disease. To paraphrase Martha Nussbaum, in a deep sense, human emotions are related to past events and carry traces of that history. [14]

"Listening" and understanding information presumes a before and after; a feedback circuit is established that will account for how the process of "informing" takes place. The person receiving the information, who may be undergoing a painful procedure, provides messages that have an impact on the person providing that information, awakening feelings of support and relief, or on the other hand, defensiveness due to rejection.

Therefore, the underlying issue relates to the training of health workers and the approach to these topics, as well as how they are incorporated in the relevant study plans, paying special attention to familiarity with tools for processing, accessing, using, and disseminating health-related information. [15]

Health Teams and the Approach to Information and Communication: Equity in Skills

Health teams are not always adequately prepared to face the severity of pain that people sometimes experience in health settings, and they build protective shields or masks for themselves. These defenses may represent an additional vulnerability layer that conceal expression, or, because of their permeable nature, allow feelings and emotions to filter through, thereby enhancing their actions, and in effect, bringing about the right to health and, particularly, the right to information.

At the same time, for any health team member, in the flood of information currently disseminated in institutions, mastering the methods and tools to distinguish what is really useful has become one of the most requested skills in the labor market.

The "precariousness of excess" [16] contrasts with the tenuous education of a large number of people and reveals questions about equitable access, educational strategies, and the need to introduce curriculum changes. These changes should take into account priorities of local contexts, not only regarding specific health issues but also on the adequate use of ICTs, in order to avoid knowledge gaps or holes inside other gaps.

The integration of several of the core ideas included here: access to information, perspective of rights, health literacy, training of health workers, take on new meaning when supported by the benefits of technology and, at the same time, present additional challenges.

PAHO/WHO Strategy and Plan of Action on e-Health

Among its strategic actions and specific goals, the PAHO/WHO strategy shows the importance of access to information for contributing to the sustainable development of health systems in Member States, including veterinary public health.

Different references are made regarding access to information in the strategy, but item 4.2 highlights the importance of providing reliable and quality information on health education and disease prevention to the population and health professionals. In order to attain this goal, a series of indicators have been identified:

- By 2017, 10 Member States will have a policy governing open access to certified public health content;

- By 2013, 11 countries will have a national VHL with information sources and services related to topics such as education for health, disease prevention and health priorities identified in their national health plans and strategies outstandingly and consistently available in the VHL;

- By 2014, a common framework will be defined for the development of portals with certified public health content;

- By 2015, 35 countries will have local access and capacity to produce and use the VHL content [17]

Key Statements for Future Consideration on These Topics

- "Digital revolution suggests a simple solution (technologies) to a historically very challenging problem (poverty)"--Robert Samuelson

- "He that knows little often repeats it"-- Thomas Fuller

- "All human interactions are opportunities either to learn or to teach" --M. Scout Peck

- "When we expand our knowledge, the pleasure for life increases"-- Emma Thompson

- "We live in a world where you can access higher or lower quality information in multiple ways. However, having the training to know how to access it and its real value and usefulness is a privilege that is not within the reach of everyone"-- J. San Valero, et al. [18]

This conversation will help to guide PAHO/WHO and its Member States to achieve this goal for the Region of the Americas.

Profiles of Specialists *[1]

Alejandro Morlachetti

He is a specialist in International Law and Human Rights, practices as a lawyer, and has a master's degree in law. Since 1998, he has served as an expert consultant for international organizations. He is professor in the Master's Degree Program on Human Rights, and coordinator of the Program on Economic, Social and Cultural Rights of the Human Rights Institute, School of Law and Social Sciences, Universidad Nacional de la Plata, Argentina. He collaborates in the Migration and Human Rights Program of the Universidad Nacional de Lanús.

Raúl Mercer

He is a pediatrician, epidemiologist, and specialist in public health who serves as: Coordinator of the Social Sciences and Health Program of the Latin American School of Social Sciences, Argentina; Coordinator of the Seminar on Childhood and Gender (PRIGEPP) and the International Course on Health Promotion (CIPS/FLACSO); and Coordinator of the "Te Escucho" Project: Promotion of Rights and Gender Equality in Public Maternity Units in Argentina. He is a member of the Initiative on Health and Rights of the Child.

María Casado

She is Director of the Research Center and Observatory for Bioethics and Law, University of Barcelona, Parc Científic of Barcelona. She is the UNESCO Chair of Bioethics and Professor of Legal, Moral, and Political Philosophy at the University of Barcelona; creator and director of the Masters in Bioethics and Law: Health and Biotechnology issues; Director of Research in Bioethics and Law in the European Doctorate Program in the School of Law.

Florencia Luna

She has a PhD in philosophy and is President of the International Association of Bioethics. She has served as: Director of the Bioethics Program (School of Social Sciences,Argentina); Coordinator of the Ibero-American Network of Bioethics; founder and director of the journal Perspectivas Bioéticas; Director of Research Projects of the National Scientific and Technical Research Council, the National Agency for the Promotion of Science and Technology, and the Secretary of Science and Technology, School of Philosophy and Literature.

PAHO/WHO experts

The Pan American Health Organization employs specialists in this field within the Region of the Americas. In order to get in touch with any of them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness or authenticity of the information published herein, and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Further Reading

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Web Sites *2

VHL: Virtual Health Library

In addition to being a library, this is a decentralized and dynamic collection of sources of information that aims to provide equitable access to scientific health knowledge. This collection functions as a network of products and services on the Internet, to meet health information needs of authorities, administrators, researchers, professors, students, media professionals, and the general public. It is different from other sources of information available on the Internet because it observes selection and quality control criteria. Available at: http://regional.bvsalud.org/php/index.php?lang=es

National Library of Medicine

The National Library of Medicine (NLM) has been a center of innovation in information since its founding in 1836. The world's largest biomedical library, the NLM maintains and makes available a vast collection of electronic information resources on a wide range of topics that are searched billions of times each year by millions of people around the globe. Available at: https://www.nlm.nih.gov/

Latin American and Caribbean Center on Health Sciences Information (BIREME)

- Provides free and open access to scientific information;
- Considers health information as a public asset and establishes the foundations for it;
- Promotes the implementation of public policies for the development and dissemination of health information and knowledge based on scientific data;
- Fosters and facilitates collaboration to make alliances and build networks among the countries of the region to strengthen activities for management of health knowledge and communication

Available at: http://www.paho.org/bireme/

Pan American Journal of Public Health, Pan American Health Organization [On-line journal].

This is an open access, peer-reviewed monthly journal, published by PAHO/WHO. With over 90 years of history, its mission is to help in the dissemination of internationally relevant scientific information on health, with the aim of strengthening the health systems of the countries and improving the health in the Region of the Americas. Available at: http://www.paho.org/journal/

World Health Organization

This is a multilingual site that provides updated information on global health matters, with special emphasis on issues relating to crisis and disasters, where relevant and timely information makes significant differences in obtaining adequate response from the health systems. Available at: http://www.who.int

Scientific Electronic Library Online (SciELO) [on-line journals]

This site is a model for the electronic publication of scientific journals on the Internet, and was conceived to meet scientific communication needs of developing countries, Brazil, in particular, and other countries of Latin America and the Caribbean. Available at: http://www.scielo.org/php/index.php?lang=es

Directory of Open Access Journals (DOAJ)

Infrastructure Services for Open Access (on-line journals). This is an open access directory to free scientific and academic journals, with full text and quality-controlled articles that cover different topics in different languages. Available at: http://www.doaj.org/

Health on the Net Foundation. @HON

This is a nongovernmental, non-profit organization accredited by the United Nations Economic and Social Council. It is internationally acknowledged and collaborates with PAHO/WHO and the NLM, with a focus on quality of information (editorial pedagogy). Available from: http://www.hon.ch/

EVIPNet: Evidence-Informed Policy Network.

This innovative initiative of the World Health Organization promotes the systematic use of scientific data on health for policy making; it is aimed at medium- and low-income countries. It promotes alliances within the country between regulatory entities, researchers, and the civil society to facilitate both the making and implementation of policy through the collection of the best scientific evidence available.[19] Available at: http://www.who.int/evidence/en/

Health Evidence (McMaster University. Canada)

This site is designed to support informed decision-making regarding public health evidence. It provides reliable sources of evidence for managers of health services and systems. It is an initiative funded by the Canadian Institute of Health Research. Available at: http://www.healthevidence.org/

Latin American and Caribbean Health Sciences Literature (LILACS). On-line database

LILACS is a database and repository of scientific and technical literature on health of the countries of the Region of the Americas that contributes to increasing the visibility, access to, and quality of information. It represents a cooperative product that promotes the development of scientific capacity in the countries. [3] Available at: http://lilacs.bvsalud.org/es/

Access to Sources of Information and Management of Social Networks [on-line course]

This is an on-line, self-directed course from the Pan American Health Organization's Public Health Virtual Campus: Virtual Classroom. Available at: http://www.campusvirtualsp.org

*2 *Hyperlinks to web sites do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented on those sites, or guarantee the validity of the information included thereof. The reason for offering links to external sites is to provide additional information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not necessarily represent the opinions of PAHO/WHO.*

Distance Communications Program (PCD), Hospital "Juan P Garrahan," Argentina

This program facilitates communication among peers from different centers through a distance communications system, similar to that in place at the Hospital Garrahan for patient consultation and follow-up. It promotes a health care referral framework in each province according to progressive levels of complexity. By strengthening relationships among colleagues from different centers, the PCD complements the activities of other programs, and acts synergistically with them.

The PCD delivered teaching videoconferences in 2012, and will increase its communications capacity with the incorporation of videoconference and IP telephone equipment, which will be distributed nation-wide and provided to the hospital by the Ministry of Science, Technology and Innovation and the Ministry of Federal Planning.

For seven years, the PDC has been part of the referral and counter-referral program of the Hospital Garrahan, whose main objectives are to train health workers, provide medical collaboration in the field in critical areas (intensive care units), support continual improvement of basic services (laboratory, pharmacy, nutrition), and provide distance communications for patient follow-up.

Mujeres que salvan vidas (Women saving lives)

This is an intergenerational training program for raising awareness on breast and cervical cancer in women over 15 years old in the greater metropolitan area of San José, the University of Costa Rica, and the National University, Costa Rica. Its aim is to use ICTs to design and implement health promotion and develop a prototype for an information system to follow up with breast cancer patients during their health care journey (diagnosis, treatment, rehab, palliative care) in the Costa Rican health system. The project to reorient health and education services in the country's healthy population is supplemented by the ICT component.

The Web site provides access to information for the promotion of health (patients suffering from breast cancer, family members of patients, NGO leaders, and the healthy population). It facilitates planning treatments for breast cancer patients in participating hospitals through digital agendas, reminders, and follow-up of appointments. Available at www.mujeresquesalvanvidas.info

Hospital H20, Spain

The Hospital Líquido of the Hospital Sant Joan de Deú (HSJD), Barcelona, Spain, is a strategy aimed at overcoming the physical barriers of the hospital building with the use of technologies oriented toward patients and their families. It includes patient-centered projects with personalized information as well as tools for health professionals such as: e-learning, webcasting, use of social networks and mobile applications.

For further information, see:
http://www.hsjdbcn.org/portal/es/web/hospital_liquid

Conclusions

In order to facilitate the analysis, the conclusions are grouped in two closely related dimensions:

Ethical-normative dimension

- It is important to consider not only the “actions” but also the “omissions” related to information access, with the aim of reducing inequalities or inequities, and to consider health within the framework of a close relationship between ethics and human rights;
- Although multiple declarations and regulations include statements referring to rights, and not overlooking progress in that respect, there is still a lot to be done;
- From the standpoint of rights, it is necessary to reexamine “information” as an independent and autonomous category. This includes not only a deep analysis of the information used in health scenarios, but also the factors affecting how information is transmitted, its availability, and access;
- Human rights are a fundamental element in health development. A health-based approach to human rights recognizes special characteristics of population groups and the importance of access to information for decision making;
- Considering human rights in the public health setting stands for a very important element in that it explicitly recognizes the enjoyment of health as a human right. In turn, it becomes a tool which contributes to strengthening and achieving better health results.

Linking health and human rights would be pointless if it did not lead to a positive and transforming impact on health practices.

Technical-procedural dimension

- "Access to knowledge is understood as intellectual access (Buckland) and not only as physical-electronic access to sources of knowledge."[17] Consequently, access to information represents a key component in postgraduate training, allowing professionals to keep current in their practice, thereby guaranteeing patient safety;

- ICTs can facilitate access to information and are powerful integration tools for people, work processes, and organizations;

- Use and application of methods and tools that help to distinguish what is really useful has become one of the most required skills in the labor market, and requires effort and commitment to collaborative training;

- Basic understanding of ICTs as tools to facilitate and promote transparency of procedures will strengthen and facilitate best practices, with emphasis on the promotion of "acceptable work" [7] of health professionals;

- It is important to acknowledge the question: "What will happen to human health if health information does not become a formally declared human right?" It is also important to recognize the risks of a scenario in which information, as a health determinant, is increasingly fragmented and inequities multiply as a result of the unequal presence and/or absence of information.

- The role of relevant actors and respective activities that contribute to the implementation of the PAHO/WHO Strategy and Plan of Action on eHealth should be acknowledged. [17]

Recommendations

Recommendations to provide orientation to national institutions (Governments, Universities, NGOs, the private sector) and international organisms.

- Redefine the concept of health information as a valuable concept and a global public asset which, in the framework of human rights, goes beyond procedures and policies;

- Incorporate inherent aspects of information in the education of health team members as well as the appropriate use of tools offered by technology, and understand the subtle relationship between information, education, access, and equity as health determinants;

- Consider information and access to information as a genuine right of people, and include this concept in regulatory instruments; bridge the gap between what is expressed and the possibility of effective implementation;

- Develop innovative strategies to facilitate health teams' access to information, and contribute to the development of the digital agenda for the achievement of health equity;

- Support information access without overlooking best practices regarding privacy policies, including a survey of current regulations and the development of the necessary instruments to achieve this purpose;

- Facilitate the search of mechanisms to guarantee, or at least advance, the access to information in developing countries, thereby bridging the gap and benefiting millions of people who use the health systems every day and seek accessible, affordable, and quality health care;

- "Contribute so that access to information provides a space that is health-centered and empowers patients, integrated with training and interaction as they relate to ICT solutions;"

- Emphasize the importance of the relationship between "health, rights, and access to information" as a necessary, desired, and attainable convergence, and incorporate the concept and the dynamics of eHealth work in policies that support equity, as well as in the structure of academic organizations.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Cooperate, within the framework of technical cooperation between the countries of the Region, to give priority to achieving the broad access to all information and knowledge resources as one of the requirements to achieve the Millennium Development Goals (MDG); [1]

- Raise the awareness of national authorities on the need to promote the access to knowledge and incorporate the use of ICTs in pro-equity policies and health programs;

- Establish a common agenda that includes the topic of eHealth in the framework of human rights and as a cross-cutting issue in the education and training of health workers;

- Define relevant legal issues based on the survey of current regulations, and contribute to the development of technological and methodological standards when gaps are identified in specific areas;

- Facilitate the articulation between actors and institutions and help to join forces of the public and private sectors, in order to consolidate in health systems and services the use of those technologies which are clearly helpful for health workers, patients, and citizens (such as, individual health records, computerized perinatal information systems, electronic clinical records, electronic prescription of medications, and telemedicine, among others); [18]

- Contribute to the expansion of health service coverage in remote areas, where the introduction of mobile technology has been critical in responding to the health needs of rural populations in cases of health emergencies and disaster situations;

- Strengthen the ongoing efforts to establish virtual health libraries in different national contexts, which include scientific networks and web sites about technical information on health using ICTs, in order to consolidate sources of information, achieve improved interoperability with available applications and on-line health services such as mobile devices, and contribute to ensuring its sustainability and development by means of integration;

- Define a common framework between PAHO/WHO and its Member States for the development of portals with certified public health content, facilitate the access to knowledge through tools for decision making in evidence-informed health policies, [20,21] and contribute to the local development of the capacity to use and produce content for the VHL.

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Video interview with the author(s)

eHealth Conversations: Access to Information

http://www.paho.org/ict4health/podcast/Entrevista-Acceso-informacion.mp3

Available in Spanish only

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Acceso-informacion.mp3

Available in Spanish only

Twitter Messages on the access to information

“Quality, opportunity, relevance”: some of the conditions of health information that should not be missing.

#eHealth: Importance of a higher and better knowledge to Open Access, its particular tools and sustainability mechanisms.

Unstable balance between the importance of informing and the “right to not knowing”. Developing strategies for a better approach.

It is important that Open Access to information is accompanied by training on the ways and mechanisms to access it.

Contextualized health information that considers other scenarios as a way to learn from those who already have the experience

Development of Communities of Practice as a way to contribute to the access to health information. Is it necessary to receive training?

ICTs as tools to facilitate the bridging of gaps between discourse and implementation in health contexts

Standards, laws and declarations: consider the importance of information as a fundamental component of the right to health.

Understanding the information in health contexts implies a before and an after, and their results will account for how the process has been.

ICTs in health as a way to accelerate processes for the benefit of people and the health system. #eSalud

Integrated Networks of Health Services: the challenge of hospitals.@OPSOMSChile. Among other ICT issues. http://www.cohan.org.co/content/43/img2/Redes_Integrales_de_servicios.pdf

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General Disclaimer

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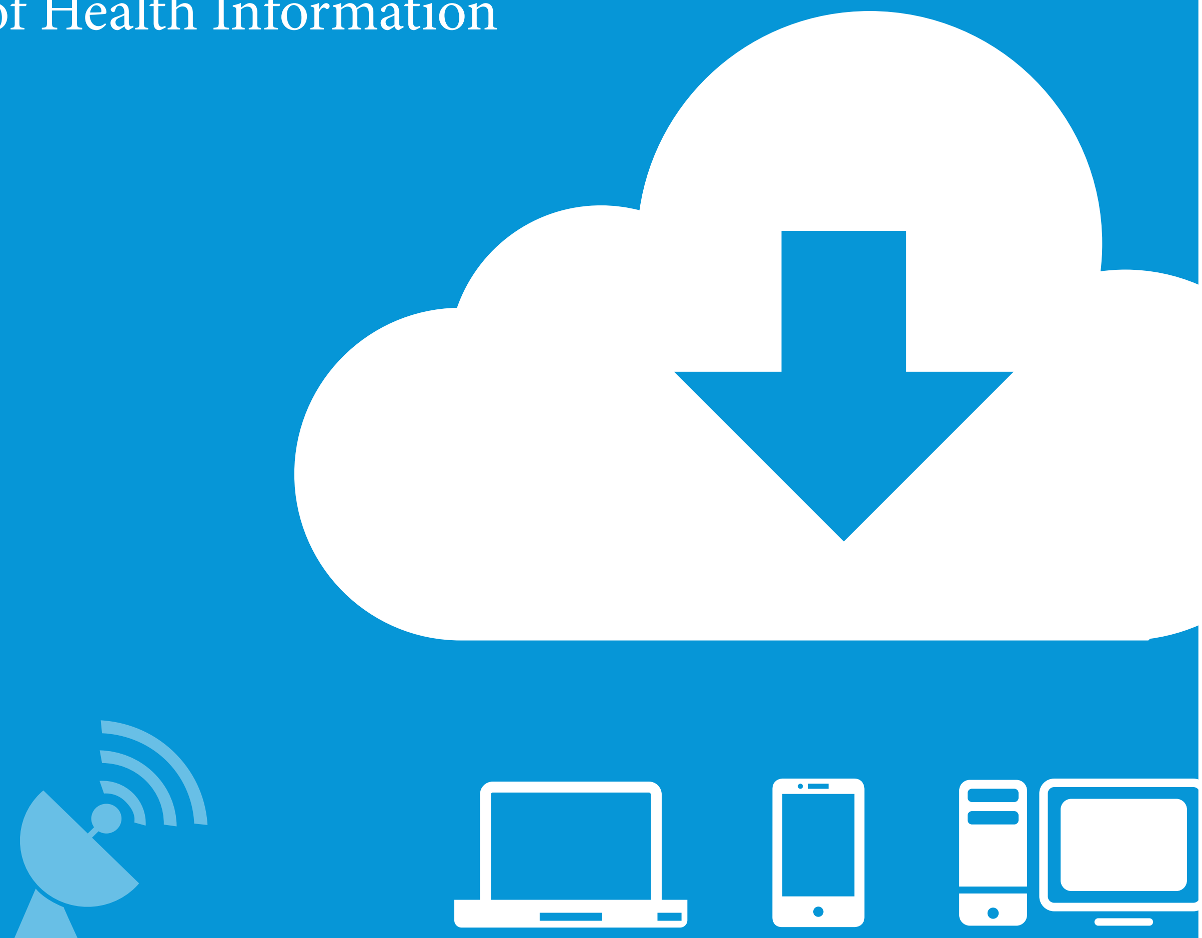
Policies Applied to eHealth and Telemedicine

Basis for Achieving Exchange of Health Information



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SUMMARY

eHealth policies that are well implemented, orderly, and inclusive help to improve peoples' wellbeing, reducing imbalances and inequalities in access to health systems, according to an expert panel convened by the Pan American Health Organization / World Health Organization to study the eHealth situation in the Americas. The group developed recommendations for policy makers and health workers on how to integrate the use of information and communications technology in health initiatives.

The experts assert that improving eHealth policies also improves access to information and training for health personnel, and strengthens the exchange of ideas, reducing geographic barriers. They emphasized that interaction between public government institutions, academic institutions, NGOs, and private companies is essential to design and implement projects based on eHealth policies that are attainable, durable, and replicable, and to avoid duplication of efforts.

The group concluded that assessments of the potential for improvement in patient care, specific budget allocations, and periodic evaluations are the foundations of any strategic eHealth plan that can be executed and sustained. They also said it is important to promote citizen participation in the design of plans and policies and use concrete tools such as quality indicators and measurement methodologies for project management.

To guide PAHO/WHO and its eHealth strategy, the experts recommended promoting the inclusion of policies for eHealth at the government and inter-agency level in each country, building a repository for terminology and experiences that can help develop eHealth policy prototypes that can be duplicated at the country, regional, and global levels.

Key factors in eHealth policies, the experts said, are health priorities according to the epidemiological profiles of each country, impact on quality of life, and cost-effectiveness, combined with clinical efficacy. There is also an urgent need to use information and communication technologies in developing health plans, policies, and strategies.

INTRODUCTION

The first initiatives that used information and communications technologies (ICTs) in health care were mainly aimed at improving health access in remote places and were mostly led by private institutions and universities. These initiatives had one common feature: the lack of national policies or standardization that could support their implementation, their future sustainability, or the ability to replicate them.

All the above resulted in expensive, but short-term investments. While they were identified as "lessons learned," they also involved rather high expenditure on resources.

At present, and with a few exceptions, most countries of the Region lack an eHealth policy that has components or priority work areas that would enable the establishment of long-lasting strategies.

While some articles and texts have given different meanings both to eHealth and telehealth, for the purpose of this analysis, the term eHealth is based on the definition of the World Health Organization (WHO), which establishes that "eHealth is the use of information and communications technologies for health."[1] The Inter-American Telecommunications Commission of the Organization of American States (CITEL-OAS) in its study "TeleHealth in the Americas," defines eHealth as "the delivery of health care services by professionals, for which distance is a critical factor, using Information and Communications Technologies (ICTs) in order to exchange reliable information for diagnosis, treatment, and prevention of diseases and accidents, for research and evaluation activities, as well as for continuing training of health care providers, with the goal of improving the quality of health for the individual and for communities."[2]

The relevance of having definite eHealth policies was evident in the Strategy on eHealth of PAHO/WHO and other international organizations such as the Inter-American Development Bank (IDB), which in its Regional Protocols of Public Policies in Telehealth project identifies six components that must lead the eHealth policies.

The Telehealth project [3] identifies six components that must guide the development of eHealth policies:

1. Regional standards with minimal requirements for data transmission and infrastructure;
2. Strategies for health promotion, disease prevention, and provision of certain services through eHealth;
3. Regional guidelines for eHealth management;
4. A strategy for a research network of topics related to eHealth;
5. A training and certification model for eHealth workers;
6. eHealth innovation: key aspects.

On the other hand, WHO and the International Telecommunications Union (ITU) elaborated the National eHealth Strategy Toolkit4 as a tool for the development of an eHealth plan or strategy in any country.

Compliant with the objective of aligning and spreading relevant information on eHealth, in 2012 PAHO/WHO convened a group of specialists with expertise on eHealth in order to form a discussion panel and receive feedback on some vital areas, one of them being the issue of policy.

This work was developed around a series of questions that may be helpful when raising the issue of eHealth strategies and policies.

- What does having eHealth policies mean? What would be the consequence of having those policies but not solid investments from the countries in this area, both for implementation and follow-up?
- Should eHealth policies be included in a national agenda?
- What can be done for a policy to endure for the long-term, regardless of governmental changes?

These conversations bring together observations on this issue, and underline the importance of setting up clear strategies and policies on eHealth for individual countries, according to their own reality.

MATERIALS AND METHODS

The chapter was based on individual research, development of surveys and, particularly, the input from the network conversations in the framework of the eHealth Conversations developed by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by the moderator and participants, suggesting work assignments, and compiling notes on the discussions. Some co-authors submitted documents for discussion on different topics.

This conversation used the virtual campus provided by the Hospital Italiano of Buenos Aires (HIBA), which has the following working tools:

- General Discussion Forum: to actively carry out the exchange of ideas on different topics that will be addressed according to the conversation assignment. Each message posted in the Forum sends an e-mail to the participants.

- Wiki: this site enables the joint creation of the document.

- Resource library: this site shares supporting documents on which opinions and/or thoughts will be based. This section includes articles from journals, chapters of manuals and books, or full texts.

The conversation was complemented by the publication of a series of tweets with the hashtag "#ehealthtalks," through PAHO's Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks and, based on the issues addressed, a document was produced, including the main recommendations resulting from the exchange of ideas and experiences. The participants in the conversations came from Argentina, Canada, Colombia, Ecuador, Peru, Uruguay, and Venezuela, among other countries.

STRATEGIC INFORMATION

Although historically the Region has had successful eHealth initiatives at all levels, many have fallen into disuse or have been disregarded following their implementation. The latter may have occurred because the countries in which they were implemented did not have eHealth policies, plans, and/or strategies to frame them and to foster their continuity. Another possible cause is the failure of different players at the national level (Ministries of Health, Education, Science and Technology, the civil society, NGOs, etc.) to get involved in the development of the initiatives.

The development of an eHealth policy within an integrated system, which includes the different sub-sectors of health services and which is related to a social security policy, is a key factor in institutionalizing and supporting universal access to health.

Regardless of the subject analyzed to introduce or determine the scope of application of ICTs in health within the framework of the health system of a State, the following factors were suggested during the conversation:

- Macro social, cultural and economic aspects
- Political and legal aspects
- Availability of technologies in the market
- Priorities in health according to epidemiological profiles
- Co-financing mechanisms
- Cost-effectiveness plus clinical efficacy
- Equity in access to information
- Impact on quality of life

Other relevant aspects were mentioned during the conversations, which are detailed below.

eHealth policies should promote the elaboration of plans to use ICTs in health. In addition, decentralization of actions and resources should be encouraged to prevent the emergence of isolated mechanisms that consume enormous economic resources without producing positive results. Integration should allow for the harmonious development of all the available resources to facilitate their inter-relationship, actions that the ICTs can readily perform.

Although planning should take place in a centralized fashion, the opinions of the different players should also be included, regardless of their hierarchy or geographic location.

Electronic tools will provide information not only to health care workers but also to the general population. Public, State-related, and private sub-sectors will regulate their actions by interacting within the framework of effective integration, in order to avoid wasting different kinds of resources. ICTs should keep these resources updated and allow interoperability between them.

Surveys or polls conducted in the Region would provide an important source of information for the updating of eHealth policies. These surveys, conducted by the different ministries of health, would take into account the minimum considerations to be used as a model, which should be easily accepted in all the countries of the Region.

At present, the application of ICTs to health care plans, policies, or strategies is a need that cannot be postponed. The creation, development, and implementation of an eHealth policy should consider the benefit and strengthening of the following actions, which emerged from the conversation:

- Distribute general directives and technical standards by governmental or institutional entities;

- Set general and specific objectives, work in networks of health service regions and zones;

- Track and procure the necessary human, technical, and financial resources; track access to primary health care levels (health promotion and protection);

- Establish and supervise actions of low complexity, with regulation and supervision from the central level;

- Support interaction of inter- and trans-disciplinary teams;

- Facilitate accessibility of the population to simplified platforms;

- Coordinate and integrate the public and private sub-sectors;
- Put into effect concurrent policies and expand actions in risk sectors;
- Collect characteristics and epidemiological data in order to establish indicators that can be regularly updated;
- Oversee and follow the traceability of drugs for highly complex and high-cost diseases;
- Promote reforms to existing legislation;
- Interact to attain a harmonious development of human resources, standardizing functions and facilitating their inter-relationship;
- Establish a permanent inter-relationship with eLearning in order to coordinate and plan common actions;
- Interact with the areas of economic policy for the funding of services, observing solidarity;
- Interact with other social security entities to expand their defined objectives;
- Detect critical areas and vulnerable sectors, based on epidemiological reports;
- Rationalize the use of services, identifying available idle capacity and service overuse;
- Based on the above, intervene in the allocation of available financial resources and in the transfer of human, technical, and economic resources according to the needs resulting from increased capacity;
- Consider the establishment of a training and certification model for eHealth workers and a learning model for users.

Profile of Specialists *1

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Born in Peru, he is a physician and surgeon with a master's degree in public health and a PhD in biomedical informatics. He has authored more than 100 publications related to the use of information and communications technologies in health, mHealth, and telemedicine. At present, he works as Director General of the General Office of Statistics and Informatics of the Ministry of Health of Peru and is President of the Peruvian Association of Biomedical Informatics.

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PAHO/WHO Specialists

The Pan American Health Organization employs specialists in this field within the Region of the Americas. In order to get in touch with any of them, please send an e-mail to: ehealth@paho.org.

*1 *The list of specialists published here is the result of the recommendations during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness or authenticity of the information published here and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Further Reading

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World Health Organization and International Telecommunications Union. National eHealth Strategy Toolkit of the World Health Organization and International Telecommunications Union ITU– 2012. Interesantes estrategias para la implementación de un plan nacional de eSalud [Internet]. Available at: http://www.itu.int/pub/D-STR-E_HEALTH.05-2012

Web Sites *2

La Estrategia Digital de Salud de Chile (Digital Health Strategy of Chile)
www.salud-e.cl

La experiencia de la salud electrónica en la Federación Médica del Interior del Uruguay (Experience of eHealth in the Medical Federation of the Interior of Uruguay)
www.cepal.org/id.asp?id=45522

Laboratorio de Telesalud Latinoamericano (Latin American Telehealth Laboratory)
http://www.laboratoriotelesalud.com.br/padrao/index.php

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee of validity of the information included thereof. The only purpose of offering links to external sites is to provide further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not represent the opinions of PAHO/WHO.*

Successful Experiences

The successful experiences in the implementation of eHealth policies, sustainability, integration, and ability to duplicate in the Region are basically represented by Brazil and Colombia.

Incorporation of TeleHealth in the Public Health System of Minas Gerais, Brazil

This represents a very clear and concrete example of successful eHealth application.
For further information, refer to:
http://www.cepal.org/id.asp?id=48606

The specific case of Brazil is highly interesting since it has included a very important general integration between public sectors, NGOs, private entities, and universities of different regions of the country. Collaboration and teamwork are essential in this successful case.
For further information, refer to:
http://www.telessaudebrasil.org.br/

The Program TeleHealth Brazil Networks is a national initiative seeking to improve the quality of primary health care in the Unified Health System (SUS) of Brazil, connecting learning and health services using ICT tools, thus offering the conditions to promote telehealth care and tele-education.

In 2007, the first phase of the Program involved nine telehealth nuclei located at Brazilian public universities in the States of Amazonas, Ceará, Pernambuco, Goiás, Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina and Rio Grande do Sul, with the following main objectives: improving the quality of primary health care, qualifying family health teams, and promoting teleconsultation and formative second opinion.

Since the beginning of the Program in 2007 and up to 2012, a budget of 86 million reales was assigned. Some of the results are: social and digital inclusion; reduction of the risk of injuries and patients' relocation; reduction of costs for patients' relocation; assessment and qualification of health care professionals; promotion of the establishment of health care professionals in remote locations; reduced isolation of health care professionals; and improvement in health care service resolution.

Plan Vive Digital de Colombia (Vive Digital Plan of Colombia)

Colombia has a defined strategy of eGovernment. At present, the country has a new Ministry of Information and Communications Technology (MinTIC), and also a policy for strengthening innovation in eHealth-related issues with several vectors (working lines) plus a National Law of Telemedicine (2010), which divides the issue into telehealth and tele-education. It assigns a mandatory budget to the so-called Capitation Payment Unit (CPU) which is assigned to insurance companies, since Colombia has an insurance model which covers nearly 96% of citizens.

For further information, refer to:

http://www.mintic.gov.co/index.php/vive-digital

Development of Telehealth in Mexico

Together with Brazil and Colombia, Mexico forms the group of pioneers in the area of applications from the government which have clear eHealth or TeleHealth policies.

For further information, refer to:

http://www.cepal.org/id.asp?id=49281

Conclusions

- Interaction between public governmental institutions, academic institutions, NGOs, and private companies is essential to prevent duplication of efforts at the time of executing projects based on feasible, long-lasting, and reproducible policies.

- A sustainable and executable eHealth strategic plan begins by assessing the possibilities of improving the health care of patients, the allotment of budget, and regular evaluation of results.

- A way to identify the priority assigned to eHealth in each country is to analyze the amount each nation invests on eHealth (either through data from national budgets or data provided in surveys).

- Advancing eHealth policies improves, among others, the access to information and training, and strengthens the exchange of ideas by reducing geographic and time barriers.

- Adequately applied eHealth policies, designed in a methodical, inclusive, and integrated way, help to improve the wellbeing of people, reducing imbalances and inequalities in the access to the health care systems.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations.

- Promote the integration of eHealth policies with governmental policies, considering the objectives connected to the development of the country.
- Support the elaboration of eHealth policies, gathering all related stakeholders, including academia.
- Use quality indicators and specific measurement methodologies for project management.
- Advance the participation of citizens in the elaboration of eHealth plans and policies by acknowledging inputs using specific tools and elements that can survive over time.
- Regulate the standards to be used throughout the entire eHealth environment.
- Support knowledge building and contents reutilization in courses, in person or through on-line training, giving academic credits.
- Conduct surveys or polls in all the countries, through the Ministries of Health, in order to have the basic considerations to serve as a model and to be easily accepted in the Region.

Recommendations to provide direction to PAHO/WHO and its eHealth strategy

- Encourage each country, from the inter-institutional and governmental perspective, to include eHealth policies based on the recommendations of this document, which can be sustainable and duplicated in all the countries.
- Continue working on and disseminating the benefits of eHealth in the Region.
- Provide guidance in the creation and centralization of an eHealth-specific terminology repository in the Region.

- Develop a prototype that can be replicated for a national, regional and global eHealth environment.

- Create training courses, starting with collaborative management of knowledge.

- Establish reference clusters for all eHealth policies.

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List of collaborators

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Video interview with author(s)

eHealth Conversations: eHealth policies

http://www.paho.org/ict4health/podcast/Entrevista-Politicas-Publicas.mp3

Available in Spanish only

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Politicas-Publicas.mp3

Available in Spanish only

Messages for Twitter on # eHealth policies

Is #eHealth a health care panacea in isolated locations? What policies would be necessary for its implementation? #ehealthtalks.

Of the 19 surveyed countries, 68% state that #eHealth is a priority. http://www.paho.org/ict4health/index.php?option=com_content&view=article&id =54%3Aestrategia-y-plan-de-accion-sobre-esalud-2012-2017&catid=18%3Aehealth-enops&%20lang=es

WHO Survey: 47% of the 19 participating countries state that they have a policy for using ICTs in health. #eHealth.

National eHealth Strategy Toolkit @WHO @ITU http://bit.ly/MxzXal

A way to identify the priority assigned to #eHealth in each country is to analyze the amount invested.

When establishing #eHealth policies, the characteristics and the legal situation of individual countries should be taken into account.

The use of ICTs in health plans is a need that cannot be postponed, either in terms of formulation or execution. #eHealth.

eHealth policies help improve people's welfare, reducing inequalities in access to health systems.

Many countries lack #eHealth policies divided into priority areas of work which enable the establishment of long-lasting strategies.

Recommend the promotion of integration of eHealth policies with a government's development policies for the country.

It is important to promote the participation of citizens in the design of plans and policies.

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General Disclaimer

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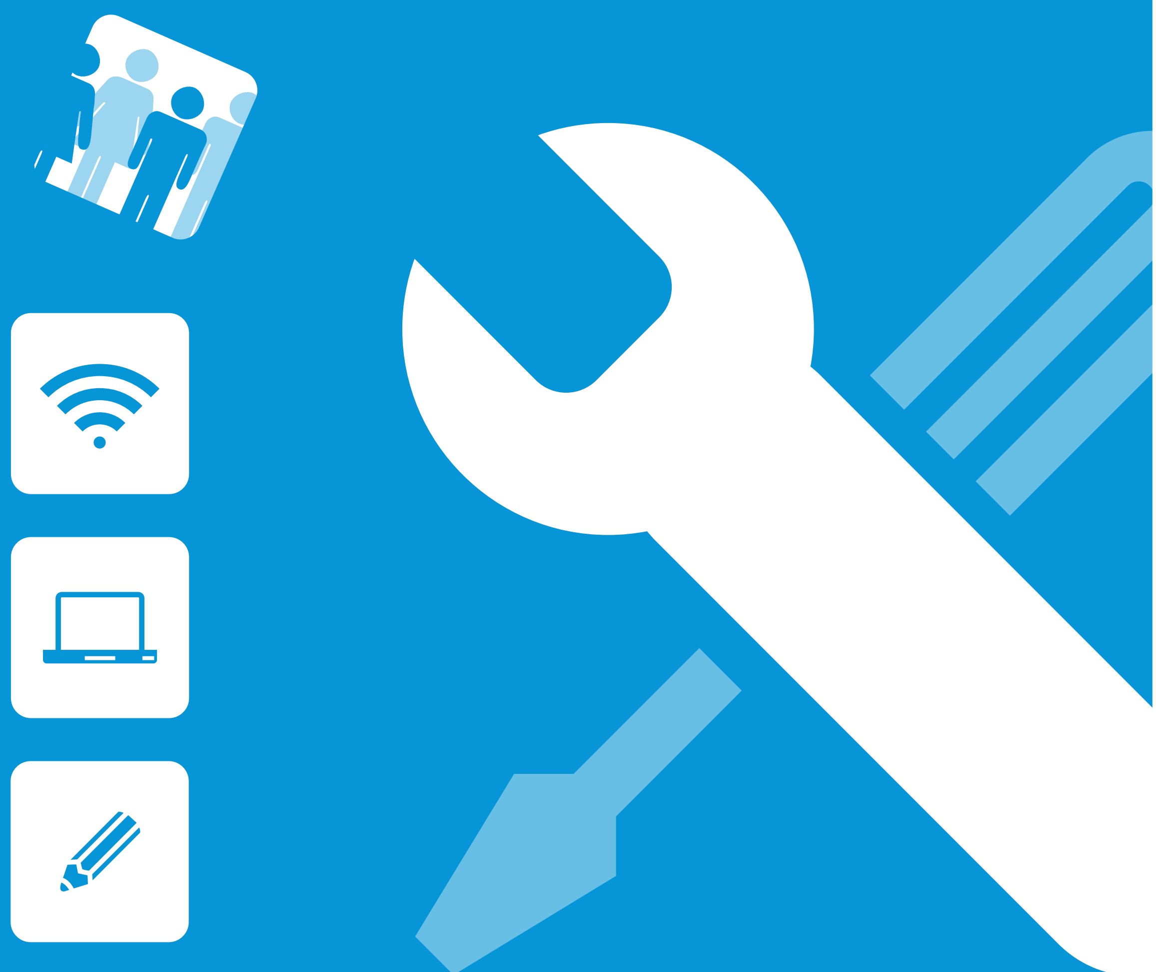
Education

Digital Literacy and eLearning as Tools for Health Education



Paula Otero,
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SUMMARY

This chapter summarizes recommendations from the health education area, to be used as a guide when implementing eHealth projects.

For eight weeks, more than 80 participants from the countries of the Region of the Americas and Spain engaged in a virtual conversation exchanging experiences and opinions on the issue of education as a strategy for eHealth.

The following topics were given priority: eLearning and digital literacy as challenges to be overcome; the need to constantly improve professional training; and the importance of harmonizing and standardizing contents for ongoing training of health professionals. The development of information and communications technology (ICTs) has transformed the way in which people, organizations, and companies access information, and this change is especially important in the field of health. PAHO/WHO is promoting a new Strategy and Plan of Action for eHealth, which seeks to apply these technologies in health management, with ongoing training and electronic learning, or eLearning.

One of the goals of eHealth is to improve information systems in health care, such as electronic medical records, health statistics, and epidemiological surveillance. These can be integrated through online health networks, but health workers have to learn to use the technology. With increased digital literacy, health professionals can transmit patient health information, allowing patients to know possible options and make the best care decisions to improve their health.

Experts in the field recommend that national institutions such as governments, universities, NGOs, the private sector, and international organizations take measures to stimulate the development of e-learning for health professionals, and support access to resources for digital literacy for the general population.

The experts suggest convening scientific societies and health institutions in the Region to promote the use and exchange of local, national, and regional experiences as part of continuing education and training of health professionals, and identify priority areas of uniform and standardized content for further training. A strategy for health promotion and education may be the development of virtual patient communities that empower them to take better care of their health.

For PAHO/ WHO and its eHealth strategy, the participants recommended that the Organization continue to promote communication among its Member States to attain digital literacy, using eLearning as a communication and training tool to reach the entire population.

INTRODUCTION

"The emergence of new demands for literacy is partly associated to digital technologies, but also to the social, financial, political, and cultural changes which characterize the 'new technological paradigm organized around information technologies.'" [1]

Manuel Castells

ICTs have changed the way in which people, organizations, and the society access information. These technologies allow for the creation of new communication, social, and expressive environments that favor the development of new educational, training, and professional experiences.

Searching for and having access to health information on the Internet by patients2 [2-4] currently appears to be an irreversible process having an impact on the entire health care system while it places the patient at the center of attention of the system. Therefore, it is crucial that patients become aware of all possible options in order to make the best decisions regarding the care and improvement of their own health. The question is no longer whether patients should or should not use social networks and other technological tools for their health care. Rather, it is determining how to use these tools to meet with the objective of improving the health of the population, bearing in mind the target audience and the resources that are available. [5]

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) defines digital literacy as the set of skills, knowledge, and attitudes required by an individual to functionally develop within the information society. [6] Thus, it is clear that the objective is for people to acquire the knowledge and the skills to use technology efficiently, developing new social and financial opportunities within their social framework.

For the World Health Organization (WHO), health literacy has been defined as the social and cognitive skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health. [7]

Digital health literacy is not static but it evolves over time as new technologies are introduced and the personal, social, and environmental context changes. It is both a process and a result and it requires constant attention and updating. [8-10]

Taking into account that electronic tools and devices applied to the health setting (eHealth) are of little value if potential users lack the necessary skills to effectively take advantage of and benefit from them, digital health literacy, defined as a set of competencies and skills to be developed, becomes a key element. [11]

The Pan American Health Organization/World Health Organization (PAHO/WHO), in the Strategy and Plan of Action on eHealth (2012–2017) [12] refers to digital literacy as the space to contribute to the Member States' sustainable development by providing training in ICTs as key elements for quality health care, health promotion, and disease prevention, ensuring training and improved access to information in an equitable manner, and establishing the following objectives:

- Promote training on ICTs in the academic and professional health sectors;

- Provide reliable and quality information on health care education and disease prevention to the population and health care professionals;

- Facilitate the dissemination, communication, and socialization of information on public health, with special emphasis on emergency situations, through social networks.

When considering education in particular, the PAHO/WHO Strategy and Plan of Action on eHealth makes recommendations in two main areas:

- **eLearning** (including distance education or learning): the use of ICTs for learning. It can be used to improve the quality of education, to increase access to education, and to make new and innovative forms of learning for a larger number of people.

- **Ongoing education in information and communication technologies:** provision of courses or programs (not necessarily formally accredited) for health professionals that helps them to develop information and communications technology skills for application in health. This includes current methods for sharing scientific knowledge such as e-publication, open access, digital literacy, and the use of social networks." [12]

The Role of Professionals in Digital Health Literacy

Health literacy is not an individual but a social matter. [13] It should not be understood as a technological product but as a social intervention that entails a number of benefits related to education, culture, and opportunities. By sharing their knowledge, the role health professionals play is fundamental to providing health care information to patients, guaranteeing quality, safety, and responsibility in the use of services and health assistance. [14-16]

David Novillo points out that the new ICTs and digital literacy offer several advantages for the development of health professionals, namely: [17]

- Rapid, universal, and immediate access to information and knowledge
- Encouragement of contact between professionals
- Faster updating of information
- Improved dissemination of scientific knowledge
- Direct impact of clinical practice and quality of health care

The main objective should be educating to educate, that is, training health professionals first so that they can later train individuals to fully participate in making informed health decisions using eHealth resources.

A mixed approached should be used that develops on-line courses and training, together with in-person seminars and conferences where professionals can meet to exchange experiences and learn about what other colleagues and organizations are developing regarding digital literacy.

It is critical to reinforce this concept: the better the professionals are trained, the better the results in population health and quality of life will be. [18] The better the digital literacy of professionals, the smaller the communication gap between them and their patients, thus improving results in the population's health and quality of life. [19]

Such digital literacy should be encouraged by health professionals with the motive of instructing the population not only to manage digital tools but also to make appropriate use of them.

In order to achieve this goal, the role played by organizations (such as PAHO/WHO, Ministries of Health, universities) is essential for the development of training programs in ICT and digital literacy for health professionals. This should be carried out through interdisciplinary work where not only other medical professionals participate in the training process, but also information specialists and social science professionals such as psychologists, sociologists, and communicators, focusing on areas that are often overlooked in the academic sphere in the countries of the Region.

Digital health literacy appears at a time when social and medical sciences can no longer evolve separately, but should begin to work together with the main objective that health professionals have more comprehensive knowledge of the physical and emotional needs of their patients. This will have a considerable impact on the improvement of the population's health and as well as the health system as a whole.

eLearning has been described as a form of learning that allows for knowledge-building and exchange among technology users, without their having to be in the same place at the same time; it provides access to knowledge for individuals regardless of their spatial and temporal location. [20-22] Therefore, it becomes a key tool for a learning strategy seeking to reach a large number of students from different countries, with updated contents.

For the health field in particular, eLearning can be a valuable tool for continuing professional education on health issues and information technologies, since it can effectively address certain major barriers to education present in the health sector. Some of these are limited access to scientific information due to budgetary restrictions, lack of locally available training, and limited free time for learning, among others.

It shall also be pointed out that eLearning improves the educational-pedagogic process by incorporating multimedia resources.

In the *Manual de Salud Electrónica para Directivos de Servicios y Sistemas de Salud* [23] (*Electronic Health Manual for Managers of Health Services and Systems*), published by ECLAC, it was suggested that to develop eLearning programs it is necessary to observe certain guidelines:

- Offerings that are compatible with professional competencies based on the profile of the target audiences and connected with their needs;
- Development of well-organized courses, including technical support, for participants and students;
- Utilization of reusable learning objects;
- Management of expectations of students and instructors;
- Ongoing availability of communication tools for participants and students;
- Continual process of evaluation, improvement, and updating of contents and offer of courses.

Continuing education on ICTs to health professionals represents another challenge regardless of the training method used, although eLearning would be the tool of first choice. [19, 24-26] Alexander, et al., defined 10 key points for the development of continuing training courses based on their 10-year experience in public health education. [27]

1. "Link educational offerings to established professional competencies."
2. "Base educational offerings on assessed needs of the target audience."
3. "Design educational offerings based on appropriate cognitive learning levels."
4. "Utilize reusable learning objects."
5. "Know the target audience (or partner with someone who does)."

6 "Develop well-organized courses and programs with a standard look and feel."

7 "Provide readily accessible technical support to participants and students."

8 "Manage student and instructor expectations."

9 "Provide continuous feedback to participants and students."

10 "Continually evaluate, refine, and update course content and delivery."

According to the abovementioned, this conversation is aimed at working on the need of developing virtual communities of patients so that they can receive support and follow-up of their diseases, by means of health education and promotion.

MATERIALS AND METHODS

The chapter was developed using individual research, surveys, and, in particular, using the input of network interactions, within the framework of the project titled eHealth Conversations, developed by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by both the moderator and the participants, suggesting work directions, and keeping records of the conversations. Some co-authors submitted documents for discussion of different issues.

This conversation used the virtual campus offered by the Hospital Italiano de Buenos Aires (HIBA), which provided the following working tools:

- General discussion forum: allows active exchange of ideas on different topics to be addressed according to the conversation assignment. Each message posted in the forum forwards an e-mail to the participants.
- Wiki: this site allows for the joint creation of the document.
- Resource library: this site is devoted to sharing support documents on which opinions and/or thoughts will be based. This section includes journal articles, chapters from manuals and books, or full texts.

Each conversation lasted eight weeks and, based on the issues addressed, a document was elaborated including the main recommendations that emerged from the exchange of ideas and experiences. The conversation on e-Learning was attended by 86 participants from the following countries:

Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Guatemala, Mexico, Paraguay, Peru, Puerto Rico, Spain, United States, Uruguay, and Venezuela.

STRATEGIC INFORMATION

eLearning: The First eHealth Challenge to Overcome

Before defining and developing the concept of eLearning, it is necessary to fully understand its origin and purpose. Wikipedia defines learning as: "...the process of acquiring or modifying abilities, skills, knowledge, behaviors or values, as a result of study, experience, instruction, reasoning, and observation." [28] Another definition establishes that: "Learning is the process through which a particular ability is gained, information is assimilated, or a new strategy of knowledge and action is adopted." [29]

From birth, human beings are subject to the learning process to develop as individuals within a society. Society, in turn, is organized to give universal access to learning in specific topics such as health, legal structure , etc.

Distance learning consists of a teaching approach that human beings have used throughout history, and as technologies have advanced to provide universal access to communication, they have used distance learning, as was the case with postal mail, radio, television, vinyl discs and recording tapes, among others.

A new era has arrived for distance learning with the development of computers, which allow for increased content and storage capacity by using compact discs and USB storage devices. Following exponential growth, ICTs now offer a wide range of possibilities for on-line communication.

ICTs have brought the Internet, a powerful tool, within reach, and e-mail has become the means of electronic communication worldwide and opened a wide range of possibilities for learning. Within this context, a new form of distance learning has emerged. As ICTs have evolved, new forms of learning have appeared with the use of electronic media, which resulted in the concept of eLearning and its derivatives such as bLearning (blended learning) which, according to Wikipedia's definition, is "learning provided through an efficient combination of different methods of delivery, models of teaching, and styles of learning, and based on transparent communication of all the areas involved in the course." [30] On the other hand, mLearning (mobile learning) [31] has been defined as: "mobile electronic learning is a teaching and learning methodology which uses small mobile devices such as: cell telephones, PDAs, tablets, PocketPCs, iPods, and other hand devices with wireless connectivity." [19, 21, 24]

From eLearning to mLearning

When eLearning first started, it consisted exclusively of electronic learning with little on-line participation of tutors, something that was criticized by followers of the Socratic model. However, the evolution of ICTs has allowed for improved communications and bandwidth, favoring the development of eLearning and virtual collaboration applications, such as Moodle and Blackboard Collaborate platforms, which gave rise to bLearning, which blends electronic and in-person learning, the latter consisting in both face-to-face and on-line classes.

The rapid evolution of ICTs and the development and increasing use of new mobile technologies such as smart phones and tablets, together with the implementation of the broadband network, have fostered the emergence and development of mLearning through mobile portals and applications for mobile devices.

In the last decade, technologies for electronic distance learning have grown exponentially, resulting in a gap in terms of their application in different topics.

eLearning in Health

PAHO/WHO supports the eHealth strategy and plan of action, which encourages the application of ICTs in health management, and, in particular, the following:

- Ongoing training on ICTs
- eLearning

The objective pursued in the area of eHealth is the computerization of information systems in health care services, which includes electronic medical records, health statistics, and epidemiological surveillance. All these aspects should be able to be integrated online in a consistent and interoperable way within the network covering health care. However, the problem which needs to be solved is that human resources must know how to use these technologies. This leads to a paradox in which technological resources are needed to help personnel to learn how to use technology for their professional activities.

Thus, the challenge posed by an eHealth plan is learning how to apply ICTs in the management performed by health workers. In order to develop an eLearning plan in health, it is necessary to be aware of certain useful factors:

- Multigenerational human resources
- Geographic location of human resources
- Technological availability (access to the network)
- Adequate design for electronic learning

It is necessary to encourage the use of social networks, the Internet, and other resources, as modes of learning. This implies a cultural change both in ICT and human resource management: access to the technology available in health care facilities should not be restricted since that implies that continuing learning of health workers is being restricted. Consequently, policies and regulations on ICT and human resource management should adopt open models for ICTs in the learning process.

It is necessary to develop mobile portals and applications for continuing learning, taking advantage of the younger generation who employ their mobile devices to socialize every day, since socialization is a way to learn behaviors and skills from others.

To ensure continuing learning in ICTs and implementing eLearning in the health sector is not a matter of technology, but rather a shift in the organizational culture, as well as a question of learning to learn. An integral change in ICT and human resource management must take place to enable eLearning implementation.

Ongoing Improvement in Training Professionals by Means of Exchange of Experiences

In training processes, it is advisable to consider videoconferences, bimodal distance methodologies through information portals, either for professional development or to seek comprehensive improvement in existing training, as well as virtual reality and/or artificial intelligence programs, without ruling out robotics, as a learning tool.

It is worth mentioning that this new training modality will not replace, but will supplement and improve, traditional training. It offers opportunities such as cost and time savings, availability of information, and the possibility, by the single click of a mouse, of knowing about exceptional experiences in other parts of the Region and the world. [14, 21, 22] Electronic mail, information and knowledge exchange portals, social networks, instant messages, and virtual classrooms are part of the new digital contributions that only 20 years ago were within the reach of only a few.

At present, professional training projects such as Coursera (https://www.coursera.org), Open Course Ware (http://ocw.mit.edu), and PAHO/WHO Virtual Campus (www.campusvirtualsp.org), provide access to on-line courses at no cost. This opens new possibilities for professionals, who can access training from their homes if they have a computer with Internet access. In addition they can have access to a wide range of courses and training offered by the most prominent universities of the world at much lower cost than in-person teaching.

From the perspective of communications, ICTs should be regarded as a new communications input, where basic aspects (network navigation, forum consultations, etc.), and more complex schemes (electronic medical record, on-line management systems, etc.) converge.

From this perspective, the challenge consists not only in developing the "digital" model but also in complementing it with the traditional model; in this regard, training in "contents" as well as in the "media" offering them is crucial.

One of the most important concepts is related to "digital literacy." Today, more than ever, there are new communications and information media that have their own characteristics and development. It becomes critical to teach and guide professionals and users how to "communicate" through the new media, evaluating ways to complement it using other communications media. [10,15] Therefore, it is essential to complement the information gathered from the Internet with that provided by the physician in the office. These two ways of "communicating" should be combined, and at the same it is necessary to guide professionals and patients in strategies that make it possible to know "how" and "what" is being communicated. It is extremely important to bridge the communications gap (asymmetric communication) between professionals and patients, not only regarding the way in which the former will provide the information, but also in the feedback that may occur between them.

Due to the new information technologies, communication faces a new challenge. It is necessary to provide training in health as well as in the new forms of communication and information exchange.

It is worth mentioning, as an example, the work done by the University of Maastricht, the Netherlands, which has a medical training program in communication skills to teach students how to "communicate" with patients. This program is not optional but is a key part of medical studies.

Regarding the use of new technologies in teaching, Jan Van Dalen, the program coordinator, explains that the University of Maastricht uses an electronic learning environment in which students keep records of meetings with hypothetical patients (so that students and their classmates can review them later and generate feedback). Outside of the classroom, in many cases the students use the new technologies, taking their smart phones out of their pockets and recording their own consultations, sharing the recordings with the rest of the students (Cocciro, L, Virtual interview with Professor Jan Van Dalen, Coordinator of Communication Tools of the University of Maastricht, the Netherlands, conducted on 13 January 2013).

This model has an impact in the Region as is evident from the development of courses and training in the communications area in health sciences careers, where ICTs play a fundamental role. In Argentina, it is worth mentioning two examples: a course on communication skills that was designed for medical residents by the Hospital Alemán of Buenos Aires, and the course on communication for physicians, organized by the Cardiovascular Institute of Buenos Aires, in the training program on clinical cardiology. Both programs assume that all the work medical residents will perform is connected to communication: conducting the questionnaire, elaborating the clinical record, case presentations during rounds, requesting a consultation, communicating a diagnosis, and listening to and advising the patient. Thus, communication skills appear as one of the four key elements (together with knowledge, ability to resolve problems, and the ability to perform an adequate physical examination) of clinical proficiency.

This experience also applies to the rest of the countries in the Region as can be seen from other examples. In 1997, the University of Chile started a progressive change in its undergraduate medical training programs. This initiative pays special attention to the communication area and the challenges that new medical doctors have to face in their relationship with patients. Also, between 2000 and 2005, the University of Antioquía, in Colombia, reorganized its curricula and included new topics in study plans for the career in medicine such as medical communication and informatics. [32]

Therefore, communication skills, within the framework of ICT development, become essential for the future work of residents, performing as the link between evidence-based medicine and the work in the real field, both mediated and framed by the development of the use of ICTs in health.

Harmonization and Standardization for Ongoing Education

Information is available, in various forms and contents; the problem lies in the capacity to interpret it, that is, turn it into knowledge. In the field of health education, turning information into knowledge is not an easy task. [20] The role of the instructor in the learning process is not only to meet the goals of the course, but, above all, to encourage students to think and rethink the contents. One could define the different specialties or stages of the health/disease care process as knowing when to think (learning) and when it is necessary to act on what was thought (learned).

Continuing professional education is overwhelmed by the need to create more contents, more quickly, and more personalized for health professionals, as well as making it accessible through different (printed or electronic) media. To this one can add the issues of fewer resources, less time, and budgets assigned both for content developers of continuing education and for those who use the content. [33,34]

Content development for continuing education demands qualified individuals or professionals to provide the appropriate design and management of teaching material.[33,35] In addition, if it is necessary to reuse these resources in the Region, they must be translated into four languages (Spanish, Portuguese, English, and French), which requires high initial costs and the expense of periodic updates of the material.

Sometimes, content development is not conducted in an integrated way or considering places it might be used, with the result that content cannot be reutilized due to its distinctly local nature. This gives rise to "silos" of educational content, which ultimately leads to increased costs, lower quality, and the production of materials that are ineffective for reutilization.

The development of unified content requires the collaboration of the entire Region. Experts in each content area should develop and evaluate the material in terms of different locations, in an attempt to "glocalize" the content (a way to connect global and local), and to ensure that it is aligned with health education needs in the Region. On the other hand, the creation of content that has consistent structure facilitates the reutilization of that content.

Content should be consistent so that all those wanting to reuse it receive a clear and unified message. This will facilitate, in the long term, faster updates of content, make better use of available resources at lower development costs, and ensure quality because of the experts selected to develop the subject matter.

Although continuing education is mainly oriented toward health professionals, this model is applicable to the other players in health systems, i.e., the patients. Specific and customized information resources can be developed since the message to be delivered may be similar, although it should be adapted to the profile and level of experience of the recipient.

Virtual Communities of Patients and Their Follow-Up by Means of Education for Health and Health Promotion

Social networks, which are broadly used by all levels of society, are already creating patient communities; therefore, objectives and expected results should be defined specifically for the health field.[36-39]

Patient communities are an indispensable resource for the sustainability of health systems. Health systems should promote and support the emergence of this type of community, encourage their self-management, and provide the necessary resources for their development. The complexity of these communities corresponds to the type of problem, pathology or disease, and objectives and duration are defined according to categories such as type of disease, treatment, age group, and social context. Then, for example, information shared among patients, even if empirical and biased, is based on their experiences of dealing with pathologies and health systems. This enables a significant reduction of material costs, as well as time savings for administrations and health workers. In this way, patient communities may help in cases where health systems should not divert specific resources.

Frequently, patient associations are self-generated, prompted by some type of emergency, or an illness of the patient, or someone related to the patient. These communities may persist or not, depending on several factors, including whether they were created as an initiative of: 1) patients, 2) professionals, or 3) institutions. Each of these variables affects the relationship between patients, their organizational capacity, the provision of necessary resources, and the demand placed on the health system for resources.

ICTs may contribute improved dynamics to patient associations, topics addressed, and local and regional interactions. The number of devices and forums currently in use enable personalized interactions and information exchange without the usual restrictions placed by health systems, such as privacy and consent for the dissemination of information. As a result, one of the essential regulations that patient communities should have is clinical data confidentiality for each member.

Education for Health

On the one hand, ICTs used for health education should contribute to accessibility and improvement of current information and, on the other, should create the means to develop the necessary knowledge to use such information. This requires categorization or differentiation according to age groups and social contexts, that is, media that are customized according to age, cultural and social environment, and urban, semi-urban, or rural settings.

Education for health, as a life attitude involving healthy habits, should begin in homes and schools, from childhood and throughout life in all sectors of society.

From a positive and far-reaching perspective, education should be aimed at the development of a population's physical and mental health. Consequently, pedagogy for individual and social health should be developed as a means to improve current health systems, clinical practice, and medicine.

The requisite of incorporating health into educational systems and pedagogy into health systems may contribute to citizen participation in the relationship between education and health.

Health Promotion

Health promotion demands an epidemiological perspective, objectives, plans, programmatic areas, knowledge of the interventions to be conducted, the resources involved, expected results, and accountability. It is one of the cross-cutting activities for societies, and is developed by the interaction of health services, professional associations, the private sector, NGOs, and citizens.

Improvement in different settings such as residential, occupational, health facilities, food industry, transport industry, etc., has a significant impact on people's quality of life and brings improvements to the health of the population.

ICTs are involved in all the processes mentioned, from planning, management, follow-up, and evaluation, to documentation. Therefore, applications should be developed for each one of these processes as well as the devices needed to carry out these processes.

Profiles of Specialists *1

William Hersh
He is Professor and Chair of the Department of Medical Informatics and Clinical Epidemiology at Oregon Health and Science University, United States. His research focuses on information retrieval, about which he has authored over 125 scientific papers as well as the book Information Retrieval: A Health and Biomedical Perspective. He has also developed all of OHSU's biomedical informatics graduate programs as well as the 10x10 ("ten by ten") program.

Heimar de Fátima Marin
She has devoted her professional career to improving patient care using information and communication technologies. She is a Professor at the Federal University of São Paulo (UNIFESP) and a specialist with the Division of Clinical Computing, Harvard Medical School, U.S.A. In 2004, she became a member of the American College of Medical Informatics. She is Associate Editor of the *International Journal of Medical Informatics* and has authored more than 250 publications.

Patricia Abbott
She is Associate Professor, University of Michigan, United States, in the Office of Global Affairs. She has a PhD in Operations Analysis and Information Sciences and was awarded a postdoctoral fellowship from the U.S. National Institute of Health (NIH) in Computer Sciences and User-Centered Design. She advocates for the development of information technologies in limited resource settings in order to increase access to education and to disseminate knowledge on health among health workers in remote communities.

John H. Holmes
A native of the United States, he has broad experience in building and strengthening capacity in informatics and epidemiology at the international level. He has developed courses on database management, epidemiology, and information systems in clinical research, which are currently taught in universities in Pennsylvania (U.S.A.), and San Carlos and Francisco Marroquín in Guatemala. He participates in telemedicine and capacity building in informatics projects through the Botswana University of the Pennsylvania Partnership. Continuing medical education and public and clinical health applications are included in these projects.

Álvaro Margolis

A native of Uruguay, he is an internist with a master's degree in medical informatics. He has held academic positions in internal medicine and in continuing medical education and is Associate Professor at the School of Engineering, University of the Republic of Uruguay. He served as President of the Federation of Health Informatics Societies for Latin America and the Caribbean, and is the current Vice President of the International Medical Informatics Association, in charge of the World Congress Medinfo (2013–2015).

Walter Curioso Vilches

A native of Peru, he is a physician and surgeon with a master's degree in public health and a PhD in biomedical informatics. He has authored more than 100 publications related to the use of information and communications technologies in health, mHealth, and telemedicine. At present, he works as Director General of the General Office of Statistics and Informatics of the Ministry of Health of Peru, and is President of the Peruvian Association of Biomedical Informatics.

PAHO Specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to get in touch with them, please forward an email to: ehealth@paho.org.

*1 *The list of specialists published here is the result of the recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published here and reserves the right to change, restrict or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

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Web Sites *2

OpenCourseWare Consortium

The OpenCourseWare Consortium is a worldwide community of hundreds of higher education institutions and associated organizations committed to advancing OpenCourseWare and its impact on global education. Courses delivered through the OpenCourseWare platform enable free and open digital publication of high-quality college and university educational materials. These materials are used to prepare courses and often include not only materials with course content but also planning materials and evaluation tools. OpenCourseWare is free and openly licensed, accessible to anyone, anytime via the Internet.
Available at: http://www.ocwconsortium.org/

Coursera

Coursera is a social entrepreneurship company that partners with top universities in the world to offer courses online for anyone, for free. One of the drivers of this project is the fact that, in the future, top universities will be educating not only thousands of students, but millions. It seeks to give access to top-level educational resources to empower people with education that will improve their lives, the lives of their families, and the communities they live in. It offers a wide range of content covering humanities, medicine, biology, social sciences, mathematics, business, information technologies, and many other branches of knowledge.
Available at: https://www.coursera.org/

Virtual Campus for Public Health

This virtual campus is an exceptional network that strengthens knowledge management and continuing learning programs for the development of human resources and public health institutions. It has actively contributed to the initiative La Salud Pública en las Américas (Public Health in the Americas), by improving essential public health functions and practices and, consequently, in the achievement of health commitments included in the Millennium Development Goals (MDG).
Available at: http://www.campusvirtualsp.org/

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by the Organization of opinions, ideas, data, or products presented in those sites, or guarantee the validity of the information included thereof. The only purpose for offering links to external sites is to provide further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not necessarily represent the opinions of PAHO/WHO.*

Mujeres que salvan vidas (Women who save lives)

The objectives are to design and implement an educational proposal for health promotion in breast cancer using ICTs. This is an information system prototype designed for the follow-up of breast cancer patients in the health care journey (diagnosis, treatment, rehabilitation, supportive care), in the Costa Rican health system.

The ICT component complements coordinated actions for reorientation of health services and health education in the healthy population. The web site www.mujeresquesalvanvidas.info is devoted to facilitating the access to information with the purpose of promoting health in breast cancer patients, NGO leaders, relatives of patients, and healthy populations. This will provide a hyperlink to an information system which, in real time, will digitally record information and help to perform data analysis. It also will facilitate planning services to accompany breast cancer patients through the health system in participating hospitals, through digital agendas, activity reminders, and follow-up of appointments.

Programs for Communication Tools at the University of Maastricht, Netherlands

Jan Van Dalen, Coordinador

These programs have provided significant experience in the use of communication tools for training health professionals with the aim of achieving better physician-patient relationships. The training program works with behavioral scientists during the first year, with the participation of psychologists who have tools to train physicians in the management and teaching of communication skills.

Webinar: Medical Informatics Certificate for Puerto Rico

The development of the training course for the medical informatics certificate was coordinated from the EviMed office in San Juan, Puerto Rico, with the Hospital Italiano of Buenos Aires, and with support of the University of Oregon, the American Medical Informatics Association, and the Regional Extension Center of the University of Ponce, Puerto Rico. The course lasted four months and was adapted to the local reality of Puerto Rico. The objectives of the course were to:

- Acknowledge the need for systematic processing of health information;
- Identify the benefits and limitations of information technologies in health;
- Identify and analyze the problems of computerization in clinical practice from the perspective of strategic institutional planning;
- Apply project management methods.

RESULTS

Conclusions

In order to foster the development of the eHealth strategy, participants concluded that the following is necessary:

- eLearning as an educational tool with massive reach, together with digital literacy as a strategy for eHealth;
- The use and exchange of local, national, and regional experiences as part of a process of ongoing improvement in training for health professionals;
- The unification and standardization of contents for continuing education, so that they can be shared;
- The development of virtual patient communities and follow-up by means of health education and health promotion.

Recommendations

Recommendations to provide direction for national institutions (governments, universities, NGOs, the private sector) and international organizations

- Encourage the development of eLearning as a training tool for health professionals and provide the social and technological support for access to resources which provide digital literacy to the population in general, as a notion of equity;
- Convene scientific societies and health institutions of the Region to encourage them to exchange and take advantage of local, national, and regional experiences, as part of the continuing education and/or training process of health professionals;

- Decide on priority topics in the health sector in order to assist in defining consistent and standardized content for continuing education, enabling participants to openly and freely share this content;

- As a strategy for health promotion and education, foster the development of virtual spaces and patient communities to empower others to improve their own health.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Continue to promote communication among Member States so that digital literacy can reach the entire population and eLearning can be used as a strategic communication and training tool for eHealth;

- Open more spaces to allow for the exchange of successful experiences in the Region as a way to expand and encourage the continuing education process for health professionals;

- Organize academic institutions of Member States to work on defining the contents for continuing education, which is of interest to the Region;

- Promote, at a regional level, the development of virtual patient communities in order to foster education for health and self-care.

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ANNEXES

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We would like to acknowledge the collaboration of the following participants:

- Allan Bejarano
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- Jeadran Malagon
- Ellen Lujan Mendez Xavier
- Luis Rodriguez
- Néstor G. Tejera

Video interviews with author(s)

eHealth Conversations: Education

http://www.paho.org/ict4health/podcast/Entrevista-Educacion.mp3

Available in Spanish only

Podcast: Recommendations on eHealth provided in digital audio

http://www.paho.org/ict4health/podcast/Educacion.mp3

Available in Spanish only

Messages for Twitter on #eLearning

#eLearning can improve the quality of education, increase access to education, and generate innovative forms of learning.

#eLearning should encompass information, access to information, digital literacy, and knowledge.

Services, human resources, and patients: Three players in the health system that should have specific and customized information resources.

It is important not to look for virtual teaching or training, but learning by using ICTs. #eLearning

In training health workers, #eLearning can be a teaching method with unified content for the entire Region.

Experience exchange through forums and collaborative spaces is an enjoyable aspect of continuing education. #eLearning

#eLearning, mLearning, bLearning: There is not only one way to have access to continuing education.

#eLearning, mLearning, bLearning: We should choose the most appropriate way for each situation.

For the training of health professionals, #eLearning may provide a more creative way of teaching.

#eLearning should consider virtual patient community projects as well as follow-up through health education and promotion.

In education, ICTs should be able to empower participants in the process so that they become more creative, communicative, prepared, and skilled.

Continuing education should provide training, education, information, and research in the field of health and social security at the regional level. #eLearning

#eLearning can facilitate the promotion of digital literacy and continuing education for the development of eHealth.

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A native of Argentina, she is a pediatrician and assistant professor of Medical Informatics at the University Institute, Hospital Italiano of Buenos Aires. She does research in the development of electronic health records, information retrieval, e-Learning, and patient security. She participated in the creation of the Spanish version of the AMIA 10x10 Program, and in the "Making the eHealth Connection" working group for the elaboration of recommendations on the development of skills in health informatics.

Alfredo Horoch

He is from Argentina, and has specialized in computer software development. He developed the Epidemiological Survey on Cardiovascular Risk Factors for the Hospital de Clínicas and the Argentine Society of Cardiology. He also developed multiplatform (PC-Tablets-Mobile) applications for primary health care, including "My Clinical Record" for patients and "Professional Background" for health professionals. At present, he performs the spatial and temporal contextualized management of processes, infrastructure, facilities, equipment, resources, among others, for health institutions.

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He is an Argentine native, and has a BA in Social Communication Sciences and a professional degree in Management of Health Systems. He is also a consultant in health communication and social marketing. Currently, he is responsible of the Communication and Institutional Relations Department of the Argentine Federation of Health Agencies.

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Born in Costa Rica, he is an informatics engineer with a post-graduate degree in Information and Communications Technology (ICT) Administration, Project Administration, and ICT Management in Social Security. He served as Technical Director of the Centralized Collection System Project to implement the collection and distribution of fees at the national level using the concept of service-oriented architecture. He develops technological innovation at the Center for Strategic Development of Health Information and Social Security.

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General Disclaimer

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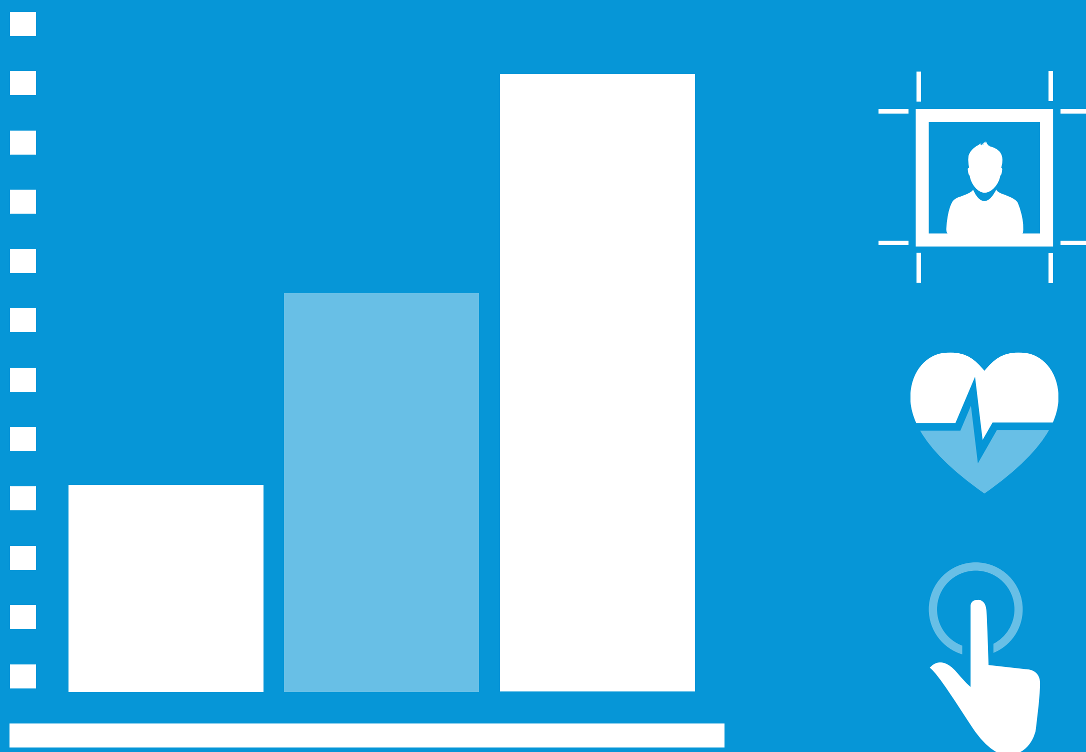
The Impact of eHealth on Patient Safety

The Use of Information and Communications Technologies to Reduce Adverse Events in Health Care



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SUMMARY

The impact of information and communications technology (ICT) on the safety of patient care can be very positive but it requires education, training, and careful design to help reduce adverse events in the health care process according to the findings of a panel of experts who participated in eHealth Conversations, a project organized by the Pan American Health Organization (PAHO/WHO).

The experts focused on the need to incorporate these issues in the health education curriculum, the utility of reporting of adverse events, and impacts of the use of electronic medical records. Recommendations focused on eHealth strategies for education, the use of interoperable electronic health records, the generation of clear policies about how to handle adverse events, and collaborative spaces to discuss all elements involved in health care.

They asserted that a significant contribution to improving patient safety is the electronic medical record , which allows for better evidence regarding the exact care given to each patient as it records date, time, and details.

In their recommendations to guide national institutions, the expert group said that the issue of patient safety should be central in graduate education and continuing professional development, incorporating simulation and training tools.

As for recommendations to PAHO/WHO to guide its eHealth strategy, the experts proposed collaboration to encourage governments and institutions to incorporate electronic medical records. They said PAHO/WHO should serve as the link between the countries to create a universal health record for people and to promote interoperability of systems.

INTRODUCTION

By analyzing concepts related to quality, safety, and patient rights, areas where using ICTs might have a positive impact could be identified, and useful elements for safe and quality health care introduced.

The concept of patient-centered quality is defined by the patient and not by the health care provider. It includes, among other variables, satisfying patient's expectations, demands, and their access to services; technical aspects; efficient use of resources; and minimization of risks.

Observing patients' rights is a central element in the concept of quality and safety, and includes, among other things, dignity and equal treatment, confidentiality, privacy, personal safety, identity, information and communication, and consent.

Within this framework, the concept of equity should be emphasized; it is the guarantee of equal access to quality health care, at the time and place required by the patient.

There is increasing concern about the qualitative and quantitative scale of adverse events, which leads to the need to design strategies and intensify efforts to prevent or circumvent them.

In 2004, WHO launched the World Alliance for Patient Safety and identified six areas for action; one of them is the development of "solutions for patient safety." These identify the most important aspects that are recognized as being accountable for almost all the adverse events related to health care. The use of ICTs can have an impact in this area.[1]

Taking one of the main causes of adverse events as an example, that is, the use of medications, it is estimated that just the introduction of integrated digital systems in the health care process could reduce prescription and medication management errors by 40%–80%.

The purpose of this Conversation was to advance the analysis of possible ICT impacts regarding patient safety in order to support the execution of the PAHO/WHO Regional Strategy and Plan of Action on eHealth.

At the same time it is important to consider that improvements in the use of ICTs will lead to the creation of standards to certify that these systems have the necessary operating and design conditions. These standards must ensure that ICT use will actually have a positive impact instead of posing a hazard for quality or introducing new risks for patient safety or rights.use will actually have a positive impact instead of being a threatening factor for quality or one which introduces new risks for patient safety or rights.

MATERIALS AND METHODS

The chapter was developed using individual research, surveys, and, particularly, the input from network interactions, within the framework of the eHealth Conversations project, developed by PAHO/WHO. Each conversation was led by a coordinator who was responsible for moderating the process, generating open debates on issues raised both by the moderator and the participants, suggesting work assignments, and keeping records of the conversations. Some authors submitted documents for discussion on different issues.

In order to prepare this work, conversations and debates were conducted using an open collaborative platform called Linkedin. This platform works as a social network, where almost all users are professionals. A group in the platform was formed around “eHealth Conversations: ICTs and patient safety,” and they shared ideas based on the conversation assigned.

The conversation was complemented with the publication of a series of tweets with the hashtag “#ehealthtalks”, through PAHO’s Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks and, based on the topics addressed, a document was elaborated including the main recommendations coming from the exchange of ideas and experiences. The conversation on patient safety included 55 participants coming from the following countries: Argentina, Chile, Colombia, Mexico, Peru, Portugal, Spain, Uruguay, and Venezuela.

STRATEGIC INFORMATION

Ideas and experiences were exchanged on patient safety, as detailed below.

Incorporation of Patient Safety as a Key Issue in the Learning Curricula for both Undergraduates and Postgraduates

The participants noted that while effective measures are taken regarding patient safety, there are flaws in execution due to lack of training or awareness on this issue. It is, therefore, critical to help generations of professionals to become more aware of the possibility of error.

Consensus was reached regarding the need to include the issue of patient safety as a core topic in training health professionals and all connected activities. WHO initiatives [1] on the topic were highlighted, and participants agreed that, although the problem is troubling, when undergraduate courses are analyzed, there are generally delays in the incorporation of patient safety into the curricula. Besides incorporating the topic in undergraduate coursework, continuity should be observed, and it should be included in all activities connected with continuing professional development.

In addition, health care facilities should develop training and dissemination activities that are ongoing and aimed at all human resources directly or indirectly involved in health care processes. It was asserted that training activities should specifically include the use of ICTs and their importance in the strategies related to patient safety. Related to this, special attention should be given to the development of activities directed toward those with managerial, administrative, and/or decision-making responsibilities.

Use of ICTs in Training

ICTs allow for the introduction of reliable training and simulation systems starting from undergraduate education, and should be used by professionals throughout their careers. The use of simulators, which are virtual reality systems that help students acquire or perfect skills, and can assist in developing and assessing competencies, helps to minimize the occurrence of adverse events related to learning curves.

Aeronautics has been used as an example, since this industry has developed activities directed at the safety of individuals. Flying aircraft is not allowed unless instruction with simulators takes place.

Impact of ICTs on the initiatives defined by WHOS [1] as priority regarding patient safety:

- **Medications with similar appearance or name:** ICTs can provide for unambiguous identification of medications by associating the drug with the individual dose of the patient. If rules and warnings regarding medications with any kind of similarity are established in the systems, careful attention will be given at the time of prescription or administration. If records are kept about these events, changes may be introduced in the pharmacy;

- **Patient identification:** computerized patient record systems allow for identification according to different parameters, including biometrics, which minimize the possibility of mistakes. They also allow for follow-up on all the activities of an individual within the health care facility using different methods such as bar codes and radiofrequency, among others;

- **Communication during patient referral:** transition in treatment is a critical moment in which situations may lead to or contribute to adverse events. Systematizing and recording these processes may reduce the possibility of errors;

- **Performing the proper procedure in the correct body site:** it is useful to make checklists, create warnings or rules that will provide barriers or restrictions to performing a procedure if checklists are not followed. Electronic medical records should be available at all facility levels; information about the procedure to be carried out can be included in the identification bar codes, among others;

- **Guaranteeing the exactness of medication in healthcare transitions:** this is a critical point during which the use of ICTs may have a positive impact, since errors connected with oral communication or illegible handwriting that confuse patients, may be reduced.

Recording and Reporting Adverse Events

The discussion focused on the importance of record-keeping systems for reporting adverse events, since identification and analysis of such situations may bring about corrective and preventive actions.

While using ICTs to develop such systems is rather simple, resistance to their use was pointed out. When adverse events occur, people prioritize anonymity and, at this level, electronic medical records (EMRs) create distrust.

Having an electronic records system facilitates and improves the way that information collected is processed, and it is necessary to consider organizational culture at the time of implementation.

Electronic Medical Records

The use and impact of ICTs was discussed and enriched by the input from the EMR discussion group.

Using EMRs would improve key aspects connected with identification since univocal identification systems and internal follow-up methods could be developed. EMRs minimize risks related to prescription errors, medication identification, warnings for drug interactions, or restrictions due to associated pathologies, among other hazards.

Confidentiality and availability of information are elements that work in opposition to each other, and are difficult to harmonize in printed records, while electronic records allow, by observing security rules, both confidentiality and ease of access to information. In addition, EMRs make it possible for information to be available at different geographic locations, i.e., available everywhere, without patients having to carry records with them.

Including informed consents in EMRs enables good control of compliance while it also allows patients or their relatives to access information relating to the patient's situation.

Critical Perspective on the use of ICTs and Quality Standards

If we take into account the accreditation manual for multipurpose institutions, such as the *Instituto Técnico para la Acreditación de Establecimientos de Salud* (Technical Institute for the Accreditation of Health Facilities [ITAES]), [2] it can be inferred that computing impacts directly and significantly on at least 8 of 39 standards, detailed below, which include all activities in a health facility, evaluating standards on structure, processes, and results. This accounts for an impact on more than 20% of standards, and, if we include those where there may be indirect or lower participation, this percentage would be significantly higher.

- Continuity of health care: this standard, among other criteria, addresses health care transitions and the availability of patient information;
- Referral: this requires referral standards, continual communication with reference facilities, and handling documents, and is connected with continuity of health care;
- Medication management: in addition to the criteria regarding pharmacy management, this requires stock control, prescription and supply tracking, and ongoing control of expiration dates, among others;
- Control of hospital infections: includes recording incidents and creating indicators;
- Clinical histories and files: the criteria are aimed at ensuring availability, legibility, completeness, confidentiality, and integrity of the clinical record;
- Statistics: it acknowledges the need to systematize information processing in order to have statistical data aimed at quality and safety management;
- Hospital governance: this relates to issues concerning the management of facilities;
- Administration: includes aspects of administrative structure such as management of files and accounting, among others
.

The remaining standards involving direct care (critical care, neonatology, surgery, rehab, transfusion, laboratory, imaging, pathology, nursing, radiotherapy), supportive services (nutrition, clothing, sterilization, cleaning, waste management), or structure (safety, electricity, hygiene, plans, among others) are influenced by ICTs insofar as they relate to the EMR, indicators management, availability of standards, continuing training, and the creation of checklists and warning systems, among others.

Challenges in the Use of ICTs

The possibility that the use of ICTs may introduce new elements of uncertainty was discussed. It was observed that aspects related to problems in information management and system design could introduce new sources of error. However, the risk is minimized if satisfactory design takes place before implementation; and it was emphasized that it is easier to detect and correct errors using ICTs, and prevent them from occurring again.

Profile of Specialists *1

Gustavo Enrique Cifuentes Rivas

He is a pharmaceutical chemist with degrees in management of pharmaceutical care, management of health care networks, and public health. He has a master's degree in management of health care institutions. At present, he is Chief of the Patient Quality and Safety Unit as well as Professor and Coordinator of Clinical Pharmacology. He is a member of the quality network of the Central Metropolitan Health Service for the assessment of tertiary care hospitals. He serves as Vice-president of the Technical Council for Accreditation of the Health Sciences Accreditation Agency.

Ezequiel García-Elorrio

He is Director of the Department of Medical Care Quality and Patient Safety of the Institute for Clinical Effectiveness and Health of Buenos Aires. He develops activities in education, research, and technical cooperation in the countries of the Region and other parts of the world. His areas of academic interest are related to patient safety at hospital level, organizational and professional change, evaluation of gaps and of the impact of projects for the improvement and flow of patient care.

José María Ceriani Cernadas

He is a physician who currently serves as coordinator of the Patient Safety Committee at the Hospital Italiano of Buenos Aires (HIBA). He is a member of the Academic Council of the University Institute, School of Medicine, HIBA. He is also associate professor of Pediatrics, director of the Post-graduate Department and director of the virtual course Pathophysiology of Common Neonatal Disorders, of the Argentine Society of Pediatrics. He is chief editor of the Archivos Argentinos de Pediatría and member of the Sub-commission for Patient Safety. He served as president of the National Meeting of Humanism in Medicine in 2013.

PAHO/WHO Specialists

The Pan American Health Organization has specialists on this field within the Region of the Americas. In order to get in touch with them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. The Organization gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published here and reserves the right to change, restrict or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

Black AD, Car J, Pagliari C, Anandan D, et al. The impact of eHealth on the quality and safety of healthcare: A systematic overview. PLoS Med 2011 Jan 18;8(1):e1000287.

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Walsh KE, Landrigan CP, Adams WG, Vinci RJ, et al. Effect of computer order entry on prevention of serious medication errors in hospitalized children. Pediatrics 2008 Mar; 121(3):e421–7

Web Sites *2

Safety of the patient and errors in medicine

Institute of Epidemiological Research, National Academy of Medicine. Argentina.
Available at: http://www.errorenmedicina.anm.edu.ar

Safety of the patient and prevention of adverse events related to health care (Online tutorial)

Ministry of Health, Social Services, and Equity, Spain.
Available at: http://www.seguridaddelpaciente.es/index.php/lang-es/formacion/tutoriales/seguridad-paciente-prevencion-efectos-adversos.html

BMJ Quality and safety British Medical Journal

Available at: http://qualitysafety.bmj.com/

Instituto Técnico para la Acreditación de Establecimientos de Salud (Technical Institute for the Accreditation of Health Facilities [ITAES])

(Manuals for Accreditation of health facilities) Available at: http://www.itaes.org.ar.

Safety. Hospital Italiano de Buenos Aires, Argentina

Available at: http://www.hospitalitaliano.org.ar/seguridad

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by the Organization of opinions, ideas, data, or products presented in those sites, or guarantee the validity of the information included thereof. The only purpose for offering links to external sites is to provide information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not necessarily represent the opinions of PAHO/WHO.*

Survey of medical students. Argentina Conference on Medical Education (CAEM)

Dr. Carlos Spector presented results of a survey made of advanced medical students who were about to graduate. The survey showed that the lack of knowledge of the respondents on patient safety was almost complete and there was only limited intention or will to learn.

Experiences at the Hospital Itálica of Buenos Aires (HIBA)

In all cases, experiences were successful since the use of EMRs, as well as univocal patient identification, has reduced the risk of related errors.

Positive aspects were highlighted, and developments in connection with the occurrence of adverse events related to these issues were considered successful. While the use of ICTs introduces new problems, they are simpler to resolve since they only require adjustments in the system. This supports evidence that the key element for effective actions depends on raising the awareness of health care workers regarding the possibility of errors.

As regards the use of EMRs, results of the cross-sectional study conducted before and after EMR implementation were submitted. The study was aimed at determining the prevalence and characteristics of errors in medical prescription and nursing administration paper records. A new study was performed after one year using the same methods in the EMR in order to quantify and qualify the type of errors with the aim of comparing both results. This was carried out in two stages:

1st stage: paper prescriptions and administrative records were analyzed in order to detect frequency and characteristics of errors in the prescription sheet and nursing administration record.

2nd stage: prescriptions and nursing administration records using the EMR were analyzed one year after implementation.

It was shown at the 2nd stage of the study that errors did not occur on items such as missing professional signature, missing time of prescription, missing time of medication discontinuation, illegible handwriting, missing patient data, scratch-outs, and missing type of diet, among others. , This resulted in a 20% reduction of errors compared to the paper format.

The use of the EMR introduced new errors arising from the ability to copy and paste, or to select from a list of products, which represented 10% of errors. Nevertheless, they were rapidly detected and easily corrected by introducing improvements to the system, which will be analyzed in a future cross-sectional study.

Another HIBA experience was the system for reporting errors, which was originally completed on paper and then through the Intranet. Most recently, paper was reintroduced and therefore both systems coexist since, in some cases, health workers are reluctant to use the Intranet because when introducing user name and password, anonymity is not guaranteed by the system. Later, an answering machine and an e-mail were introduced so as to provide several possibilities to users.

Use of EMRs in Peru to improve patient safety

Nearly 223 health care facilities which provide childbirth assistance all over the country have access to the on-line Live Birth Certificate and the telemedicine system for perinatal services. More than 66,000 newborns in the country now have the abovementioned certificate, which, by agreement with the *Registro Nacional de Identificación y Estado Civil* (RENIEC) (National Registry of Identification and Civil Status), includes data on newborns, their parents, and the professionals assisting the delivery. This makes it possible to provide the newborn with an identity card in a short period of time.

This record is unique for the entire health sector and marks the beginning of what the EMR will be. The Ministry of Health manages the information that is currently gathered in the on-line Live Birth Certificate which will be useful to follow-up the growth and development of the child. This strengthens the governing role of the Ministry, which currently delivers certificates in 68 health facilities of the country.

Use of the telemedicine system is currently applied in perinatal maternal care, hospital neonatal ICUs, and in maternal and child health centers. It reduces the gap in the number of specialists present in the country, as well as distances, since professionals can receive clinical support and training and share clinical cases. In addition, it connects with specialists in countries such as Colombia, United States, and England where, apart from analyzing cases, management problems are resolved.

For further information, refer to:
http://es.scribd.com/mobile/doc/129732501

Experience of the Hospital Alemán of Buenos Aires, Argentina, in the use of electronic prescriptions to reduce adverse events with high-risk medications

A medication database has been designed for electronic prescriptions, standardizing measuring units and adequately describing the presentations including more than one drug. In case of cancer drugs, a template system has been created including preset standard doses and dosage. Closed dosages have been created for some potentially life-threatening drugs, such as potassium chloride.

Conclusions

- There is still little knowledge on patient safety issues and, in many cases, the measures adopted fail due to the lack of training. Therefore, it is important that different aspects of patient safety are included in undergraduate education and on an ongoing basis in postgraduate instruction;

- ICTs can be very helpful in learning processes since training and simulation systems can be implemented to improve competencies, skills, and proficiency. This has a double impact on patient safety: on the one hand, ICTs improve practices and, on the other, they reduce the adverse events that might occur during periods of training;

- ICTs can have a positive impact on the following WHO priority aspects of patient safety:
  - Medications having similar appearance or name
  - Patient identification
  - Communication during patient referral
  - Performance of the proper procedure at the proper body site
  - Control of concentrated electrolyte solutions
  - Accuracy of medication in health care transitions

- The use of EMRs improves aspects of patient identification and all the mistakes connected to it. On the other hand, it improves the availability of (local and remote) information, and careful attention should be given to the development of systems that guarantee confidentiality and integrity of that information;

- The EMR gets rid of many of the common errors in paper format, improving security. In contrast, new errors can be systematically corrected, reducing the possibility that they will be repeated;

- The use of EMRs provides better evidence of the services delivered to patients since date, time, and quantity are automatically recorded, thus improving data completeness and quality;

- The design of systems should be oriented toward avoiding new elements of error, adding failure records, elaborating policies concerning risks, generating records on adverse events, and efficiently analyzing information. The development of the culture of an organization should be addressed, including aspects such as the importance of anonymity, in order to guarantee usage of the system;

- ICTs are also useful in creating communication and training tools for patients and relatives, promoting safer health care;

- ICTs have a positive impact on all standards regarded as relevant for health care quality.

Recommendations

Recommendations to provide direction for national institutions (governments, universities, NGOs, the private sector) and international organizations.

- Include patient safety as a core topic both in graduate curricula and in continuing professional development;

- Include the use of ICTs in educational activities, incorporating simulation and training tools;

- Promote the use of EMRs and regulate their use, especially regarding interoperability aspects;

- Develop clear policies regarding the management of adverse events, recording these events in order to implement corrective actions not only regarding knowledge but also regarding experience;

- Endorse the development of certification and standardization systems for the use of ICTs in health and encourage institutions to undergo external quality evaluations.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Foster and develop strategies in graduate education and continuing professional development on patient safety;

- Collaborate with and encourage governments and institutions to incorporate the use of EMRs;

- Act as the link between the countries in the creation of a universal minimum health record of people and promote system interoperability;

- Carry out multinational collaborative projects on recording adverse events, creating a universal database that would include not only the report of the event but also the corrective measures taken in each particular case; create an expert committee that can develop solutions;

- Continue to support collaborative or participative spaces and meetings aimed at discussion and consensus

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List of Participants

We would like to acknowledge the collaboration of the following participants:

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- Francisco Daniel Vázquez Camacho
- Gustavo Daniel Ribero Lavie

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Seguridad-del-paciente.mp3

Messages for Twitter on Safety of the Patient #PatientySafety

The use of ICTs requires education, training, and a careful design to help to reduce adverse events in delivering health care.

Clear policies must be set on how to manage adverse events, and support given to notification and registry of errors.

It is important to promote the registry of adverse events so we can learn from those experiences.

It is vital to introduce the topic of patient safety in undergraduate training and in continuing training of professionals.

ICTs can help to implement training and simulation systems to improve competencies, abilities, and skills.

ICTs can improve patient safety practices and help to lessen adverse events that might occur during the training period.

ICTs can have a positive impact on patient safety in terms of patient identification.

ICTs can have a positive impact on patient safety in terms of performing proper procedures on correct body site.

ICTs can have a positive impact on patient safety in the control of concentrated electrolyte solutions.

ICTs can have a positive impact on patient safety in accuracy of medications during patient transitions.

Electronic medical records are an essential tool for patient safety in health care.

Computerization of health care should be a government strategy to improve equity and safety. #egovernment #eHealth

The implementation of ICTs in health care should comply with quality and safety standards to prevent the introduction of new errors.

All those involved in health care are obliged to actively participate in debates and consensus on safety.

Following the slogan of @ITAES [2] quality and safety in the health care process is the responsibility of every one.

The use of electronic medication management is an essential tool for safe health care.

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He is an industrial engineer with 10 years of experience in strategy consulting in Spain and Chile, where he developed projects in the area of comprehensive risk management systems, process definition, and organizational models. He was involved in the implementation of a Cloud platform for comprehensive management of patient safety in the Public Hospital Network (70 hospitals) and the Primary Care Center Network (400 centers) in Cataluña, Spain.

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General Disclaimer

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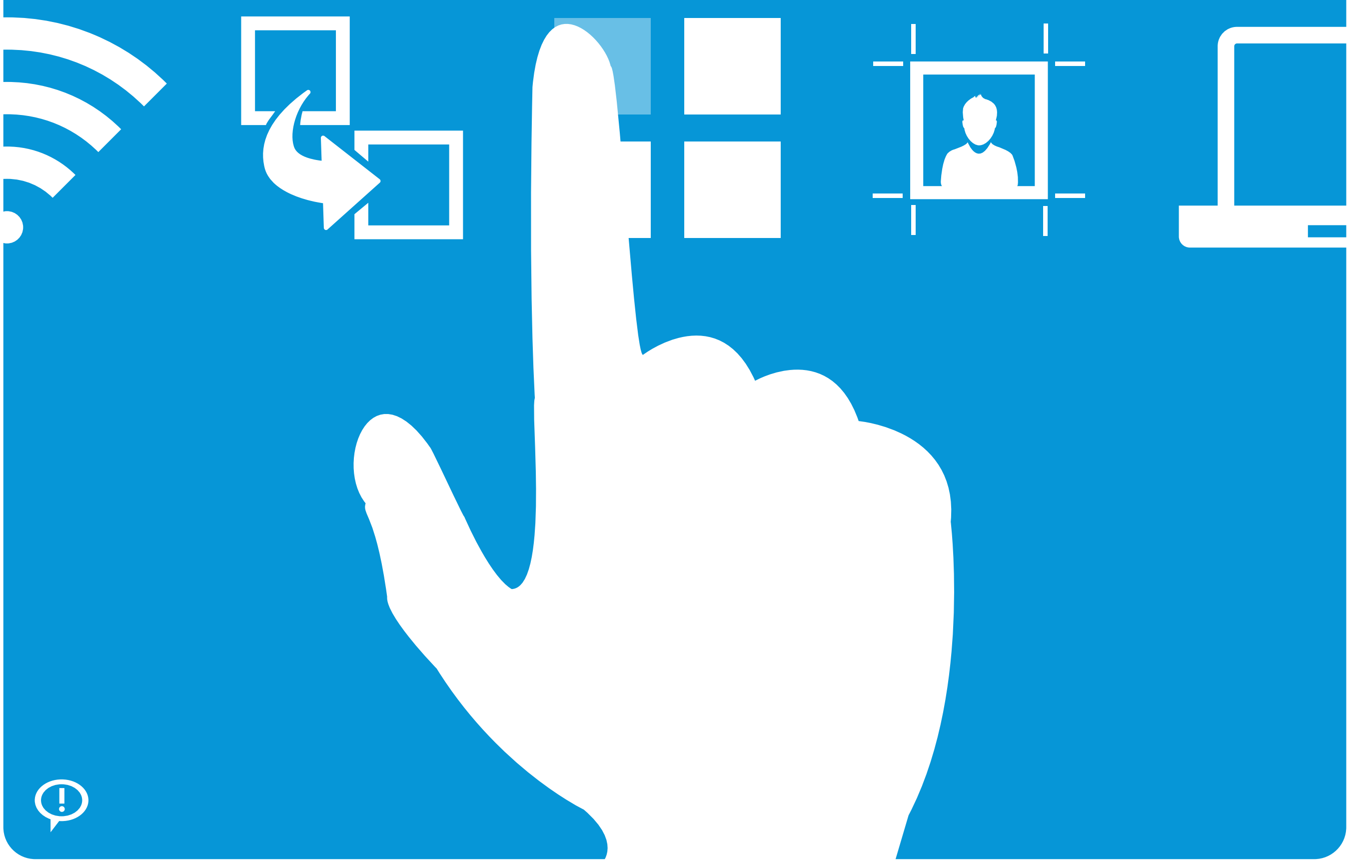
Electronic Medical Records

An Essential Component of Health Information Systems



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SUMMARY

Electronic medical records can facilitate access to information, communication, and actions to help improve health care quality and patient safety. The medical record, or a patient's medical history, is a key component of the health system for research, management, and quality control in health institutions.

With clear benefits compared to traditional paper records, electronic records provide easy access and availability of clinical information, legibility, the ability to display information in multiple formats, security, and integration with other components of the information system.

A group of experts who participated in the eHealth Conversations project, convened by PAHO/WHO, recommended providing guidance to institutions to promote the use of electronic health records and to raise public awareness about their importance in clinical care, as well as the potential benefits when properly implemented, and the risks when they are not.

Another recommendation of the experts is to promote the use of personal health portals, integrated with institutional records, to facilitate access to care and information specific to each person.

Participants in the conversation also made recommendations to guide PAHO/WHO and its eHealth strategy, including support to Member States to advocate policies to promote electronic health records. They said PAHO/WHO should promote the use of standards in the region for future clinical information to be exchanged between countries, and promote training and exchange of professionals between countries, especially for countries where progress has been slow in this area.

INTRODUCTION

The clinical history, or health record, consists of a set of documents, both written accounts and graphics, referring to health and disease events of an individual.

The health record has the following functions[1]*:*

- Treatment
- Education
- Research
- Management
- Legal
- Quality control of health care

The clinical history has been recorded on paper by health professionals, with all the limitations and risks that this implies. During the last few years, the EHR has started to be promoted as a way to reduce the risks and disadvantages of using paper. In the countries of the Region, with a few exceptions, there is no reliable information on the use of electronic records and, where EHR is available, use is low. This chapter describes the dialogues conducted by the participants in the conversations on EHRs, with the purpose of identifying the situation of participating countries and finding alternatives to encourage and promote effective adoption of EHR.

MATERIALS AND METHODS

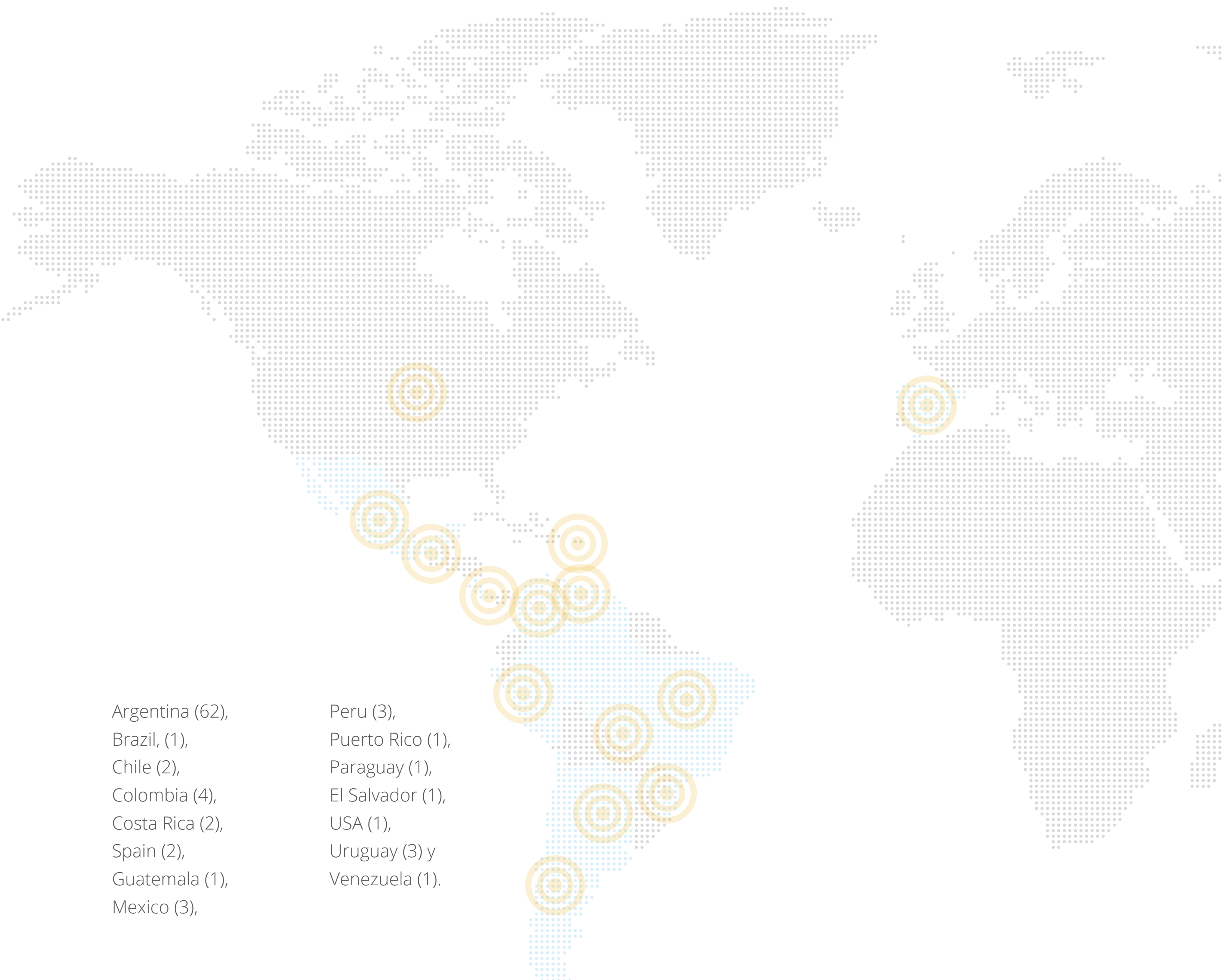
The chapter was developed using individual research, development of surveys and, particularly, the input from network interactions within the framework of the eHealth Conversations organized by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by him/her and the participants, suggesting work assignments, and compiling the discussions. In addition, some authors submitted documents for discussion on different topics.

This conversation used the virtual campus offered by the Hospital Italiano de Buenos Aires (HIBA), which has the following working tools:

- General discussion Forum: to actively carry out the exchange of ideas on different topics according to the conversation assignments. Each message posted in the Forum sends an e-mail to the participants.
- Wiki: this site enables the joint creation of the document.
- Resource library: this site is aimed at sharing support documents on which opinions and/or thoughts will be based. This section includes journal articles, chapters of manuals and books, or full texts.

The conversation was complemented by the publication of a series of tweets with the hashtag "#ehealthtalks," in PAHO's Twitter account on eHealth (@ehealthpaho). Besides, a webinar was organized on systems that can assist with decision making to encourage the discussion on this topic. The virtual meeting was coordinated by Dr. Guilherme Del Fiol, one of the leaders in this topic.

Each conversation lasted eight weeks and, based on the issues addressed, a document was elaborated including the main recommendations resulting from the exchange of ideas and experiences. The conversation on EHR was attended by 89 participants coming from the following countries:



Argentina (62),
Brazil, (1),
Chile (2),
Colombia (4),
Costa Rica (2),
Spain (2),
Guatemala (1),
Mexico (3),
Peru (3),
Puerto Rico (1),
Paraguay (1),
El Salvador (1),
USA (1),
Uruguay (3) y
Venezuela (1).

STRATEGIC INFORMATION

The participants in the conversation agreed on defining the EHR as the record of health data of an individual or group, in digital format, which includes the health status in different moments of life (of the individual or group), and the actions taken to determine and/or change it.

Other terms used to refer to EHRs are: electronic health records, electronic clinical history, digital clinical history, electronic clinical record, and digital health record.

Benefits of the EHR

Among the potential benefits of EHRs, the conversations highlighted the following:

- **Access to and availability of clinical information:** EHRs facilitate the access to patient information since, unlike other formats, electronic information can be accessed from multiple places and by more than one user at a time;
- **Legibility and multiple display formats of data:** one of the most important problems of handwritten documents is illegibility. Electronic documents prevent this problem; when data are structured or numeric, they can be organized in charts, which facilitates the understanding of stored information;
- **Unalterable information:** if the appropriate security mechanisms are in place, it can be ensured that the information stored in databases cannot be changed;
- **High availability and recovery in case of disaster:** sometimes, the clinical history of patients travels with them, for example when they have to be examined inside or outside the medical facility; in the case of electronic data, they can be consulted anytime. As in the case of security mechanisms, when the appropriate strategies are in place, information will not be lost in case of disasters, such as an earthquake;

- **Communication between health professionals and patients:** EHRs can facilitate the communication between professionals since they provide multiple contact alternatives, such as alerts or messages. With the introduction of personal health portals, improved communication between professionals can be translated into the contact between health team members and patients;

- **Confidentiality:** one of the main fears related to EHRs concerns confidentiality and loss of sensitive information of patients. At present, there are security strategies that allow only authorized users to have access to the clinical information of patients;

- **Data aggregation and analysis:** EHRs facilitate clinical research, as well as measurement and assessment of quality, providing easy access to data loaded in the records;

- **Integration:** one of the advantages of the EHRs is their potential to improve health quality by integrating decision making into the systems, since they can alert professionals in case of errors or suggest the revision of different sources of knowledge during medical care. Integration with other components of the health information system is also possible, for example, for laboratory results or images.

Functional Areas or Uses of EHRs

According to a 2003 report of the U.S. Institute of Medicine (IOM), the key functional areas an EHR should include are the following: information management, results management, medical orders management, systems that help for better decision making, help or support to patients, integration with administrative systems, and the possibility of generating public health reports.[2]

Other functional areas were discussed, such as the importance of having a summary of visits to the health system and the need to guarantee the privacy and confidentiality mechanisms required by the legislation of each country. The ISO 183008[3] standard on EHR also details a set of architecture requirements aligned with the functional areas described by the IOM. Some of them are: inclusion of information as free text, search of unstructured (text and non-text) data, and the inclusion of structured text within those data. There should also be the possibility of including comments within the information stored, allowing the physician to rate structured information adequately; it should be possible to relate these comments with specific data attributes.

The means used to define the different levels of importance associated to comments and other entries in the EHRs may alter the way in which information is presented, or how it is returned from a consultation. The HL7 electronic health record functional model can also provide a comprehensive list of functions that should be contained in an EHR, such as handling a list of problems, handling clinical notes or documents, the possibility of requesting medical orders or studies, warnings on drug dosage, or reminders of preventive practices, among others.[4]

Input of Information to the EHR

Either in electronic or traditional paper format, data entry has always been a challenge. Although electronic data entry can be performed through free text or using structured templates, different reports in the literature recommend a balanced model including both types of entry.[5]

This model should have a mixed system enabling the user to enter information in free text format, favoring "freedom of speech," although before being saved it should be associated to coded terms in order to be understood and afterwards used by information systems. At the same time, data entry can be performed using desktops or laptops with automatic data capture to enter information into the EHR. The use of mobile devices with barcode reading capability has great advantages and has shown to significantly reduce medication errors, by recording drug administration.[6]

Clinical Support Systems for Decision Making

With the aim of improving the quality of care, reducing medical errors, improving health processes, and guaranteeing accessibility of patients to the health system, clinical decision support systems (CDSS) are developed. These systems are a key component of the layer of clinical data and the rationale for system computerization. Integrating these systems into the EHR can assist health professionals in the health care process with information alerts to users at the time of the encounter with patients.[7]

Implementation of an EHR

Prior to the implementation of an EHR, it is important to take into account that the complexity of information management in health organizations is greater than that of other types of organizations. Therefore, it is very important to carefully plan this task, adequately managing the change, identifying opinion leaders, i.e., key players within the institution who are respected by their peers, and trying to get their support and that of the authorities of the institutions. Since the language used by those in charge of the implementation of health systems is frequently different from that of end users, i.e., health professionals, it is important to have people acting as a bridge between both players. Having people that play this role has been described as a key factor for successful implementation.[8]

Assessment and Certification

EHR assessment and certification is a major problem since no clear regulation is in place in the Region, except for Brazil, which can be taken as an example. In other countries where certification entities exist, they are starting to play an important role in health systems and it is beginning to be necessary to certify software used.

Empowered Patients

At present, a new paradigm is being experienced which tends to guide and empower patients within the health system. Informatics does not escape this reality and patient-oriented informatics is currently a discussion topic.[9] In this context, personal health portals have appeared where patients can load their own clinical data, and the health system can provide services such as setting medical appointments or receiving clinical test results. During the conversation, population acceptance and consent were identified as one of the cornerstones for successful functioning of these systems.

Risks

Apart from the advantages that can be documented by successful experiences, some serious problems have also been described, such as the experience reported by a pediatric hospital in the United States, where an increase in mortality was reported following the incorrect implementation of a computerized physician order entry system in the health system.[10] With this in mind, the participants in this conversation underlined the importance of monitoring implementation processes and final results, in order to avoid new problems or difficulties generated by the EHR.

Profile of Specialists [*1]

Daniel Luna

Born in Argentina, he is a physician specializing in internal medicine. He is a candidate for a master's degree in Information Systems Engineering and a PhD in IT Engineering. He is responsible for the Department of Health Informatics, Hospital Italiano of Buenos Aires (HIBA), and is Head Professor of Medical Informatics in the School of Medicine of the University Institute and the School of Medicine of the HIBA. He has submitted more than 200 papers to congresses and scientific journals, chapters of books, and books.

Javier Carnicero Giménez de Azcárate

Born in Spain, he is physician and surgeon with a master's degree in Management of Health Services from the Public University of Navarra and a PhD from the University of Valladolid. He is member of the Board of Directors of the Spanish Health Information Society.

William Tierney

He is a clinical epidemiologist, and current President and General Director of the Regenstrief Institute, an organization dedicated to research in health care informatics. His research focuses on implementing electronic health record systems (EHRS) in hospital and outpatient venues in Indiana and in East Africa, where his team of developers implemented sub-Saharan African's first EHRS. He has authored more than 50 articles about adverse clinical effects of various clinical conditions and their treatments.

Guilherme Del Fiol

Born in Brazil, he is a physician and surgeon with a PhD in biomedical informatics, and Assistant Professor in the University of Utah's Department of Biomedical Informatics, U.S.A. He is an expert in clinical decision support, knowledge management, controlled terminologies and standards in the use of IT in health care. He developed the Infobutton Manager online service for electronic health record systems. He chairs the Clinical Decision Support Work Group, Health Level Seven.

Catherine K. Craven, MLS, MA

She is a doctoral candidate in health informatics at the University of Missouri, where she has been a National Library of Medicine Biomedical and Health Informatics Research Fellow. She has most recently published on planning and preparation processes for electronic health record system implementation in critical access hospitals and a task analysis of ICU physicians examining technology, interruptions, and clinical team communication. She has been a leader of the American Medical Informatics Association (AMIA) for 10 years.

Elske Ammenwerth

She is Professor of Health Informatics at the University of Health Sciences, Medical Informatics and Technology. Her research areas include health information systems, evaluation of information systems, medication safety and eHealth. She has published over 80 peer-reviewed journal papers and 16 books in this area. Since 2007, she has been chair of the Austrian Health Conference. She is an international member of the American College of Medical Informatics.

PAHO/WHO Specialists

The Pan American Health Organization has specialists in this field in the regional office and its representations in the Member Countries. In order to get in touch with them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of the recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. The Organization gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

Additional Reading

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Web Sites *2

EHR Science

English site on the design and implementation of clinical information systems.
For further information, please visit: http://ehrscience.com/

American EHR Partners

Organization devoted to support an on-line community of clinicians who use information technologies. It provides the necessary tools to identify, implement and efficiently use EHRs and other technologies for health.
For further information, please visit: http://www.americanehr.com

ARHQ Health IT Resources

Site of the US Quality Agency providing access to content referring to EHRs and other health information technologies.
For further information, please visit: http://healthit.ahrq.gov/

Canadian EMR

Canadian EHR site used by health professionals to compare different EHRs or visualize detailed information on clinical systems available in Canada.
For further information, please visit: http://www.canadianemr.ca/

EMR and HIPAA Wiki

Wiki provided by the EMR and HIPAA pages, with resources of interest related to the EHR and regulations on confidentiality and privacy of sensitive information.
For further information, please visit: http://www.emrandhipaa.com/wiki/Main_Page

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee of validity of the information included thereof. The only purpose for offering links is to provide information regarding the existence of further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not represent the opinions of PAHO/WHO.*

Itálica Project of the Hospital Italiano de Buenos Aires (HIBA), Argentina

This is an initiative to improve health care, education and research, administration, and management processes of the HIBA network. Itálica is an information health system designed and developed by the HIBA Health Information Department which includes all the systems for management of information based on components that provide web services. It was built with standards to facilitate interoperability and integrates, in a user-friendly fashion, the different functions of the HIBA as a health care, academic, administrative, and managerial institution.

For further information, please visit:

http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=ver_curso.%20php&id_curso=13384#.UTXntKJ9608 and http://www.hospitalitaliano.org.ar/archivos/repositorio/11/recursos/26_TIC_en_el_HIBA.pdf

United Nations Economic Commission for Latin America and the Caribbean

As part of its collection of project documents, ECLAC published a document in which the experiences of the HIBA Itálica Project are detailed, titled "*Incorporación de tecnologías de la información y de las comunicaciones en el Hospital Italiano de Buenos Aires*" prepared by Drs. Fernán González Bernaldo de Quirós, Daniel Luna, Analía Baum, Fernando Plazzotta, Carlos Otero, and Sonia Benítez.

For further information, please visit:

http://www.hospitalitaliano.org.ar/archivos/repositorio/11/recursos/26_TIC_en_el_HIBA.pdf

Federación Médica del Interior (FEMI) (Uruguay)

The Federación Médica del Interior (FEMI) (Medical Federation of the Interior), founded in 1966, brings together medical associations of the interior of the country in a health care network which extends all over the country, providing coverage to more than 715,000 members. After 45 years of service, it continues to progress and it is now incorporating ICTs into the health care service. In March 2005, the creation of the National Integrated Health System (SNIS) and the new governmental requirements regarding health care oversight provided a political environment which benefits continued growth of FEMI. Within this framework, the development of a clinical- epidemiological information system of the covered population was conceived, and development started for the FEMI Digital Health project. The main vehicle for improvement in the global process of health care and management is the implementation of EHR in FEMI institutions.

For further information, please visit:

http://www.femi.com.uy/gen/barra_lat/femi_fofemi_saluddigital.html

Megasalud (Chile)

In 2001, Megasalud, the largest outpatient health care network of Chile, acquired a basic, commercial outpatient electronic health record, with coding options based on the ICD-10 (SiapWin). This record was used by all the professionals in the institution, with only a few using structured diagnosis, and generally entering diagnosis in uncoded free text. In 2007 Megasalud decided to change their electronic clinical record and build their own record which allowed them to create follow-up plans on specific pathologies and clinical management. The process of creating common terminology and the new record took three years; it was carried out in collaboration with HIBA. Since then, Megasalud has been incorporating new capabilities and services to its clinical record. This new EHR provides for longitudinal health care, considering the structured and coded entry of information for different domains (drugs, measurement of vital signs or clinical parameters, laboratory results, examination requests, etc.).

For further information, please visit:

http://www.ncbi.nlm.nih.gov/pubmed/21347025

Clínica Alemana (Chile)

In 2007, the Clínica Alemana of Santiago, a leading health institution of Chile, decided to change the electronic health record that had been used from 2002 to 2012 (RCE Orden, then SONDA), due to the limited functionality, scalability, and information management available with the software implemented. After a thorough evaluation process of international commercial solutions, in 2012 the hospital decided to create a medical information unit and develop its own solution to respond to the needs of information management and patient safety. At present, the new EHR is under development.

For further information, please visit:

http://portal.alemana.cl/wps/wcm/connect/internet/home/blog+de+noticias/ano+2012/12/clinica+alemana+firma+convenio+con+hospital+italiano+de+buenos+aires

Fundación Cardioinfantil Instituto de Cardiología, Colombia

The Fundación Cardioinfantil of the Cardiology Institute (FCI-IC) has been working in health information systems since 2001, incorporating models for different administrative levels. As of 2006, when the need to implement a clinical level interrelated with the administrative and inherited clinical systems became evident, a strategic partnership was made with one of the largest health software providers in the country: Carvajal. In 2008 the project of implementing the EHR was started, initially in the emergency area, followed by administrative areas in 2009, and hospitalization and intensive care areas in 2010–2011. Work has been done to integrate the EHR system with structured data entry (computerized physician order entry, or CPOE) and administrative modules such as the institution's admission system. At present, work is ongoing to integrate the business intelligence model which allows optimized decision making based on data captured from the information system.

For further information, please visit:
http://cardioinfantil.org/

Conclusions

- EHRs have clear benefits when compared with traditional written records. Some of them are access and availability of clinical information; legibility; the possibility of multiple display formats; security; and integration with other components of the information system.
- It is important to have clear national and/or institutional policies on health standards to be able to exchange information between institutions and exploit the real benefits of EHRs. At the same time, it is extremely important to define policies regarding patient identification.
- There are commercial or open source EHR solutions but, regardless of the choice, the aim of the EHRs in each institution should go beyond being the digital format of a written record, facilitating the functioning of clinical systems to help with decision making.
- It is important to encourage or empower the population through the use of technology, integrating electronic records, such as through the use of personal health portals. These systems can facilitate care and access to specific information of each person.
- The EHRs provide health professionals with access to data in the information system. Although EHRs have numerous potential benefits, it is important to monitor implementation processes and results in order to avoid new problems or difficulties generated by the electronic system.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations.

- Promote the use of the EHR, raising the awareness of the population about the importance of adequate management of clinical information and the potential benefits when systems are well implemented, as well as about the associated risks when they are not.
- Publicize and train key people from different disciplines within the health system on EHR-related topics.
- Encourage the adoption of health standards at different levels, which helps to identify concepts and then foster inter-institutional understanding.
- Establish certain mechanisms for EHR control, support, and back-up, independent from private or public health care providers.
- Promote the use of personal health portals integrated with institutional EHRs, i.e., systems through which patients can interact with and be fed by the health system, taking into account the consent of patients to access the information.
- Promote the development of EHR certification and assessment policies and processes to guarantee their quality.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Support Member States so that they advance EHR promotion policies.
- Promote the use of standards in the Region so that in the future clinical information can be exchanged among different countries.
- Support training and exchange of professionals between nations, especially countries with low development in this area.
- Foster, by means of some incentive, the development of local systems by supporting governments and NGOs with training and equipment.
- Encourage the organization of meetings and spaces devoted to the discussion of EHR-related subjects.

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ANNEXES

Acknowledgements

The participants in the conversation acknowledge the collaboration of Dr. William Tierney in an interview for this project, and for the participation of Dr. Guilherme Del Fiol in a webinar about systems to assist in decision making and their relationship with electronic health records.
The webinar is available at: http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=ver_curso.php&id_curso=13292#.U5H4f7cU_ct

Video interview with authors

eHealth Conversations: Electronic Medical Records

http://www.paho.org/ict4health/podcast/Entrevista-Registros-Medicos-Electronicos.mp3

Available in Spanish only

Podcast: Recommendations on eHealth provided in digital audio

http://www.paho.org/ict4health/podcast/Registros-Medicos-Electronicos.mp3

Available in Spanish only

Messages for Twitter on #EHR (Electronic Health Records)

Identification of patients is a cornerstone when working with the Electronic Health Records. #EHR

The US Institute of Medicine defines electronic health records in 1997. English report: http://www.nap.edu/catalog.php?record_id=5306 #EHR

The US Institute of Medicine explains the key functionalities of electronic health records: http://www.nap.edu/catalog.php?record_id=5306

Electronic Health Records Functionalities: Information management, results management, test requests ... #EHR

Electronic Health Records Functionalities: Providing support to administrative activities, collaborating with the communication between professionals and patients.

Manual of @socinfo_cepal with interesting information on Electronic Health Records: http://www.cepal.org/publicaciones/xml/2/46012/Manual_de_salud_electronica_para_directivos_de_servicios_y_sistemas_de_salud.pdf #RES

Systems to help decision making are essential to improve the quality of Electronic Health Records. #EHR

Through personal health portals, healthcare can be improved

Webinar on systems to help in decision making: http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=ver_curso.php&id_curso=13292#.ULe58KWUFH9 #RES

Each country should have electronic health records certification and assessment policies and processes available to guarantee their quality.

Interview to William Tierney on the recommendations for the implementation of electronic health records (in English): http://youtu.be/5vMaw98Yf84

Authors

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Born in Argentina, he is a physician specialized in Medical Informatics in the Hospital Italiano of Buenos Aires (HIBA). He has a Master's of Science degree from the Oregon Health University, U.S.A., where he also worked as a researcher in the Clinical Informatics Department. He was granted a scholarship by the Fogarty International Foundation. He has knowledge in the area of Health Information Systems, particularly clinical systems, and is now Chief of the Medical Informatics Department of the HIBA.

Néstor Gustavo Tejera

Born in Uruguay, he has worked in development of bioinformatics systems since 1986. He created the InfoMed Series which required parameterization that aligned interests of different medical specialties and styles of accounting management. In 1999 he became a consultant in intelligent interoperability. He created the KW Foundation to enhance the services of knowledge sharing on standards.

Alfredo Horoch

Born in Argentina, he is a specialist in computer software development. He developed the Epidemiological Survey on Cardiovascular Risk Factors for the Hospital de Clínicas and the Argentine Society of Cardiology. He also developed multiplatform PC-Tablets-Mobile applications for primary health care, including "My Clinical Record" for patients and "Professional Background" for health professionals. At present, he performs the spatial and temporal contextualized management of processes, infrastructure, facilities, equipment, resources, among others, for health institutions.

Pablo Pazos Gutierrez

Born in Uruguay, he is a computer engineer specializing in health information systems, standards and interoperability. Since 2006, he has worked in research, development, education and consulting projects in medical informatics. He is the Director of CaboLabs Medical Informatics and member of the Localization Committee of the OpenEHR Foundation.

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Born in Argentina, he received education in public health and psychiatry, and mental health. He got experience in management and supervision of primary health care services in Cuba (1962–1965). Since 1992, he has been devoted to matters related to quality of health care, and since 2005 to the automation of outpatient care, through the Donabedian Argentina Foundation.

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Born in Argentina, he has a bachelor's degree in computer sciences, and is an organizational consultant specializing in process reengineering and quality systems. He chairs the Steering Committee of the Biomedical IT Group of Buenos Aires, and is director of the electronic publication Management en Salud. He teaches courses and seminars on the paperless office, digital signature and computerized clinical records, planning and management control.

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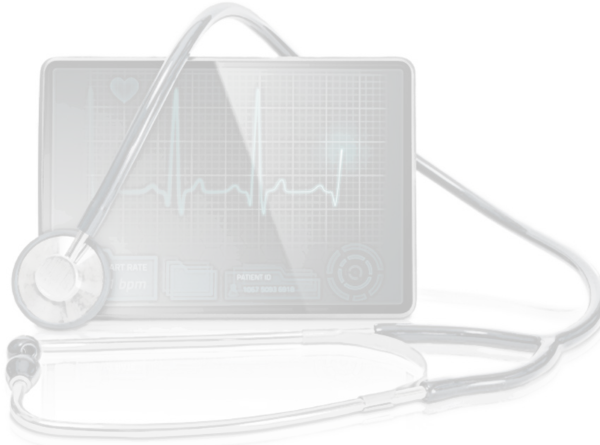
General Disclaimer

This publication was developed by the Knowledge Management, Bioethics and Research Department of the Pan American Health Organization (PAHO), within the framework of the activities of the project "eHealth Conversations: Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to Health." The information and opinions expressed in this publication are the exclusive responsibility of the authors and may not represent the opinions of PAHO/WHO.

Interoperability Standards

Fundamentals for Achieving Exchange of Health Information

Daniel Luna, Alfredo A. Almerares, Mauro J. García Aurelio,
Pablo Pazos Gutiérrez, Selene A. Indarte Galli



SUMMARY

Health organizations use various types of electronic systems for clinical and administrative purposes, and technical guidelines or definitions to make the integrated management of these systems viable are important. In many cases, however, these systems cannot share information and there is lack of consensus on standards for interoperability. This is one of the main conclusions of a group of experts convened by PAHO/WHO for its project, eHealth Conversations.

The current need to integrate, consolidate, and coordinate patient information requires the implementation of standards, because a system of patient-centered health care requires interoperable information systems. "Interoperability" denotes the communication between different technologies and software applications that allows the proper exchange and use of data.

The lack of information exchange between systems precludes the ability to integrate various actors into the health system, which directly affects the quality of care, the experts said. Reconciling the various aspects of information systems such as information models, communication protocols, and data exchange formats is key to their effective use and the availability of accurate, consistent, and reliable information when needed.

The experts, in their recommendations to guide national institutions such as governments, universities, NGOs, the private sector, and international organizations, suggest promoting national consensus and a regional agreement for the development of standards. These standards should be based on expert opinion and ratified by national legislation, while respecting health system goals.

The experts asserted that it is important to define strategies for health systems with clear goals and deadlines, and to design appropriate information systems that are sustainable, with standards that certify interoperability. These health information systems must be interoperable at all levels, especially at the semantic level, to facilitate coding and data exchange.

INTRODUCTION

At present, many health facilities have different types of electronic records, either clinical or administrative, and these records are almost indispensable for their work. Clinical data of patients should represent the true core of the information system; nevertheless, in order to achieve this, it is necessary to have standards that enable interoperability. [1,2] Interoperability is the ability or capacity of two or more systems to exchange information and use it [3].

The lack of consensus on interoperability standards prevents the integration of the different players of the health system, having a direct impact on the quality of health care. The aim of this work is to present the concepts discussed in the project titled "eHealth Conversations: Standards for Interoperability," in order to make substantive contributions to strengthening the eHealth strategy and plan of action in the Region. The objective is to identify the best strategies for the adoption of health interoperability standards, thereby enabling the effective use of information and knowledge produced in different health organizations and systems.

MATERIALS AND METHODS

The chapter was developed based on individual research, development of surveys, and, in particular, the input from network conversations within the framework of the eHealth Conversations organized by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by him/her and the participants, suggesting work assignments, and compiling results of the discussions. Some authors submitted documents for discussion on different topics.

This conversation used the virtual campus offered by the Hospital Italiano of Buenos Aires (HIBA), which has the following working tools:

- General discussion forum: to actively carry out the exchange of ideas on different topics to be addressed according to the conversation assignment. Each message posted in the Forum sends an e-mail to the participants.
- Wiki: this site enables the joint creation of the document.
- Resource library: this site is aimed at sharing support documents on which opinions and/or thoughts will be based. It includes articles of journals, chapters of manuals and books, or full texts.

The conversation was complemented by the publication of a series of tweets with the hashtag "#ehealthtalks", through PAHO's Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks and, based on the issues addressed, a document was elaborated including the main recommendations resulting from the exchange of ideas and experiences. The conversation on interoperability was attended by 70 participants coming from Argentina, Chile, Colombia, Costa Rica, Islamic Republic of Iran, Italy, Mexico, Paraguay, Peru, Spain, United States, Uruguay, and Venezuela.

STRATEGIC INFORMATION

Some of the most relevant issues discussed during the conversations are detailed below:

Interoperability is the ability or capacity of two or more systems to exchange information and use it. [3] This definition encompasses two different ideas: the first is that of exchange of information (syntactic or operative interoperability), and the second is that the exchanged information can be properly understood, processed, and used effectively by the recipient (semantic interoperability). [4]

The ability to interoperate is attained by making certain aspects of the different information systems compatible, such as, information models, communication protocols, and data exchange formats, among others. [5] To achieve this, it is advisable to implement existing standards such as Health Level Seven (HL7), Digital Imaging and Communication in Medicine (DICOM), International Organization for Standardization 13606 (ISO 13606), Continuity of Care Record (CCR) and OpenEHR, among others, which represent the cumulative experience of hundreds of professionals over decades of research and development. [6]

Standards are aimed at achieving interoperability which, in turn, is intended to achieve the effective, precise, consistent, and secure use of information when and how it is needed. There are different levels of interoperability. [7]

Level of System Logic

From the perspective of system logic, it is possible to identify three levels of interoperability:

- Syntactic interoperability: the exchange of information between systems, which does not guarantee its correct interpretation and use. Technical and standards issues are solved in the areas of protocols and exchange formats;

- Semantic interoperability: correct interpretation and use of the exchanged information is guaranteed, for which formal definitions of each entity, attribute, relationship, restriction, and exchanged term is needed;

- Business or organizational interoperability: systems of different areas are integrated to support distributed business/organizational processes. To achieve this, rules and processes should be defined, as well as the players participating in these processes and organizational objectives of the different structures (i.e., departments, hierarchies, etc.).the different business structures: departments, hierarchies, etc.

Systems in the Interoperability Environment

Exchange between different systems in the interoperability environment include: [7]

- Between devices
- Between (computerized) information systems
- Between departments
- Between organizations
- Between regions
- Between countries

System Architecture

Three levels of system architecture considered for interoperability are:

- Level 1: individual systems should comply with a basic level of standardization regarding their data, codes, structures, relationships, and restrictions, thus enabling syntactic interoperability;

- Level 2: based on networks where semantic interoperability is attained through the application of standards such as communication protocols, interfaces, etc;

- Level 3: the information and services infrastructure for the interconnection of networks that will exchange the information, thus attaining global semantic interoperability and organizational interoperability.

There is a need to integrate, consolidate, and coordinate patient information through the creation of health care networks which can incorporate management techniques such as quality indicators, and offer tools such as decision support systems. This process demands the implementation of standards.

Categories of Interoperability Standards

Three levels of system architecture considered for interoperability are:[2]

- Data exchange and messaging: enable transactions so that data exchange can flow consistently between systems or organizations. Some of the most common are HL7, DICOM, the Institute of Electrical and Electronics Engineers (IEEE), National Council for Prescription Drug Programs (NCPDP), Accredited Standards Committee X12 (ANSI X12), and Integrating the Healthcare Enterprise (IHE);

- Terminology: provide the standards-specific codification for clinical concepts such as pathologies, list of disorders, allergies, diagnosis, and medications, which may or may not have lexical variations. For example, the Systematized Nomenclature of Medicine (SNOMED) for clinical terms; the Logical Observation Identifiers Names and Codes (LOINC) for laboratory results; the International Classification of Diseases (ICD) for diseases and causes of death; the International Classification of Primary Care (ICPC-2); the Diagnosis Related Group (DRG), and the Anatomical Therapeutic Chemical (ATC) Classification System, among others;

- Documents: indicate the type of information that should be included in a document and where it can be found. Two organizations developed similar standards based on different information models: HL7 created the Clinical Document Architecture (CDA) and the American Section of the American Society for Testing Materials International (ASTM) created the Continuity of Care Record (CCR). The Continuity of Care Document (CCD) is a standard that resulted from collaborative effort between HL7 and the ASTM to harmonize the data models and the specifications of both (CDA and CCR) standards;

- Applications: determine the way organizational rules are implemented. Applications can interact; this includes the unique log-in for different applications within the same environment and the standards to provide a comprehensive view of data through multiple, non-integrated databases. The Clinical Context Object Workgroup (CCOW) is one example;

- Conceptual: allow transfer of data through the systems without their losing sense and context. Some examples are: the Reference Information Model (RIM), the Functional Model of the Institute of Medicine (IOM), the HL7 Functional Model, and the OpenEHR Archetype Model;

- Architecture: defines the process implied in data storage and distribution. Some examples are the public health information network of the Centers for Disease Control and Prevention (CDC) (United States) and the national electronic disease registry system.

A patient-centered health system cannot be conceived unless there are interoperable information support systems. The information should accompany the patient throughout the health system, guaranteeing secure, complete, and confidential availability of data. It is an essential tool for patient safety, decision support, and the efficient and effective management of health organizations and the system as a whole.

Some of the barriers to attaining interoperability are technical complexities and political aspects that hinder technological development and equity in the access to information.

Profile of Specialists *1

Fernando Campos

He holds a master's degree in Strategic Management of Software Engineering; he is currently the Chief of the Software Engineering Area of the Department of Health Informatics, Hospital Italiano of Buenos Aires, and has served as the President of Health Level 7 (HL7) Argentina since 2012. He has worked in interoperability for more than 13 years and earned the following certifications: HL7 V2.xControl Specialist, HL7 CDA R2 Specialist, and HL7 V3 RIM.

Alejandro López Osornio

He is a family doctor who specializes in medical informatics. He has been Chief Terminologist and Associate Physician in the Medical Informatics Service of the Hospital Italiano of Buenos Aires. He is a project and terminology leader in TermMed SA, and member of the Classification Committee of the World Organization of Family Doctors (WONCA) (International Classification of Primary Health Care). He is also a member of the Quality Committee of the International Health Terminology Standards Development Organization (IHTSDO). He received certification as SNOMED CT implementation advisor, 2013.

Diego Kaminker

He is an information architect; he chaired the Health Level Seven (HL7) Argentina, from 2006 to 2012. He is currently International Affiliate Director at HL7 International, and co-chair of WG Education and the International Mentoring Committee. He provides training for interoperability standards at the global level, and is the coordinator and author of the HL7 e-learning course, the HL7 Meaningful Use Workshop, and webinars on Meaningful Use "What to expect when you are exchanging."

PAHO Specialists

The Pan American Health Organization has specialists in this field in the regional office and its representations in the Member Countries. In order to get in touch with any of them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO assumes no liability for damages derived from the use of this information.*

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Web Sites *2

Economic Commission of Latin America and the Caribbean (ECLAC)

The ECLAC web site provides answers to requests for technical cooperation from public sector organizations and other national institutions in order to develop specific projects. Also, it disseminates regional and sub-regional works. Available at: http://www.cepal.org

Health Level Seven International (HL7)

Health Level Seven International (HL7) is an organization that develops standards to minimize incompatibilities between health information systems. Available at: http://www.hl7.org

Certification Commission for Health Information Technology (CCHIT)

The mission of the Certification Commission is to accelerate the adoption of health information technologies. Available at: http://www.cchit.org

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee validity of the information included thereof. The only purpose of offering links to external sites is to provide further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not represent the opinions of PAHO/WHO.*

Itálica Project of the Hospital Italiano de Buenos Aires (HIBA), Argentina

This initiative seeks to improve health care, education and research, administration, and management processes of the HIBA network. Itálica is a health information system designed and developed by the HIBA Health Informatics Department which includes all the systems that facilitate the management of information based on components that provide web services. It was built with standards to facilitate interoperability and integrates, in a user-friendly manner, the different functions of the HIBA, including health care, academics, administration and management.

For further information, please visit: http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=ver_curso.php&id_curso=13384#.UTXntKJ9608 and http://www.eclac.cl/publicaciones/xml/5/45765/2012-707-W.459_Incorporacion_de_TIC_en_el_Hospital_Italiano_de_Bueno_Aires_WEB.pdf

Implementation of the Health Information and Informatics Committee for the Unified Health System, Brazil

This initiative provides regulation of the use of standards for interoperability for the exchange of information between health information systems of Brazil's Unified Health System (SUS), at municipal, state, and federal levels, which complement both public and private health sectors.

For further information, visit: http://portal.saude.gov.br/portal/arquivos/pdf/2c_221210.pdf

RESULTS

Conclusions

- Interoperability is the ability or the capacity of two or more systems to exchange and use information; [4]
- The capacity to interoperate is attained by harmonizing certain aspects of different information systems: information models, communication protocols, and data exchange formats, among others;
- The aim of standards is to support interoperability and the aim of interoperability is to attain an effective, precise, consistent, and secure use of information when and how it is needed;
- The present need to integrate, consolidate, and coordinate patient information demands the implementation of standards;
- It is not possible to conceive of a patient-centered health system if the supporting information systems do not have interoperability;
- The barriers to attain interoperability include technical complexities and political aspects that hinder technological development and equity in the access to information.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations.

Recommendations to provide direction PAHO/WHO and its eHealth strategy

- Support interoperability of health information systems at all levels, especially at the semantic level, which deals with the structure for data exchange and codification;

- Join efforts to generate a positive environment for the exchange of information, favoring software products that can be integrated into the existing infrastructure, without ignoring the fact that data exchange can present difficulties for institutions;

- Know the objective before applying a standard in order to achieve interoperability;

- Define a health systems strategy with clear objectives and timeframes. According to these objectives and timeframes, an appropriate and sustainable information system can be defined, conceived, and designed based on standards that guarantee interoperability;

- Promote national consensus and regional agreement for the development of standards based on expert opinion, always observing the objectives of the health system, and endorsed and ratified by national legislation;

- Select the most effective option: standards can be adopted or adapted, and can also be created to align with specific characteristics of a country or health system;

- Encourage discussion among different governments on the barriers to attaining interoperability at different levels;

- Collaborate to recognize the best strategies in each case to attain interoperability and, in this way, strengthen the objectives of the health system;

- Work in partnership with governments to ensure they give priority to the training of human resources;

- Disseminate strategies that have already been implemented with the purpose of learning from successful and unsuccessful experiences;

- Support meetings and spaces devoted to discussion and learning between organizations of different governments;

- Provide material, expert knowledge, and advisors so that all countries in the Region can define their standards platforms according to their needs and the regional situation.

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ANNEXES

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We would like to acknowledge the collaboration of the following participants:

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- Gustavo Rigoni
- Gustavo Tejera
- Jorge Armando Guerra
- Luis Baeza
- Mabel Pardo
- Mauro Giacomini
- Olga Lucia Rodriguez
- Pablo Orefice

Video interview with authors

Conversations about eHealth: Interoperability

http://www.paho.org/ict4health/podcast/Entrevista-Interoperabilidad.mp3

Available in Spanish only

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Interoperabilidad.mp3

Available in Spanish only

Messages for Twitter on #Interoperability

#Interoperability is the ability to exchange and process information in a secure, reliable, traceable, and real-time manner.

The aim of standards is to attain #interoperability.

In order to optimize the use of resources and coordinate policies that improve quality and access to health systems, standardization is necessary.

The aim of #interoperability is to attain an effective, precise, consistent, and secure use of information, when and how it is needed.

The application of a unique standard does guarantee #interoperability.

In order to attain interoperability it is necessary to use a set of complementary standards focused on different areas.

There are three basic and scalable levels of #interoperability.

#Interoperability Level 1- Individual systems with a basic level of standardization that defines how and what information is processed.

#Interoperability Level 2- Networks, integration of individual systems which reuse the standards implemented by them.

#Interoperability Level 3-Interconnection of networks that exchange information according to defined profiles, agreements, regulations, and criteria.

For syntactic #interoperability to exist, it should be possible to exchange information.

For semantic #interoperability to exist, the exchanged information should be used.

For organizational/business #interoperability: define the rules that determine what information will be exchanged and what will trigger the exchange.

#interoperability may take place between devices, between information systems, between departments, organizations, regions, and countries.

In order to attain a patient-centered health system, supporting information systems should be interoperable.

Information should accompany the patient, guaranteeing secure, complete, and confidential access to data.

Based on the objectives and timeframes of the health system strategy, the information system needed is defined by its sustainability.

The (computerized) information system should be conceived and designed according to standards that guarantee #interoperability.

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Born in Argentina, he is a physician specializing in internal medicine. He is a candidate for a master's degree in information systems engineering and a PhD in IT engineering. He is in charge of the Department of Health Informatics, Hospital Italiano of Buenos Aires (HIBA) and is Professor of Medical Informatics in the School of Medicine of the University Institute CEMIC and the School of Medicine of the HIBA. He has submitted more than 200 papers to congresses and scientific journals, including chapters of books and books.

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General Disclaimer

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Legal Trends

in the Use of ICTs in Health

Jorge Armando Guerra, Susana Castiglione, Fiona Pompey,
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SUMMARY

A study on the existence of telecommunication standards in Argentina, Chile, Colombia, Mexico, and Peru, as well as in several English-speaking Caribbean countries, found that all have such standards and, except for Dominica, Saint Lucia, Turks and Caicos Islands, and the British Virgin Islands, they have elaborated documents or national strategies regarding information and communication technologies (ICTs). Chile, Colombia, Mexico, and Peru have policies or strategies regarding the use of ICTs in the health area, and Colombia and Peru have enacted specific and comprehensive telehealth standards.

In the countries that were analyzed for this report, the electronic health record is acknowledged and given the same value as the traditional or written clinical history as long as certain requirements are met. Those countries also have rules and systems for clinical information exchange. Chile, Colombia, Mexico, and Peru have documents or rules for ICT application in integrated health service networks.

In all the countries that were studied, the digital signature and electronic documents are regulated and it has been established that both should be comparable to printed documents with handwritten signature as long as certain requirements are complied with. All of these countries also have criminal and administrative provisions regarding computer crimes.

With regards to the protection of personal data, most of the countries included in this chapter, except for Barbados, the British Virgin Islands, and Turks and Caicos Islands, have specific regulations on this topic. The analyzed legislation revealed that there is consensus that the privacy of health-related information should be carefully protected.

INTRODUCTION

This chapter identifies and analyzes the legislation on the use of ICTs in the health sector in five Latin American countries: Argentina, Chile, Colombia, Mexico, and Peru, as well as in the following English-speaking Caribbean countries: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, the British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, and Turks and Caicos Islands.

The work is oriented toward regulatory references and documents specifically dealing with ICTs and health; this includes the exchange of clinical information, the security of information systems, and the protection and confidentiality of personal data. The first section is on ICT standards and documents in general, since in some cases they expressly refer to the health issue.

MATERIALS AND METHODS

The chapter was developed using individual research, development of surveys, and, in particular, the input from network conversations within the framework of the eHealth Conversations organized by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by him/her and the participants, suggesting work assignments, and compiling the discussions. Some authors also submitted documents for discussion on different topics.

Each conversation lasted eight weeks and, based on the topics addressed, a document was elaborated including the main recommendations coming from the exchange of ideas and experiences. The research on the Latin American countries consisted of consulting health sector legislation and general rules on telecommunications from official Internet sites of the Ministries of Health, and additional legal, national, and regional databases. To review the regulations of the English-speaking Caribbean countries, the health and telecommunications regulations available at the Library of the Faculty of Law of the University of the West Indies, in Cavehill, Barbados, were consulted. In addition, information was obtained from meetings with officers from the Ministries of Health and the Office for the Caribbean Area of the International Telecommunications Union. It should be noted that, in some cases, it was not possible to find legal standards for some of the variables under study. Nevertheless, this does not imply that the regulations are lacking at some jurisdictional level, but that, in spite of research efforts, it was not possible to attain such information.

STRATEGIC INFORMATION

ICT General Standards

This section identifies the main standards that regulate ICTs in general. Due to the large quantity of legislation concerning telecommunications, this study only mentions the main standards and documents. The intent was to locate specific references to ICTs and the promotion of information technology accessibility, with special emphasis on references to the health sector.

All the Latin American countries studied have developed numerous regulations regarding telecommunications and specific provisions and/or documents in relation to ICTs.

The English-speaking Caribbean countries under study have a general regulatory framework in telecommunications (Telecommunications Acts), which has been significantly improved during the past few years. The tendency of regulations on this issue is toward the deregulation of the telecommunications sector, interconnection, and universal access. The Information and Communications Technology Authority Law (2011) of the Cayman Islands is one of the most recent and updated regulations, while the Telecommunications Act (1990) from Guyana is one of the first in the Region, which currently requires revision.

There are initiatives to help the English-speaking Caribbean countries improve their technology and infrastructure. For example, the International Telecommunications Union (ITU) has started assistance projects in areas such as Internet governance and spectrum management. The Eastern Caribbean Telecommunications Authority (ECTEL) also provides technical support to its five member countries.[1]

In Argentina, Decree No. 378/05 approved the strategic guidelines for the National Plan for Electronic Government and the Sectoral Plans for Electronic Government of the agencies of the National Public Administration. The country also has an Electronic Digital Agenda, created by Decree No. 512/2009 of 7 May 2009, aimed at improving and increasing participation in the information and knowledge society, increasing the access, use, and ownership of ICTs as a social development factor. Decree No. 512 specifically puts forward the fundamentals for the regulations for the Digital Agenda. Another provision that should be noted regarding ICTs is Decree No. 1.552/2010 of 21 October 2010, which created the National Telecommunications Plan, known as "Argentina Conectada."

In Chile, ICT policy is included in what is known as Digital Strategy. It devises the public policy that maps digital development in Chile over a certain period of time. The 2007–2012 Digital Strategy developed by the Committee of Ministries for Digital Development, created in February 2007, proposes, as a general objective, to contribute to the economic and social development of the country through the potential offered by the use of ICTs. The Under-Secretariat of Telecommunications (*Subsecretaría de Telecomunicaciones,* SUBTEL) is currently working on the 2013–2020 Digital Agenda.

Colombia Colombia has standards, plans, and programs that, over the past few years, have fostered the use of ICTs in different areas, including health. The key objective of these initiatives is to bring connectivity to the masses, with systems that can reach the most remote regions of the country and to encourage all citizens to use ICTs. Within this effort, it is worth mentioning Act No. 1.341 of 30 July 2009, which defines and regulates access and use of data messages, eCommerce, and digital signatures. Stimulus for ICTs in Colombia was included in the 2006–2010 and 2010–2014 National Development Plans. Specifically, the first plan includes and supports the 2008–2019 National ICT Plan led by the Ministry of Communications. Within this framework, a number of programs are being developed such as the Technology Plan "*Vive Digital*" and the program "*Compartel de Conectividad en Banda Ancha*" (Compartel Broadband Connectivity).

In Peru, the regulations on general telecommunications and on broadband Internet, as well as on interconnection services, are quite developed. The government policy in this regard is included in the 2013–2017 National Strategy for Electronic Government. This is based on other plans, such as the 2012 –2016 Strategy for Modernizing Public Management and the Bicentennial Plan, which has six principles of development aligned with the Peruvian Digital Agenda 2.0 (Information Society Development Plan in Peru) approved by Supreme Decree No. 066-2011-PCM.

Mexico has also developed a wide variety of regulations related to telecommunications. Regarding ICTs, the Digital Government Unit is in charge of implementing what is known as eGovernment or digital government. This is defined as the exploitation of ICTs to improve internal management of public administration, thereby providing better services, facilitating access to information, increasing accountability and transparency, and strengthening citizen participation. The Digital Agenda (AgendaDigital.mx) is the governing document which articulates current and future actions related to the expanded use and exploitation of ICTs. It is worth mentioning the 2011 Agreement, which establishes the Interoperability and Open Data Scheme of the Federal Public Administration, and the Agreement of 12 July 2010 on administrative provisions for ICTs and information security.

As for the English-speaking Caribbean countries, Anguilla has the 2004 Telecommunications Act whose Chapter T6 refers to the liberalization of the telecommunications sector, universal access, and interconnection. This Act establishes a Public Service Commission whose functions include granting licenses and the regulation of public services and telecommunications. Also, the draft for an ICT Strategic Plan (A Strategic Framework for an Information Economy for Anguilla, Draft, 2009), identifies 10 priority areas for fostering communications, including the development of a legal and regulatory framework to facilitate electronic commerce, the promotion of information infrastructure, and the implementation of a model for the delivery of on-line governmental services. This plan also refers to the need to develop the infrastructure to support the development of the medicine and health sectors.

In 1951, Antigua and Barbuda enacted the Telecommunications Act, Chapter 423. In 2007, new standards were developed to liberalize the ICT sector and establish a telecommunications commission. In 2012, the Technology Endeavor Project was launched with the aim of developing ICTs in the country.

In the Bahamas, the 2003 Policy on Electronic Commerce recognizes that electronic commerce should be guided by principles of universality, free access to the Internet (to hospitals and clinics, among others), interoperability, and interconnection security of information systems. Moreover, the policy recommends the liberalization of telecommunications infrastructure and the development of "high technology free-trade zones." In turn, Chapter 304 of the Communications Act, 2010, establishes the main objectives of the policy for electronic communications, which include the promotion of access to high quality networks and privacy protection.

The National ICT Strategic Action Plan promotes the use and application of ICTs in Barbados. The document lists 10 objectives to be reached by 2015, which include access to the broadband telecommunications structure in the entire country and the development of an efficient legal and regulatory framework to facilitate and foster ICT development. In addition, it recommends increasing public access to the Internet. In regards to health, the plan proposes the creation of an improved information system to facilitate the follow-up and control of communicable diseases. Chapter 282B of the Telecommunications Act, 2001, which predates the liberalization of the telecommunications market, establishes in article 32 that the Ministry of Commerce has the authority to develop and revise the telecommunications policies and the interconnection and universal service policy to guarantee access to all residents and services.

In Belize, Telecommunications Act No. 16, 2002, establishes the regulation and the development of telecommunications in the country to liberalize the sector and promote access to high quality services. It also has the ICT National Strategy of Belize intended to promote universal access to ICTs. This strategy recommends the improvement of the national telecommunications infrastructure through the development of a global framework to promote competitive broadband services, the promotion of national and international investment in the Internet backbone, and the competitive development of Internet services. The strategy also refers to the Government Software Warehouse Program which is responsible for developing applications for use in the national health information system.

The British Virgin Islands adopted the Telecommunications Act No. 10 in 2006. It establishes a Telecommunications Regulatory Commission which licenses, regulates, and develops telecommunication services. This Commission advises the Ministry on telecommunications-related policies at the international, regional. and national level. It also deals with the application of national telecommunications standards. At present, the Caribbean Telecommunications Union collaborates with the British Virgin Islands in the drafting of a national ICT policy.

In the Cayman Islands, the 2011 Information and Communications Technology Authority Law, which is under revision, establishes an Information and Communications Technology Authority to authorize and regulate ICT services and networks, as well as to promote and maintain an efficient, economic, and harmonized use of its infrastructure. The law also promotes competition in the delivery of services, interconnection, and the need to share infrastructure. On the other hand, this standard establishes free access to Internet services for educational and health institutions; this access is financed by a universal fund (section 62).

Dominica has the Telecommunications Act No. 8, 2000, aimed at promoting competition in telecommunications.

In Grenada, the Telecommunications Act of 2000 addresses the liberalization of the market and competition in the sector. In addition, it has the ICT Strategy Plan that foresees the development of infrastructure for access to high quality telecommunications. The plan also recommends the revision of the methods of accessing national and international interconnection; achieving quick and reliable interconnection through the deregulation and development of the national infrastructure; support for the delivery of integrated voice, data, and video services; and the adoption of advanced technologies.

Guyana developed the ICT4D Guyana National Strategy Final Draft 2006, which promotes universal access to information, knowledge, and telecommunications infrastructure. The country's Telecommunications Act of 1990 is outdated, but a new draft bill is being written to promote development and regulation of the national infrastructure of information, competition at all levels, interconnection development, and universal access.

In Jamaica, the Telecommunications Act No. 1, 2000, is aimed at promoting fair and open competition as well as universal access. This country has elaborated several strategies for the creation of high capacity networks to facilitate access to technologies with interconnection to international networks.

In Montserrat, the Info-Communications Development Act No. 4, 2009, is one of the most advanced laws on ICTs in the Region. This standard establishes the Montserrat Info-Communications Authority (MICA) which is responsible for the promotion and development of information systems and services in the government and the ministries. Montserrat has also issued the National ICT Policy with the aim of allowing universal, open, and affordable access via high-capacity wireless and cable to infrastructure, technologies, and services.

Saint Kitts and Nevis has elaborated ICT strategic plans as well as the Telecommunications Act (No. 2, 2000), which establishes the National Telecommunications Regulatory Commission and provides universal service, interconnection, and infrastructure sharing. It also has the 2006 National ICT Strategic Plan, intended to support universal access, interconnectivity, reliability, and technological neutrality. The Plan also recognizes that rural communities should be guaranteed the right to use any appropriate alternative for the creation of local and broader range networks.

In 2000, Saint Lucia issued the Telecommunications Act No. 27, which addresses liberalization and open competition, the functioning of a regime of universal service and the introduction of advanced telecommunications technologies.

In Saint Vincent and the Grenadines, the Telecommunications Act No. 1, 2001, establishes the National Telecommunications Regulatory Commission (NTRC). It states that access, market liberalization and competition, universal service, and introduction of advanced technologies should be guaranteed. Act 42 anticipates universal access to Internet services for rural communities and hospitals. The Electronic Communications Bill is being drafted and is expected to replace the current Telecommunications Act. This draft bill foresees the liberalization of electronic communications and the strengthening of NTRC capacity. The 2010–2015 St. Vincent and the Grenadines National ICT Strategy and Action Plan, mentions the need to increase access to broadband in households and recommends that public institutions (e.g., health facilities) should have computers and Internet access. In this sense, it recommends restructuring the national health information system and a new fiber optic cable connection for the Ministry of Health.

In Trinidad and Tobago, the Telecommunications Act No. 4, 2001, includes the creation of an open telecommunications market and universal access to telecommunications among its objectives. The 2012–2015 draft National ICT Plan proposes the implementation of programs for universal communications service, fixed broadband access, wireless broadband, the migration to IPv6/G2C services, and the delivery of public services to the population by electronic means.

The 2009 Telecommunications Ordinance of Turks and Caicos Islands establishes the Telecommunications Commission. Its functions include the promotion of competition and the establishment of quality standards for telecommunication services for the population.

Information and Communications Technologies in Health

All the Latin American countries analyzed have regulations that have an impact on ICTs and health, and, except for Argentina, all of them have elaborated national policies or strategies on this issue. Colombia (Telehealth Act No. 1.419, 2010) and Peru (Technical Standard for Health [NTS] No. 067-MINSA/DG SP-V.0) have adopted specific and comprehensive standards on telehealth.

In the English-speaking Caribbean countries, no specific standards, plans, or programs have been found on ICTs and health, except for the references to ICTs in standards, plans, or programs from Anguilla, Barbados, Bahamas, Belize, the Cayman Islands, St. Vincent and the Grenadines, mentioned in the previous section.

In Argentina, there seems to be no specific policy or regulation on this subject, apart from the provisions of the general ICT standards and the Digital Agenda. Decree No. 378/05, which approves the strategic guidelines of the National Plan for Electronic Government, refers to the "Sectoral Plans for Electronic Government" but no specific plan for health was found. Nevertheless, there are some isolated experiences on issues such as the integrated health information system of the Hospital Italiano de Buenos Aires. [2]

The only standard found for Argentina with a direct impact on ICTs and health is Resolution No. 883/2007, which creates the National Unified Health Information System, with the aim of strengthening and making available the health information of the different programs in place in the health sector.

Chile has an ICT plan known as the Digital Health Strategy 2011–2020. Its mission is to contribute to the improvement of the health of the population through timely, efficient, and reliable management of standardized information which allows improved disease prevention and health care. This strategy also approves the achievements of the strategic objectives of the health sector which are included, in part, in the Health Objectives of the Decade. Within the framework of the Digital Health Strategy, a number of projects were created such as the Health Network, known as Ruta 5 Digital de Salud, coordinated by the Department of ICTs Sectoral Management of the Ministry of Health and the project titled Health Care Network Information System (Sistema de Información de la Red Asistencial, SIDRA). This project was created to implement modules to strengthen the work of the health care network, and to support the operational management at every level, with a focus on improving comprehensive health care for clients of the public health system.[3]

In Colombia, there are numerous standards and a specific provision. Act No. 1.419 of 13 December 2010 establishes the guidelines for the development of telehealth, addressing the issues of telehealth, telemedicine, and tele-education in health. The Act establishes that, regardless of benefits offered, insurance companies and service providers of the General Social Security System should offer in their portfolios telemedicine as a category of service, with adequate, effective, and rational services, facilitating free access and choice to their users, thereby contributing to its development and sustainability. The Act also provides for telehealth principles and an Advisory Committee on Telehealth, as well as providing for its funding.

Colombia has also issued a telehealth policy led by the Ministry of Health and Social Protection and the Ministry of Information and Communications Technologies. This is the 2012–2014 Plan titled "Hacia un Plan País en Telesalud" (Moving Toward a Country Telehealth Plan) aimed at improving health conditions and directed toward the entire population, especially those residing in remote locations. Another relevant standard is Resolution No. 1.448 of 8 May 2006 which defines the qualifying conditions for institutions providing health services under the telemedicine modality and which should enroll in the special registry of health service providers (section 7). Also, it includes provisions on the ethics of service delivery under the telemedicine modality (section 13). Also significant is Agreement No. 3 of 30 July 2009 of the Health Regulatory Commission (CRES), which includes in the Mandatory Health Plan the delivery of health services under the telemedicine modality.

In 2001, Mexico Mexico elaborated the e-Health Action Program for the 2001–2006 period, based on the proposals of the 2001–2006 National Development Plan and the 2001–2006 National Health Program. As part of this action program, two initiatives emerged for the achievement of its objectives: the design, instrumentation, and operation of the telemedicine/telehealth systems, and the eHealth portal. Following this, the 2007–2012 Specific Action Program on Telehealth was approved; its mission is to contribute to the universality of health care through the development and the integration of a national telehealth system that favors access to and the provision of quality, efficient, and person-centered distance health services. Mexico has issued several standards with a direct impact on ICTs in health, including: Official Mexican Standard NOM-035-SSA3-2012, in relation to health information; NOM-004-SSA3-2012 on clinical records; and, particularly, NOM- 024-SSA3-2012 on electronic health records and health information exchange systems. Section 6.4 of the last standard also refers to health information standards and includes Regulatory Appendix A called *Matriz de Catálogos Fundamentales* (Key Matrix Catalogues).

As mentioned before, Peru has a specific standard regarding telehealth: the Technical Health Standard (NTS) No. 067-MINSA/DG SP-V.01 which contributes to the decentralization and integration of the national health system and universal delivery of health services with quality, efficiency, and equity through the incorporation of telehealth. Its general aim is to regulate, by means of technical and administrative provisions, the applications of telehealth in management and actions related to information, education, and communication in health services, as well as in the delivery of health services under the telemedicine modality. In addition to this standard, a National Telehealth Plan was developed, approved by Supreme Decree No. 028-2005-MTC of the Telehealth Advisory Board (created by Article 2 of the Supreme Decree No. 028-2005/MTC), which is the entity responsible for its development and implementation. The main objective of this Plan is to develop, implement, and disseminate an integrated telehealth system with the purpose of improving and expanding the delivery of health services, for the benefit of the general population and, particularly, rural and marginalized populations. It makes specific reference to integrating the telehealth system into the National Coordinated and Decentralized Health System (SNCDS) as a supporting technology, and, using a national telehealth network, integrating it into all constituent subsystems: Ministry of Health, Social Health Insurance, Armed Forces Health Service, the National Peruvian Police, the private health sector, and health delivery units at different health care levels.

Another relevant standard is the Ministerial Resolution No. 297-2012/MINSA 2012 which approves the technical document *Establecimiento del marco conceptual para el fortalecimiento de los sistemas de información y de tecnologías de información y de comunicación en el Ministerio de Salud* (Establishing the conceptual framework for strengthening information systems and information and communication technologies in the Ministry of Health). This document identifies information system concepts and ICTs involved in the strategies and objectives of the Ministry and establishes a standard criterion in the actions to be performed in this regard.

Exchange of Clinical Information

This analysis variable covers two aspects of ICT regulation. First, it seeks to identify specific regulations on electronic medical records. An attempt was also made to identify standards governing the electronic exchange of demographic, clinical, and epidemiological information among different players and components of the health systems, or among governmental agencies in general. Second, reference was made to the exchange of information, with an emphasis on integrated health services networks.

The English-speaking Caribbean countries have no standards or documents that regulate the collection, use, and exchange of national or regional clinical information. The ICT standards analyzed from some countries refer only to the value of electronic documents, and health standards do not address the issue since they were drafted before the computerization of health information systems. References to the use of ICTs in integrated health networks were not found.

The five Latin American countries analyzed acknowledge the electronic health record and they assign to it the same value as the traditional or written clinical history as long as certain requirements are met.

The clinical history was not regulated in Argentina until Act No. 26.529 was approved on 19 November 2009. Although this standard deals in general with patients' rights in their relationship with health professionals and institutions, Section 12 of the Act establishes that the content of the clinical history may be recorded electronically as long as all steps are taken to guarantee the preservation of its integrity, authenticity, inalterability, and durability, and the retrieval of the data contained in due time and form.

In Chile, as in Argentina, this issue is addressed by a law dealing with the rights of people in connection with health. Act No. 20.584, 2012, regulates the rights and duties of people in relation to health care actions, refers to the confidentiality of the information contained in the clinical record, and provides its definition in section 12. Circular IP No. 16 of 26 October 2011 also interprets and clarifies what the unique and individual clinical record is, and establishes that professionals involved in the care of the patient have access to the complete background that make up the medical history of the patient. The Accreditation Manual of Institutional Providers of Open Health Care Centers establishes that these institutions should have a unique clinical record, defined as the instrument that records the medical history of an individual.

In Colombia, Resolution No. 1995 of 8 July 1999, which establishes standards for the management of the clinical record, states that health care providers can use physical or technical means such as computers or magneto-optical means, when appropriate, in compliance with circular 2 of 1997 issued by the General Archive of the Nation (parameters to be taken into account for the implementation of new technologies in public archives), or the modifying or supplementary standards. Resolution No. 1.448 of 8 May 2006, which defines the qualifying conditions for health provider institutions under the modality of telemedicine, refers to the quality of the clinical record in telemedicine. Finally, in 2011, Colombia sanctioned Act No. 1.438, which reforms the general system of social security in health, and introduces what is referred to as the "unique electronic clinical record" that will be in force as of 2014 (section 112, provisional paragraph).

In Mexico, the clinical record may be stored in electronic, magnetic, electromagnetic, optical, optical-magnetic means, or any other technology for the integration of the clinical record, as long as the minimal requirements are complied with, according to the Official Mexican Standard NOM-004- SSA3-2012, on the Clinical Record (5.13).

In 2001, in order to address the issue of the use of electronic media, Mexico's Social Security Act, published on 21 December 1995, was amended to acknowledge the value of documents submitted by magnetic, digital, electronic, optical, magneto-optical, or similar means (sections 15, 39C, 40 and 286 I). Similarly, Section 111 refers to the unique electronic clinical record.

In Peru , issues relating to the clinical record are included in Ministerial Resolution No. 597-2006-MINSA of 27 July 2006, which approves the Health Technical Standard for the Management of the Clinical Record. The aforementioned Telehealth Technical Standard includes a section devoted to the Clinical Record and Health Records (6.2.3.). It establishes that all the patients seen under the telemedicine modality should have a clinical (electronic or physical) record and its management should be ruled by the Health Technical Standard for the Management of the Clinical Record NTS No. 022-MINSA/DGSP-V.02.

Regarding the exchange of health information, in 2007, Argentina created, by Resolution No. 883/2007, the Unified National Health Information System, aimed at strengthening and making available health information from the different systems in place in the health sector. Until then, only the Statistical Health System (SES) and other systems had been developed, predominantly for epidemiological purposes.

The Ministry of Health also has the Argentine Integrated Health Information System (SISA) [4], which is an information technology project to improve the decision making of all system players. It aims to reduce the fragmentation of health information at all levels, and to make information available in due time and form, for those who need it, integrating, building, and articulating the different federal records into a modern and reliable technology platform.

Chile has standards that regulate the interoperability of the different types of electronic documents in the entities of the Central State Administration (Decree No. 81 of 23 December 2004). In turn, Decree No. 77 of 21 December 2004 approved the technical standard that allows electronic communications among the entities of the State Administration and between them and natural and legal persons to operate effectively and efficiently, and it also implements at the administrative level the right to petition (enshrined in number 14, Section 19 of the Political Constitution of the Republic of Chile).

Act 19.937 of the Health Authority and New Management Model of 24 February 2004, makes important changes for the integration of health care networks in Chile. This led to the creation of a new under-secretary in charge of health care networks and the reorganization of health services, changing the role of the Directorate of Health Services to management of the network. It also provides for the formation of an Integrated Health Care Network Council (CIRA), a new location for primary level care, and a new design for the administration, called networked hospital management. The support to the health networks provided by ICTs occurs through several projects and initiatives, among which the following can be highlighted: the Ministry of Health Network (Red Minsal-Ruta 5D), the Disease Surveillance System, and the Pre-hospital Care Information System. The Health Care Network Information System (SIDRA) project is also significant since its general objective is to install an integrated information system made up of interoperable applications and components that will provide technical support for the key processes of health, administrative, and resource management of the health care network.

In Colombia Act 1.438, 2011, which modifies the general social security health system, includes the definition and adoption of a plan to guarantee the connectivity of institutions related to the health sector, within the framework of the National Plan of Information and Communications Technologies (Section 113). This standard adopts the Strategy of Primary Health Care and then establishes that the Ministry of Health and Social Protection should define and implement tools for systematic use, such as electronic health records as well as other technical instruments, in the entire nation.

Section 112, which specifically refers to the articulation of the information system, establishes that the Ministry of Health and Social Protection, through the Integrated Social Protection Information System (SISPRO), will articulate the management and will be responsible for the administration of information. Additionally, the Ministry of Health and Social Protection, together with the Ministry of Information and Communication Technologies, will define and adopt a plan so that, in a period of less than three years, the connectivity of institutions related to the health sector is guaranteed, within the framework of the National Plan of Information and Communication Technologies (section 113).

In Mexico, the Official Mexican Standard NOM-024- SSA3-2012, apart from regulating the information systems of the electronic health record, establishes the mechanisms for service providers of the national health system to record, exchange, and consolidate information. Furthermore, the 2007–2012 National Health Program incorporates the proposal of an Integrated Health Services

Model (MIDAS) developed by the Secretary of Health in 2002. Section 4.2 of strategy 4 of this program refers to the design and instrumentation of innovative mechanisms for the management of medical units and health service networks. Strategy 8 mentions the promotion of investment in systems, ICTs that improve the efficiency and integration of the sector, and includes lines of action which recommend, among others, the modernization of the ICTs of the national health system.

Peru has several provisions on the exchange of information specifically in health. The most relevant is Directive No. 001-2002-OGEI: General Standards on Actions of Information Systems, Statistics, and Informatics of the Ministry of Health, which must be applied in the Headquarters of the Ministry of Health, health directorates, regional health directorates (with the corresponding dependent health facilities), specialized institutes, and decentralized public agencies.

The Administrative Directive No. 180-MINSA/OGEI V.01, establishes the technical criteria for the incorporation of ICTs in Peru's health sector. It encourages the development of conditions for the exchange of health information between different service providers and other health sector actors. It provides for the development of the eGovernment platform and specifically the ICTs that should facilitate the interaction between the health sector and the citizens and businesses involved in it. It is also important to mention the Family- and Community-Based Model of Comprehensive Health Care (MAIS-BFC), which is rooted in the concept of integrated networks elaborated by PAHO/WHO, and refers to the use of technologies as an attribute of the networks.

Peru's Framework Law on Universal Health Insurance No. 29.344, 2009, and its Regulation, Supreme Decree No. 008-2010-SA, introduced the concept of the "functional network of health care." Section 142 of the Law addresses the standardization of information and states that it is mandatory for the Ministry of Health to elaborate, publish, disseminate, and update the classification, denomination, codification, and description of information standards related to the record of services and/or set of health services with promotional, preventative, recovery, and rehabilitation purposes oriented toward the management of the health conditions prioritized for universal health insurance. Section 143 establishes an identification system for health care which will constitute the basis for the corresponding code, and which will be unique and consistent over time once it has been generated. It also establishes a user identification system.

This section focuses on standards on the quality of the collection and preservation of data and the functionality of information systems. This includes the standards regulating electronic documents and signature, as they have a direct impact on the exchange of clinical records and other health-related documents. It also addresses the standards punishing violations to the security systems and other actions generally considered computer crimes.

In only a few countries of the Region studied were standards found that specifically address the security of health information systems. In Mexico, a provision on the management and security of health information has been approved, and in Peru, the Ministry of Health has adopted Guidelines for Information Security Policy and the Administrative Directive on Information Security Management. There are ICT standards which facilitate and regulate electronic communications and transactions in general, in an attempt to avoid misuse or unauthorized interference in information systems and databases, and which, in some cases, refer to the information systems of health service providers.

Digital signature and electronic documents are regulated in all the Latin American countries analyzed. It is established that electronic documents and documents with digital signature should be comparable to printed documents with handwritten signature, as long as certain requirements are met. All the countries have criminal and administrative provisions regarding computer crimes.

Except for Dominica and Guyana, the English-speaking Caribbean countries included in this study have legislation related to electronic transactions and/or regulations on the misuse of computer services.

In Argentina, Provision No. 6/2005 of the National Office for Information Technologies establishes the Model Information Security Policy. In September 2011 a process to adapt this standard was started, compliant with the amendments to Standard ISO/IEC 27002 on Information Security, Personal Data Protection, and Social Responsibility. In addition, Resolution JGM No. 580/2011 of 28 July 2011, created the National Program for Critical Information Infrastructures and Cybersecurity (ICIC).

Act No. 24.624 of 28 December 1995, regarding the General Budget of the National Administration and amending Act 11.672, considers that electronically archived documents of the National Public Administration have full probative value. Act No. 25.506 of 14 November, on the Digital Signature, recognizes the use of electronic and digital signature and its legal efficacy in the conditions specified. Act No. 26.388 of 4 June 2008, modified the Criminal Code and established the criminal classification of the so-called computer crimes.

In Chile, Decree No. 83 of 2005 approved the technical standard establishing the minimum mandatory security and confidentiality characteristics that electronic documents of the entities of the State Administration should meet, as well as other characteristics whose application is advised with the same purpose. Likewise, it includes a number of standards regarding the quality and security of the Internet. Act No. 19.799 of 2002 on electronic documents and signature, regulates the electronic documents and their legal effects. Supreme Decree No. 181 of 17 August 2002, of the Ministry of Economy, Development, and Reconstruction, approves the Regulation of Act No. 19.799 on electronic documents, electronic signature, and the certification of such signature. Particularly, the standard deals with certification services. Act No. 19.223 addresses computer crimes.

In Colombia, Law No. 1.581, which sets up the general provisions for personal data protection, establishes a series of principles applicable to the management of data, among which the principle on legality stands out. Regarding electronic documents and signature, Act No. 527 of 1999 defines and regulates the use of data messages, electronic commerce, and digital signatures, and establishes certification entities. Decree No. 1.747 of 11 September 2000, regulation of Act 527, deals with certification entities, certificates, and digital signatures. The Official Publication of the Superintendent of Industry and Commerce, Title V, Chapter 8, has instructions in case of authorization requests from digital signature certification entities, audit of open certification entities, standards, plans and procedures for security, as well as certification. The Superintendent of Industry and Commerce issued, on 23 June 2011, the Opinion No. 11065828, which explains the characteristics and regulations applicable to the digital signature of an electronic document. Circular No. 2, 1997, of the General Archive of the Nation establishes the parameters for the implementation of new technologies in public archives and contains important provisions regarding the collection and preservation of data and validation of that information.

Act No. 1.273 of 5 January 2009, which modifies the Colombian Criminal Code, creates a new legally protected right called "information and data protection." Among other crimes, it addresses the abusive access to a computer system, interception of computer data, violation of personal data, and website spoofing to capture personal data.

In Mexico, the Official Standard NOM-024-SSA3-2012, the Electronic Health Record Information Systems and Exchange of Health Information, establishes security measures for the functionality of systems. It contains a section (6.6) devoted to Universal Considerations on Information Management and Security. The 2011 Agreement that establishes the Interoperability and Open Data Scheme of the Federal Public Administration sets the requirements for governance of interoperability among dependencies and entities. This agreement states that administration entities should define and agree, jointly with the other participating public institutions, the scope of their responsibilities in the provision of integrated digital services and information exchange services.

The Decree that issues the Advanced Electronic Signature Act of 2012 regulates their use in actions foreseen in the law and the issuing of digital certificates to natural persons, the services related to the advanced electronic signature, and the official approval of the advanced electronic signature. Computer crimes in Mexico are included in the Federal Criminal Code by the amendment published in the Official Journal on 17 May 1999.

In Peru, Ministerial Resolution No. 224-2004-PCM approves the mandatory use of the Peruvian Technical Standard NTP-ISO/IEC 17799:2004 EDI, Information Technology, in member entities of the National Informatics System. Likewise, the Ministerial Resolution No. 246-2007-PCM, approves the mandatory use of the Peruvian Technical Standard NTP-ISO/IEC 17799:2007 EDI, Information Technology. Other important documents are Ministerial Resolution No. 520-2006-MINSA, which approves the technical document "Guidelines for information security policy of the Ministry of Health" and Ministerial Resolution No. 575-2006-MINSA of 20 June 2006, which approves Administrative Directive No. 090, Information Security Management of the Ministry of Health. Section 6.2.5 of the Technical Telehealth Standard refers to risk management and establishes that it will be necessary to define the processes for the follow-up and assessment of risks inherent in the delivery of health services under the telemedicine modality. Act No. 27.269 of Digital Signatures and Certificates of 27 May 2000, refers to electronic signatures that are included on a data message, or added, or logically associated to them, may link and identify the signer, as well as guarantee the authentication and integrity of electronic documents. Act No. 27.309 of 17 July 2000 incorporated computer crimes in the Criminal Code.

With respect to the English-speaking Caribbean countries, in Anguilla the Electronic Transactions Act, 2006, establishes the legal principles applicable to electronic commerce and archives. Section 6 refers to the legal value of electronic documents.

Antigua and Barbuda has an Electronic Transactions Act (No. 8, 2006) similar to that of Anguilla. The Computer Misuse Act, 2006, forbids the access, unauthorized use, or interference with information systems.

In the Bahamas, the Electronic Communications and Transactions Act, 2006, provides the legal requirements for electronic documents and signature.

Likewise, Section 6 of the Data Protection Act, 2008, establishes that a "data controller" guarantee the accuracy of data and that they have not been distorted or misused. The controller should also guarantee that necessary measures are taken against unauthorized use or distortion of information.

The Computer Misuse Act of the Bahamas, 2006, refers to the security of computers and information systems to prevent unauthorized use or alteration of data. It punishes unauthorized use of information systems with prison and fines. If a computer contains data or programs devoted to providing services directly related with the protection of public security, such as basic emergency medical services, additional sanctions are established.

The Hospitals and Health Care Facilities Act, 2000, authorizes the Ministry of Health of the Bahamas to prescribe the necessary standards to regulate issues related to clinical archives and information in hospitals and health care facilities. In particular, Section 6(1) establishes that an up-to-date copy of the electronic health records of each patient should be filed in clinics and health care facilities.

In Barbados, the Electronics Transactions Act, 2001, acknowledges the value of electronic transactions and documents. The Computer Misuse Act No. 4, 2005, makes provisions for the use and protection of information systems against unauthorized or improper use. Section 4 specifically refers to illegal access to computerized systems, and Section 5 establishes that a person who knowingly and recklessly destroys or alters data, obstructs, interrupts, or interferes in the lawful use of data, or denies access to any person with a right to information, will be guilty of an offense. Likewise, interfering with an informatics system, illegally intercepting data, or disclosing a password or access code without authorization will be considered an offense.

In Belize, the Electronic Transactions Act, 2003, is aimed at facilitating appropriate use of electronic transactions and their confidentiality. Section 11 establishes that when information is requested in writing, this request is complied with if such information is submitted in electronic format. Section 14 (1) establishes that public entities responsible for creating, collecting, receiving, filing, transferring, distributing, publishing, or issuing information and documents, can do so electronically and, therefore, they should specify the control processes and procedures used to guarantee the integrity, security and confidentiality of that information.

The Interception of Communications Act of Belize, 2010, regulates the provision of information regarding communications interception. Section 13 states that a person commits an offense when he/she intentionally intercepts or appropriates protected information through a communications network. "Protected information" is defined as electronic data that are accessed exclusively with an access password.

The British Virgin Islands have sanctioned the Electronic Transactions Act, 2001, which seeks to facilitate electronic transactions. Section 4 establishes that it is unlawful to use, transfer, or accept the electronic record of an individual without his/her consent. Section 10 deals with the conservation of records. Section 49 (1) (d) of the Telecommunications Act states that any individual who obstructs or interferes with the forwarding, transmission, delivery, or receipt of communications will be guilty of an offense.

In Cayman Islands, the Electronic Transactions Law No. 7, 2000, establishes the standards and procedures for the security of electronic records. The Act is aimed at guaranteeing the limited access to records and ensuring their authenticity, processing time, and integrity in an effective fashion. The Computer Misuse Law enacted in 2000 protects the security of computerized information services against unauthorized use, and provides for punishment of individuals who access or modify information without being duly authorized. The Health Practice Law of 2005 lists the necessary criteria for appropriate recording and information management. The Law stipulates, among other issues, that all the records and information of the patient should be filed so as to guarantee confidentiality. The record of patients which, in accordance with standards, are to be kept for long periods of time, should be filed in a secure and adequate manner.

Section 117 of the Health Practitioners Act of Dominica establishes that health professionals should keep patients' records for a period of seven years.

The Electronic Transactions Act, 2008, of Grenada is aimed at facilitating electronic communication between governmental and public agencies as well as promoting the efficient delivery of public services through reliable electronic means. Section VI thereof refers to misuse and the restrictions for the dissemination of computerized information. In addition, the Ministry has the authority to issue regulations on the management of personal data, whether they originate in or outside Grenada.

The objective of the Electronic Transactions Act No. 2, 2000, of Jamaica to facilitate electronic transactions by using reliable electronic documents as well as to promote the development of the infrastructure for the implementation of secure electronic commerce. The Cyber Crimes Act No. 3, 2010, establishes legal sanctions in cases of misuse of information systems and databases. The person who, knowingly and without authorization, interferes with databases or programs, will be guilty of an offense and punished with sanctions which will be more severe when unauthorized access occurs in protected information systems, such as the equipment used for the delivery of services in public hospitals.

In Montserrat, the Electronic Transactions Act No. 7, 2009, establishes the legal principles applicable to electronic commerce and to the processing, verification, and attribution of electronic documents. Section 26 (1) states that a provider of information security services should use adequate and reliable systems, procedures, and human resources for the provision of services.

In Saint Kitts and Nevis, the Electronic Crimes Act No. 27, 2009, forbids interference in informatics systems as well as the unauthorized access to them. The Electronic Transactions Act No. 9, 2011, addresses questions related to electronic documents and signature and regulates issues regarding databases containing personal data.

The Electronic Transactions Act, 2007, of Saint Lucia, deals with electronic commerce. Section 15 states that data are considered comprehensive when they are filed in full and with no changes. It establishes that if a public entity has the power to create, collect, receive, store, and transfer documents, they can be in electronic format. The Computer Misuse Act No. 11, 2011, establishes the protection of informatics systems, and the confidentiality, integrity and availability of their data. The law also seeks to prevent the abuse of information systems.

In Saint Vincent and the Grenadines, the Electronic Transactions Act of 2007 seeks to facilitate electronic transactions and prevent interference in information systems. Part VII thereof deals with the protection of information systems considered critical and which belong to the public administration. The Ministry has the authority to issue minimal standards regarding the access, transfer, and control of information systems considered critical, guaranteeing the integrity and authenticity of the information, and the technological procedures and methods used for the storage or archiving of essential information systems. Part X of the Law refers to information systems and to offenses related to informatics, and Section 66 establishes that the person who intentionally gains access to information systems will be guilty of an offense.

In the Electronic Transactions Act No. 6, 2011, Trinidad and Tobago acknowledges the legal value of the electronic documents and signature. Section 5 (d) refers to applicable norms and standards related to the authenticity and integrity of electronic documents. Section 53 states that public entities that have to issue and receive documents can do it by electronic means. These entities should define the standards for creating, storing, and issuing documents, as well as the control procedures to guarantee their integrity, security, and confidentiality. The Computer Misuse Act No. 86, 2000, forbids access, use, or interference with information systems without the appropriate authorization. Section 3 (1) states that the person who knowingly interferes with said systems, without authorization, will be guilty of an offense.

In 2009 the Turks and Caicos Islands enacted the Electronic Transactions Ordinance which regulates, among other issues, records and data protection as well as electronic documents and signatures.

Protection of Personal Data and Confidentiality in the Use of ICTs

The standards that regulate the effective custody of personal data and confidentiality are summarized here, including the prevention of the transfer of personal data between sectors. No specific mention is made of confidentiality in the physician-patient relationship, which is contained in standards regarding rights and duties of patients, and the exercise of medicine, and which are accepted in all the countries studied.

All Latin American countries included in this study have a specific standard regarding the protection of personal data. These provisions protect sensitive data such as health-related information. During the last few years, English-speaking Caribbean countries have also adopted legislation oriented toward the protection of personal data and privacy. No standards were found in this regard in the British Virgin Islands, Barbados, and Turks and Caicos Islands. It is worth mentioning that, within the Caribbean Harmonization Project, the International Telecommunications Union has recently finished a review of the provision of standards on privacy and data protection regarding medical information in selected Caribbean countries.

In Argentina Act No. 15.326 (Protection of Personal Data), enacted on 4 October 2000, and its Regulatory Decree No. 1.558 of 2001 define, in section 2, sensitive data as personal data that reveal racial and ethnic origin, political opinions, religious, philosophical, or moral convictions, labor affiliation, and information regarding health or sexuality. Act No. 26.529 of 21 October 2009 (Patients Rights regarding their Relationship with Health Professionals and Institutions), also regulates the rights of patients regarding their clinical record and informed consent.

In Chile, Act No. 19.628, enacted on 28 August 1999, specifically deals with the protection of personal data. Section 10 states that sensitive data shall not be dealt with, except when authorized by law, consented to by the owner, or when data are necessary to determine or provide health benefits for the owner. This section also includes a glossary which defines sensitive data (sub-section g) as those related to facts or circumstances of private life or privacy such as (among others) physical or mental health status. Section 19 of the Political Constitution of the Republic of Chile guarantees (sub-section 5) the inviolability of any form

of private communication, which can only be intercepted, opened, or recorded in the manner determined by law.
Section 29 of Act No. 17.374 of 10 December 1970, states that the National Institute of Statistics, fiscal and semi-fiscal entities, and State companies, as well as each of the relevant officers, shall not disclose facts relating to people or entities they have been in touch with during the performance of their tasks. The strict maintenance of confidentiality constitutes "statistical secrecy."

Section 127 of the Decree No. 725 of 31 January 1968 (Health Code), states that medical prescriptions, clinical analysis or tests, and health-related services are confidential. Their content shall be disclosed or a copy shall be given with the express written consent of the patient.

Another relevant standard regarding confidentiality of electronic data in Chile is Decree No. 83 of 12 January 2005, which approves the technical standard that establishes the minimal mandatory security and confidentiality characteristics that must be met by electronic documents pertaining to State administration entities (Section 6).

In Colombia, Act No. 1.266 of 31 December 2008, which dictates the general provisions of habeas data, regulates the management of the information contained in personal databases, including health services. It specifies that these data cannot be transmitted or shared without the consent of the client. This standard (section 2) applies to all personal information data recorded in a databank, either public or private. Likewise, on 17 October 2012, Colombia approved Act No. 1.581 which dictates the general provisions for the protection of personal data.

In Mexico, the Federal Law for the Protection of Personal Data in Possession of Private Individuals, approved on 27 April 2010, is aimed at regulating legitimate, controlled, and informed treatment, in order to guarantee the privacy and the right to information self-determination of people. It defines sensitive personal data as those data that may reveal aspects such as present and future health status and genetic information. Mexico also has the Guidelines for the Protection of Personal Data of 2005, which should be mandatory in the entire nation for private persons handling personal data under the terms of the Federal Law for the Protection of Personal Data in Possession of Private Individuals and its Regulations.

In Peru, Article 2 of the Constitution establishes that every person has the right that information services, private or public, computerized or not, refrain from providing information that affects personal and family privacy. Article 10 deals with secrecy and inviolability of information and private documents.

In Antigua and Barbuda, Chapter 13 of the Telecommunications Act, 2007, addresses the obligation of operators and providers of telecommunications networks and services to maintain confidentiality, stating that they must not use or reveal any confidential or personal information or information belonging to the user. The Minister has the capacity to provide directions to guarantee the security of electronic records. In addition, the Computer Misuse Act, 2006, forbids unauthorized access and interference with programs or databases, and Section 8 (1) states that it is an offense for any person to disclose a password, access code, or any other means to access computers or databases.

In the Bahamas, Section 9(2) of the Hospitals and Health Care Facilities Regulations asserts that medical records of patients and their clinical records are confidential. Chapter 324A of the Data Protection (Privacy of Personal Information) Act, 2008, foresees the protection of privacy of people regarding personal data and regulates the collection, processing, storage, use, and dissemination of personal information. It defines "sensitive personal data" as information relating to physical or mental health. It also establishes that the person gathering the data has the responsibility to ensure that security measures are complied with to prevent unauthorized access to information. Part III of the Act creates the position of Commissioner for Data Protection. The Computer Misuse Act, 2006, establishes that the person who, knowingly and without authorization, discloses passwords or access codes to information systems, will be guilty of an offense.

In Belize, Chapter 13 of the Freedom of Information Act provides the right to obtain documents available at a ministry department or other entity, as long as such documents are not of a classified nature. A document is considered classified when its circulation implies the unwarranted dissemination of information related to personal characteristics, including that of deceased people.

In the Cayman Islands, the list of national standards enforced by the Health Practice Law, 2005, establishes that medical records should be created, maintained, and stored according to the recommendations of professional practice. Thus, it is necessary to take the necessary measures to preserve the confidentiality of all patient information.

The Electronic Transactions Law, 2000, which establishes the legal principles governing electronic commerce, establishes a system to regulate the management of personal data (Part VIII). Section 33 (1) states that the Governor may issue regulations for the treatment of personal data, whether or not they originate in the Cayman Islands, and the Governor can issue regulations to protect the privacy of information. Section No. 76 of the Information and

Communications Technology Act prescribes that a licensee who intentionally discloses any personal data of a subscriber or end-user is guilty of an offense.

The Telecommunications Act of Dominica states that the information of a subscriber or end-user of services is confidential and cannot be intercepted without express consent of the owner.

The Telecommunications Act of Grenada establishes similar concepts, and the dissemination of data of an end-user or subscriber requires the authorization of the owner or a court order.

In Guyana, the Ministry of Health Act No. 6 of 2005 establishes that one of the functions of the Ministry is to obtain data from the medical information systems and disseminate it in an effective communications network without disclosing personal information of patients. The Interception of Communications Act No. 21, 2008, has regulations regarding the dissemination of data. It establishes that, except as provided in the Act, the person who intentionally intercepts a communication during its transmission through a telecommunications system will be committing an offense.

The Interception of Communications Act of Jamaica provides for actions against the person who intentionally intercepts a communication during the course of its transmission, through a telecommunications network.

In Montserrat, Part 8 of the Electronic Transactions Act No. 7, of 2009, deals with data protection. Section 32 allows the Governor to adopt standards for the treatment of personal data if they originate in Montserrat. Likewise, the Governor has the authority to issue regulations aimed at protecting privacy. The Information and Communications Development Act No. 4, 2009, states that one of the functions of the authority responsible for communications is to establish standards and control codes and to regulate privacy and data protection.

In St. Kitts and Nevis, sections 39 and 40 of the Telecommunications Act No. 2, 2009, address the confidentiality and secrecy of communications. Section 39 establishes that any transmission through a public telecommunications network is confidential and cannot be intercepted, controlled, or interrupted without the express consent of the sender. Section 40 prescribes that all personal information related with subscribers to services is confidential and cannot be disseminated by a provider without the consent of the owner or a court order.

The Telecommunications (Confidentiality in Networks and Services) Regulations, 2002, refer to the interception of communications and confidential information of subscribers. Section 17 establishes that a telecommunications provider shall set policies and procedures to facilitate the supervision and strict control of employees or officers with access to personal information of subscribers. Similarly, Section 8 (1) of the Electronic Crimes Act prescribes that the person who provides, distributes, or makes available a password, access code, or similar data that allows access to a computer or database, will be committing an offense.

In Saint Lucia, the Data Protection Act No. 11, 2011, makes provisions regarding personal data protection and establishes the requirements for managing information, including the information that can be used to identify people.

In St. Vincent and the Grenadines, the Data Protection Act No. 11, 2011, deals with the issue of privacy and data protection. It refers to the collection, use, amendment, and dissemination of personal information and acknowledges the right of people to privacy. It defines personal information as information corresponding to an identifiable person, including electronic medical records. Section 100 states that the information collected for a particular purpose by a public authority shall not be used for any other purpose. The Telecommunications (Confidentiality in Networks and Services) Regulation, 2001, establishes that personal information of subscribers of communications services is confidential and cannot be disseminated by the provider without authorization of the owner or a court order.

Section 65 of the Telecommunications Act, 2001, of Trinidad and Tobago foresees that a person who obstructs or interferes with the forwarding, transmission, delivery, or receipt of any communication will be guilty of an offense.

Profile of Specialists [*1]

Guillermo Schor Landman

He is an attorney specializing in telecommunications regulation, and serves as chair of the Ibero-American Telemedicine Foundation and co-chair of the RIC and Health Working Group of eLAC2015 (Economic Commission for Latin America and the Caribbean, @ LIS). He was associate rapporteur of the Telemedicine Study Group of the International Telecommunications Union's Development Office, and regional coordinator of the European Health Telematics Observatory.

Horacio Roberto Granero

Born in Argentina, he holds a doctorate in legal sciences and is a researcher appointed by the Universidad FASTA. He is the Director of the Postgraduate Program for lawyers specializing in high technology law. He has also specialized in new technologies law, providing advice to national and international companies. He was a member of the Drafting Commission of the Digital Signature Act. At present, he chairs the Commission of the Bar Association for High Technology Law.

PAHO Specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to get in touch with any of them, please send an e-mail to ehealth@paho.org.

*1 *The lists of specialists published here is the result of the recommendations made by the participants during the virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability before third parties for damages derived from the use of this information.*

Additional Reading

Improved Government Better Service: 2010–2014 CARICOM eGovernment Strategy, Caribbean Centre for Development Administration, CARICAD, 2009 (Draft). Available at: http://www.gov.gd/egov/docs/ict_egov/draft_2010_2014_CARICOM_egovernment_strategy.pdf

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Agencia para el Desarrollo del Gobierno de Gestión Electrónica y la Sociedad de la Información y del Conocimiento (AGESIC) (Agency for the Development of Electronic Government and the Society of Information and Knowledge). AGESIC legal framework, Uruguay.
The objectives of AGESIC are to improve services to citizens, using the opportunities offered by ICTs. Available at: http://agesic.gub.uy/

Secretariat of the Senate of the Colombian Republic. Laws and antecedents. Colombia Available at: http://www.secretariasenado.gov.co/

Dirección General de Información de Salud (DGIS) (General Directorate of Health Information), Mexico
The purpose of the *Dirección General de Información de Salud* (DGIS) is to advise and assess oversight of the criteria and procedures used to capture, produce, and disseminate statistical information. It has joint responsibility for oversight of the provisions of the general laws regarding health and statistical and geographic information. Available at: http://www.dgis.salud.gob.mx/intercambio/acuerdo.html

Dirección Nacional de Protección de Datos Personales (DNPDP) (National Directorate for Protection of Personal Data), Ministry of Justice and Human Rights, Argentina
The *Dirección Nacional de Protección de Datos Personales* (DNPDP) is the control organ created at the national level for the effective protection of personal data. It is responsible for the Database Registry, an instrument organized to know and control databases. Available at: http://www.jus.gob.ar/datos-personales.aspx

The Eastern Caribbean Telecommunications Authority (ECTEL)
ECTEL was established by the Governments of the five Eastern Caribbean States (Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines) in order to promote liberalization of the telecommunications market and competition in the member States. Available at: http://www.ectel.int/

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee validity of the information included thereof. The only purpose for offering links to external sites is to provide further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not necessarily represent the opinions of PAHO/WHO.*

Enhancing competitiveness in the Caribbean through the harmonization of ICT policies, legislation, and regulatory procedures (HIPCAR)

HIPCAR is aimed at assisting CARICOM/ACP/CARIFORUM2 Caribbean countries to harmonize their policies, legislation, and regulatory procedures regarding ICTs with the purpose of facilitating market integration, encourage investment in improved capacities and services of ICTs, and increase the protection of consumers' interests in the whole region. In short, the objective of the project is to improve the competiveness and the social, economic, and cultural development in the Caribbean region through the use of ICTs. More information is available at: www.itu.int/en/itu-d/projects/itu-ec-acp/hipcar/pages/default.aspx

"Argentina Connected" and Integrated System of Health Information (*Sistema Integrado de Información Sanitaria*, SISA) Projects of the Ministry of Planning, Argentina

Regulations that approved the creation of Argentina's National Unified System of Health Information aimed at strengthening and making available health information from the different systems of the health sector.

"Salud.uy" Program, Uruguay

This program developed an agreement between institutions, including the Presidency, the Ministry of Public Health, the Ministry of Economy and Finance, and AGESIC. More information is available at: www.presidencia.gub.uy/wps/wcm/connect/presidencia/portalpresidencia/comunicacion/comunicacionnoticias/historia-clinica-nacional-imagenologia-telemedicina

Conclusions

Recognition of the importance of legal aspects for the design, management, and strategic planning for health, advances the validity of telemedicine actions.

After analyzing the existing standards, the following can be concluded:

- All of the countries studied have standards that regulate telecommunications and most have national documents or strategies regarding ICTs. The English-speaking Caribbean countries have not developed specific standards or programs on ICTs and health.
- The Latin American countries studied recognize the electronic medical record and, assuming it meets certain requirements, assign it the same value as the traditional or written clinical history.
- The digital signature and electronic documents are regulated in all of the Latin American countries studied, and, assuming they meet certain requirements, are equivalent to printed documents with a written signature.
- In the legislation analyzed, there is consensus that health information should be considered sensitive personal information, and its privacy must be protected.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations

- Work together to define the legal framework to accompany a national eHealth strategy that improves the health of the population by means of timely, efficient, and reliable management of standardized information, through the intelligent use of ICTs;

- Provide support to legislative entities so that they complement the eHealth strategy with legislation in keeping with new technologies;

- Include the discussion of issues related to the application of ICTs in health, particularly telemedicine, in the curricula of legal studies;

- Form multidisciplinary work teams.

Recommendations to provide direction to PAHO/WHO and its eHealth strategy

- Facilitate the implementation of a digital strategy in health in the governments of Member Countries;

- Facilitate the implementation of a digital strategy in health in the governments of Member Countries;

- Disseminate the experiences regarding eHealth strategy among Member States;

- Facilitate the creation of learning and discussion forums among governments, universities, and service provider systems.

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Standards

Anguilla

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- Electronic Transactions Act, 2006.
- Telecommunications Act, 2004, Chapter T6.

Antigua and Barbuda

- Constitution Order, 1981.
- Computer Misuse Act, 2006.
- Electronic Transactions Act No. 8, 2006.
- Medical Practitioners Act, 2009.
- Telecommunications Act, 2007.

Argentina

- Decree No. 1552/2010 of 21 October 2010; Plan Nacional de Telecomunicaciones (National Telecommunications Plan) "Argentina Conectada" is created.
- Act No. 5.690 of 28 November 2002, on protection software preventing the access to specific sites.
- Decree No 1.018/98 of 1 September 1998. It creates the argentina@internet.todos program.
- Decree No. 252 of 17 March 2000, creates the *Programa Nacional para la Sociedad de la Información* (National Information Society Program).
- Provision No. 4/2010 of 7 November 2010, of the *Oficina Nacional de Tecnologías de Información* (National Information Technology Office), approves the *Manual del Usuario del sistema Estándares Tecnológicos para la Administración Pública en Línea* (Online Technology Standards for Public Administration System User Manual).
- Resolution No. 163/2010 of 31 August 2010 of the *Secretaría de la Gestión Pública* (Secretariat of Public Management) approves the implementation of the system "Estándares Tecnológicos para la Administración Pública en Línea" (Online Technology Standards for Public Administration).
- Decree No. 378/05 approves the strategic guidelines that govern the *Plan Nacional de Gobierno Electrónico y los Planes Sectoriales de Gobierno Electrónico de los organismos de la Administración Pública*

Nacional (National Plan for Electronic Government and the Sectoral Plans for Electronic Government of the entities of the National Public Administration).

- Act No. 24.624 of 1995 of the *Presupuesto General de la Administración Nacional* (National Administration General Budget) provides full probative value to the documents of the *Administración Pública Nacional* (National Public Administration) archived electronically.
- Act No. 26.685 of 1 June 2011 on electronic record.
- Act No. 25.506 of 14 November on digital signature.
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- Provision No. 6/2005 of the *Oficina Nacional de Tecnologías de Información* (National Information Technology Office) approves the *Política de Seguridad de la Información Modelo* (Model Information Security Policy).
- Resolution JGM No. 580/2011 of 28 July 2011, creates the *Programa Nacional de Infraestructuras Críticas de Información y Ciberseguridad* (ICIC) (National Program for Critical Information Infrastructure and Cybersecurity).
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- Act No. 26.388 of 4 June 2008, modifies the Criminal Code and establishes the criminal categorization of computer crimes.

Bahamas

- Communications Act, 2010, Chapter 304.
- Computer Misuse Act, 2006.
- Constitution of the Commonwealth of Bahamas.
- Data Protection (Privacy of Personal Information) Act, 2008, Chapter 324A.
- Electronic Communications and Transactions Act, 2006.
- Health Professions Act, 2010.
- Hospitals and Health Care Facilities (General) Regulations, 2000.
- Hospitals and Health Care Facilities Act, 2000.
- Medical Act, Chapter 224.
- Telecommunications Act, 2006, Chapter 304.

Barbados

- Computer Misuse Act No. 4, 2005.
- Constitution of Barbados, 1966.
- Electronics Transactions Act, 2001.
- Medical Professions Act, 2011.
- Telecommunications Act, 2001, Chapter 282B.

Belize
- Constitution of Belize.
- Electronic Transactions Act, 2003.
- Freedom of Information Act, Chapter 13.
- Interception of Communication Act, 2010.
- Medical Practitioners Registration Act, Chapter 318.
- Telecommunications Act, No. 16, 2002.

British Virgin Islands
- Electronic Transactions Act, 2001.
- Telecommunications Act No. 10, 2006.
- Virgin Islands Constitution Order, 2007.

Cayman Islands
- Computer Misuse Law, 2000.
- Constitution Order, 2009.
- Electronic Transactions Law No. 7, 2000.
- Health Practice Law, 2005.
- Information and Communications Technology Authority Law (revisión de 2011).

Chile
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- Act No. 20.522, 2011, creates the *Fondo de Desarrollo de las Telecomunicaciones* (Telecommunications Development Fund).
- Exemption Resolution No. 698 of 30 June 2000 sets quality indicators of feeder links to handle national internet traffic and their advertising system.
- Supreme Decree No. 368 of 18 March 2011 approves the Reglamento Neutralidad de la Red (Network Neutrality Regulation).
- Act No. 19.799 of 12 April 2002 on electronic document and signature.
- Supreme Decree No. 181 of 17 August 2002 of the *Ministerio de Economía, Fomento y Reconstrucción* (Ministry of Economy, Development and Reconstruction), approves the Regulations of Act No. 19.799 about electronic documents, the electronic signature and its certification.
- Act No. 20.584 of 24 April 2012 regulates the rights and duties of people in relation with health care-related actions (art. 12).
- Circular IP No. 16 of 26 October 2011 addresses accreditation system for accreditation manuals of institutional providers of open and closed care facilities.
- Decree No. 81 of 23 December 2004 establishes the technical standard for the entities of the *Administración Central del Estado* (Central State Administration) on interoperability of different types of electronic documents.
- Decree No. 77 of 21 December 2004 approves the technical standard allowing communications by electronic means among the entities of the State Administration.

- Exemption Decree No. 820 of 22 September 2011 of the Ministry of Health, approves the Technical Standard on Health Information Standards.
- Decree No. 83 of 12 January 2005 approves the technical standard that sets minimal mandatory security and confidentiality characteristics that electronic documents of the entities of the State Administration should comply with, and others whose application is recommended with the same purpose.
- Act No. 19.223 of 28 May 1993 on computer crimes.
- Decree No. 725 of 31 January 1968, Health Code Sect. 127 (classified nature of medical prescriptions and laboratory analysis or tests and health-related services), and Sect. 134.
- Agreement that establishes the Interoperability and Open Data Scheme of the Federal Public Administration, 2011.
- Criminal Code of Chile, Articles 246 and 247.

Colombia

- Act No. 1.341 of 30 July 2009 defines and regulates the access and use of data messages, electronic commerce, and digital signatures.
- Opinion No. 11065828 of the Superintendencia de Industria y Comercio (Superintendent of Industry and Trade), of 23 June 2011.
- Act No. 527 of 18 August 1999, defines and regulates the access and use of data messages, electronic commerce, and digital signatures; establishes certification entities; and issues other provisions.
- Decree No. 1.747 of 11 September 2000, regulation of Act No. 527.
- Act No. 1.419 of 13 December 2010, establishes the guidelines for the development of telehealth in Colombia.
- Resolution No. 1.448 of 8 May 2006, defines the qualifying conditions for the institutions that provide health services under the telemedicine modality.
- Resolution No. 1.995 of 1999, of the Ministry of Health, establishes standards for the management of clinical records.
- Act No. 1.122 of 9 January 2007, promotes telemedicine services in difficult-to-access territories.
- Act No. 1.151 of 5 January 2007 issues the 2006–2010 National Development Plan.
- Agreement No. 357, 2007, of the *Consejo Nacional de Seguridad Social en Salud*, CNSSS (National Social Security Health Council) approves the distribution criteria of the resources of the *Subcuenta de Eventos Catastróficos y Accidentes de Tránsito* (Catastrophic Events and Traffic Accidents Sub-account) and includes telemedicine.
- Decree No. 3.039 of 2007, adopts the 2007–2010 National Public Health Plan and includes the promotion of telemedicine as one of its components.
- Resolution No. 3.763, of 2007, includes technical annexes specifying the facilities and necessary maintenance to deliver telemedicine services.

- Agreement No. 3 of 30 July 2009, of the Comisión de Regulación en Salud, CRES (Health Regulatory Commission), which includes the delivery of health services in the Plan Obligatorio de Salud, POS (Mandatory Health Plan) under the modality of telemedicine.
- Act No. 1.438 of 2011 establishes the unique electronic clinical record.
- Resolution No. 1.995 of 1999 establishes standards for the management of the clinical record.
- Circular No. 2 of 1997 of the General Archive of the Nation establishes the parameters to be taken into account for the implementation of new technologies in public archives.
- Resolution No. 1.995 of 1999 establishes standards for the management of the Clinical Record, art. 18.
- Resolution No. 1.448 of 2006 defines the qualifying conditions for the institutions that deliver services under the telemedicine modality; it makes reference to the quality of the electronic medical record.
- Act No. 1.438 of 2011, Art. 14, addresses integrated networks.
- Act No. 1.273 of 5 January 2009, modifies the Criminal Code, and creates a new legally-protected right called "protection of information and data."
- Act 1.581 issues general provisions for the protection of personal data in Colombia.

Dominica
- Commonwealth of Dominica Constitution Order, 1978.
- Health Practitioners Act.
- Hospitals and Health Care, 2002.
- Medical Act Chapter 39:02.
- Telecommunications Act No. 8, 2000.

Grenada
- Electronic Transactions Act, 2008.
- Grenada Constitution Order, 1973.
- Health Practitioners Act, 2010.
- Telecommunications Act, 2000.

Guyana
- Constitution of Guyana, 1980.
- Interception of Communications Act No. 21, 2008.
- Ministry of Health Act No. 6, 2005.
- Telecommunications Act, 1990.

Jamaica
- Constitution of Jamaica, 1962.
- Cybercrimes Act No. 3, 2010.
- Electronic Transactions Act No. 2, 2007.
- Interception of Communications Act, 2002.
- Telecommunications Act No. 1, 2000.

Mexico

- Federal Telecommunications Act of 7 June 1991.
- Agreement which establishes the *Esquema de Interoperabilidad y de Datos Abiertos de la Administración Pública Federal* (Interoperability and Open Data Scheme of the Federal Public Administration), 2011.
- Agreement of 12 July 2010 on administrative provisions regarding ICTs for information security, and *Manual Administrativo de Aplicación General* (Administrative Manual of General Application) on these issues.
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- Official Mexican Standard NOM-035-SSA3-2012, regarding Health Information.
- Official Mexican Standard NOM-024-SSA3-2012, *Sistemas de Información de Registro Electrónico para la Salud e Intercambio de Información en Salud* (Electronic Health Record and Health Information Exchange Systems).
- Official Mexican Standard NOM-004-SSA3-2012, on the Clinical File.
- Federal Criminal Code, reform of 1999. Ninth Title: *Revelación de Secretos y Acceso Ilícito a Sistemas y Equipos de Informática* (Disclosure of Secrets and Illegal Access to Information Systems and Equipments). Sections 211 bis 2, bis 3. Political Constitution of the United States of Mexico (Sect. 16).
- *Ley Federal de Protección de Datos Personales en Posesión de Particulares* (Federal Law for the Protection of Personal Data in Possession of Private Individuals), 2010, published on 5 July 2010.
- *Lineamientos de Protección de Datos Personales* (Guidelines for the Protection of Personal Data), 2005, published in the *Diario Oficial de la Federación* (Official Journal of the Federation) on 30 September 2005.

Montserrat

- Electronic Transactions Act No. 7, 2009.
- Info-Communications Development Act No. 4, 2009.
- Montserrat Constitution Order, 2010.

Peru

- Supreme Decree No. 013-93-TCC, Digital Agenda 2.0 Act, *Plan de Desarrollo de la Sociedad de la Información* (Information Society Development Plan), approved by Supreme Decree No. 066- 2011-PCM.
- Act No. 29.022 for the *Expansión de Infraestructura en Telecomunicaciones en el Perú* (Expansion of Telecommunications Infrastructure in Peru) of 25 May 2007 and its Regulations.
- Supreme Decree No.024-2008-MTC approves the regulatory framework for the promotion of the development of public telecommunications services in rural areas and places of preferential social interest.

- Supreme Resolution No. 063-2010-PCM creates a Provisional Multisectoral Commission to elaborate the *Plan Nacional para el Desarrollo de la Banda Ancha en el Perú* (National Plan for the Development of Broadband in Peru).
- Act No. 29.904, *Promoción de la Banda Ancha y Construcción de la Red Dorsal Nacional de Fibra Óptica* (Promotion of Broadband and Construction of the National Fiber Optic Backbone Network), of 25 November 2012.
- Act No. 28.530 declares that the promotion of access to Internet use is a topic of social interest.
- Ministerial Resolution No. 126-2009-PCM approves the guidelines for the accessibility to web pages and applications for mobile telephone services for public institutions of the National Informatics System.
- Ministerial Resolution No. 129-2012-PCM of 25 May 2012, approves the mandatory use of the Peruvian Technical Standard "NTP ISO/IEC 27001:2008 EDI *Tecnología de la Información; Técnicas de Segurida; Sistemas de gestión de seguridad de la Información; Requisitos* (Information Technology; Security Techniques; Information Security Management Systems; Requirements) in all the member entities of the National Informatics System.
- Ministerial Resolution No. 381-2008-PCM approves guidelines and mechanisms to implement the interconnection of equipments for the electronic processing of information among State entities.
- Ministerial Resolution No. 246-2007-PCM approves the mandatory use of the Peruvian Technical Standard "NTP-ISO/IEC 17799:2007 EDI. Information Technology.
- Act No. 27. 269, 2000, on Digital Signature and Certificates.
- Act 27.292 of June 2000, amends the Civil Code allowing the use of electronic means to communicate the statement of intention and use of electronic signature.
- *Norma Técnica de Salud*, NTS (Technical Health Standard) No.067-MINSA/DG SP-V.01), approved by Ministerial Resolution No 365- 2008/MINSA.
- Ministerial Resolution No. 297-2012/MINSA of 16 March 2012, approves the Technical Document *"Establecimiento del Marco Conceptual para el Fortalecimiento de los Sistemas de Información y de Tecnologías de Información y de Comunicación en el Ministerio de Salud"* (Establishing the Conceptual Framework for Strengthening Information Systems and Information and Communication Technologies in the Ministry of Health).
- Ministerial Resolution No. 1.942-2002-SA/DM of 17 December 2012, approves Guideline No. 001-2002-OGEI: *Normas Generales sobre Acciones de Sistemas de Información, Estadística e Informática en el Ministerio de Salud* (General Standards on Actions of Information Systems, Statistics, and Informatics of the Ministry of Health).

- Supreme Decree No. 024-2005-SA of 29 December 2005, approves the *Identificaciones Estándar de Datos en Salud* (Standard Identifications of Health Data).
- Ministerial Resolution No. 553-2002 CIE A/DM of March 2002, validates the use of the International Statistical Classification of Diseases and Related Health Problems, revision 10 (ICD-10) in all health care facilities of the nation, and requests the General Office of Statistics and Informatics (OGEI) to implement the standard and to reinforce the technical capacities of the staff.
- Ministerial Resolution No. 537-2011-MINSA of 22 July 2001 approves the Administrative Directive No. 180-MINSA/OGEI V.01, which establishes the technical criteria for the incorporation of information and communications technologies in health.
- Ministerial Resolution No. 597-2006-MINSA of 27 July 2006, approves the Technical Standard for the Management of Clinical Records.
- Technical Telehealth Standard: *Historia Clínica y Registros asistenciales* (Clinical History and Health Care Records) (6.2.3.).
- Ministerial Resolution No. 297-2012/MINSA, of 16 March 2012, Technical Document *"Establecimiento del Marco Conceptual para el Fortalecimiento de los Sistemas de Información y de Tecnologías de Información y de Comunicación"* (Establishing the Conceptual Framework for Strengthening Information Systems and Information and Communication Technologies in the Ministry of Health).
- Ministerial Resolution No.1.942-2002-SA/DM of 17 December 2012 approves Directive No. 001-2002-OGEI: *Normas Generales sobre Acciones de Sistemas de Información, Estadística e Informática en el Ministerio de Salud* (General Standards on Actions of Information Systems, Statistics and Informatics of the Ministry of Health).
- Ministerial Resolution 547-2008-TIC, *Estándares de Tecnologías de Información y de Comunicación* (Information and Communications Technologies Standards): Ministerial Resolution No. 554-2001.
- Ministerial Resolution No. 461-2008-MINSA of July, 2008, approves the Administrative Directive No. 13 for the *Uso Racional de Recursos Informáticos y de Comunicaciones* (Rational Use of Information and Communication Resources).
- Supreme Decree No. 024-2005-SA of 29 December 2005 approves the *Identificaciones Estándar de Datos en Salud* (Standard Identifications of Health Data), that is, the standardized identification and codification of clinical and administrative data of mandatory use in health care, for recording and exchanging information.
- Framework Law on Universal Health Insurance, No. 29.344 de 2009. Section 142, information standardization, and 143.
- Ministerial Resolution No. 224-2004-PCM approves the mandatory use of the Peruvian Technical Standard NTP-ISO/IEC 17799:2004 EDI, *Tecnología de la Información. Código de buenas prácticas para la gestión de la seguridad de la información primera edición* (Information

Technology. Code of practice for information security management, first edition) in member entities of the National Informatics System.
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- Ministerial Resolution No. 520-2006-MINSA approves the technical document *"Lineamientos de Política de Seguridad de la Información del Ministerio de Salud"* (Guidelines for Information Security Policy of the Ministry of Health).
- Ministerial Resolution No. 575-2006-MINSA of 20 June 2006, approves the Administrative Directive No. 090, *"Gestión de la Seguridad de la Información del Ministerio de Salud"* (Information Security Management of the Ministry of Health).
- Act No. 27.309 of 17 July 2000, incorporates computer crimes to the Criminal Code.
- Act No. 29.733 of 3 July 2011 on protection of personal data; sanctions established in Title VII.
- Peruvian Constitution, Articles 2 and 14.

St. Kitts and Nevis
- Electronic Crimes Act No. 27, 2009.
- Electronic Transactions Act No. 9, 2011.
- Saint Christopher and Nevis Constitution Order, 1983.
- Telecommunications (Confidentiality in Networks and Services) Regulations, 2002.
- Telecommunications Act No. 2, 2002.

Saint Lucia
- Computer Misuse Act No. 11, 2011.
- Constitution of Saint Lucia, 1978.
- Data Protection Act No. 11, 2011.
- Electronic Transactions Act, 2007.
- Telecommunications Act No. 27, 2000.

St. Vincent and the Grenadines
- Constitution of St. Vincent and the Grenadines, 1979.
- Data Protection Act No. 11, 2011.
- Electronic Communications Bill.
- Electronic Transactions Act, 2007.
- Telecommunications (Confidentiality in Networks and Services) Regulations, 2002.
- Telecommunications Act No. 1, 2001.

Trinidad and Tobago

- Computer Misuse Act No. 86, 2000.
- Constitution of the Republic of Trinidad and Tobago, 1976.
- Electronic Transactions Act No. 6, 2011.
- Telecommunications Act No. 4, 2001.

Turks and Caicos Islands

- Constitution of the Turks and Caicos Islands, 2011.
- Electronic Transactions Ordinance, 2009.
- Telecommunications Ordinance, 2009.

Video interviews with author(s)

eHealth Conversations: legal trends

http://www.paho.org/ict4health/podcast/Entrevista-Aspectos-Legales.mp3

Available in Spanish only

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Aspectos-Legales.mp3

Available in Spanish only

Messages for Twitter on #legaltrends

Chile, Colombia, Mexico, and Peru have policies or strategies regarding the use of ICTs in the health area. #ehealthtalks

Colombia and Peru have approved specific and comprehensive standards in telehealth. #ehealthtalks

The English-speaking Caribbean countries so not have standards for ICTs which specifically refer to the health issue. #ehealthtalks

Only a few countries in the Region have specific standards on the security of health information systems. #ehealthtalks

Regarding protection of personal data, most countries have a specific standard on this issue. #ehealthtalks

There is agreement that privacy of health-related information should be strictly protected. #ehealthtalks

The digital signature is regulated in most Latin America and Caribbean countries and is regarded as a handwritten signature if certain requirements are complied with. #ehealthtalks

Electronic documents are regulated in most Latin America and Caribbean countries and they are comparable to printed documents. #ehealthtalks

Some countries acknowledge the electronic medical record and assign to it the same value as the written clinical record if certain requirements are complied with. #ehealthtalks

Chile, Colombia, Mexico, and Peru have documents or standards for the application of ICTs in the framework of integrated health service networks. #ehealthtalks

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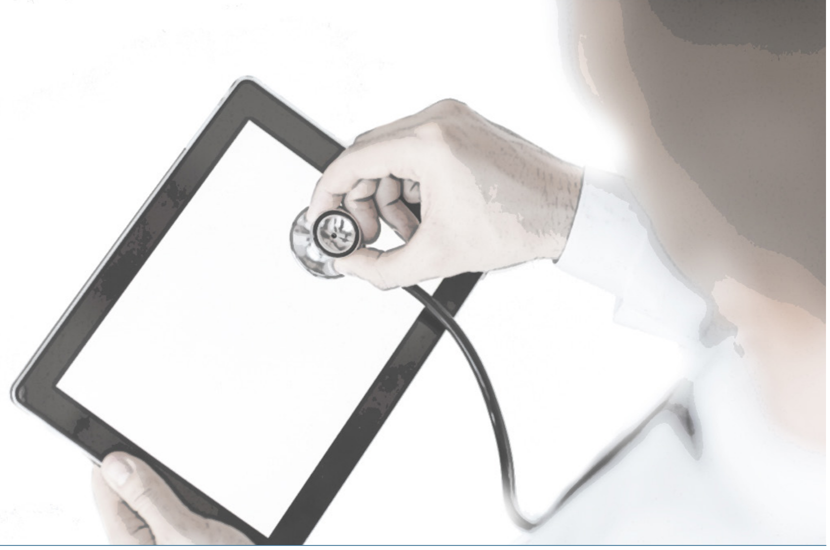
General Disclaimer

This publication was developed by the Knowledge Management, Bioethics and Research Department of the Pan American Health Organization (PAHO/WHO), within the framework of the activities of the project "eHealth Conversations: Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to Health." The information and opinions expressed in this publication are the exclusive responsibility of the authors and may not represent the opinions of PAHO/WHO.

eGovernment and its Relationship to eHealth

The Road to Improving Health Access in the Region

Valentina Jaramillo
Néstor G. Tejera, Pablo Orefice, Allan Bejarano, Francisco C. Ulloa Rodríguez, Sergio Arriagada



SUMMARY

New initiatives that integrate eHealth and eGovernment can help improve access to health care in the Region of the Americas, according to research studies, surveys, and discussions with experts who took part in eHealth Conversations, a project organized by the Pan American Health Organization.

eHealth covers the health sector's use of digital information to support health care, from diagnosis to follow-up of patients, both locally and remotely, while eGovernment covers the use of modern technologies to increase efficiency, transparency, and citizen participation in the public sector.

Countries of the Region should continue to make progress in the integration of eGovernment and eHealth, to make access to resources more equitable and to improve health care, the experts concluded.

Health systems can benefit from the use of new technologies for eHealth, allowing more efficient interconnection of all users and providers, while eGovernment fosters links with other sectors to increase the efficiency of the health system and the number of beneficiaries in the population.

eHealth benefits from information and communications technologies, which are the best catalysts to ensure efficient use of resources in the public sector, and can help society offer better care for people's health needs and improve their health. As a state policy, eHealth provides equal access to information, and collaborative knowledge building for the common good, with data protection, electronic documents, and open data.

In a similar manner, eGovernment encourages citizen participation in decisions, strengthening democracy and governance. The role of eGovernment is important for eHealth because it can promote interoperability standards and infrastructure to unify networks into a single information system, which facilitates greater access to information in real time, and, consequently, better decision making.

INTRODUCTION

In order to address the issue of the relationship between eHealth and the projects and initiatives of the electronic government, also known as eGovernment or digital government, it is necessary to define these two terms.

eHealth: the World Health Organization (WHO) defines eHealth as "the use, in the health sector, of digital information electronically transmitted, stored, or obtained, in support of health care, both at local and distance level." According to the 2006 Annual Report on the Development of the Information Society in Spain, eHealth is defined as "the application of Information and Communications Technologies in the wide range of aspects that affect health care, from diagnosis to follow-up of patients, including the management of the organizations involved in these activities."[1] Both definitions show that this is a wide-ranging topic that includes and affects all the players of the health system and not only patients, the general population, and/or health professionals.

According to the Organization of American States (OAS) "Electronic government is the application of information and communications technologies (ICTs) to the work of the public sector, with the aim of increasing efficiency, transparency, and citizen participation. This definition clearly expresses how, through its innovative approach, electronic government actions position ICTs as a support element, and put the emphasis on the development of good governance. This implies achieving higher levels of efficacy and efficiency in governmental tasks, improving government processes and procedures, increasing the quality of public services, incorporating more and better information in decision-making processes and facilitating the coordination between different government instances."[2] It can be clearly observed that eGovernment reaches all sectors and seeks citizen participation for better access to public services.

Considering that each country in the Region addresses this topic in different ways, this conversation is intended to determine whether there is, or there should be, a direct relationship between eHealth and eGovernment through the analysis of different experiences.

The relationship between eHealth and eGovernment becomes more evident when reviewing the concept of national health systems (NHS), where public and private, national and international health services converge, and which includes as one of the primary activities the delivery of final, intermediate, and support services specifically aimed at the protection and improvement of the health status of the population, whether or not services are for-profit or nonprofit.[3]

The NHS can benefit from the use of new technologies for eHealth, which allow interconnecting all the above mentioned entities more efficiently. On the other hand, eGovernment will foster this interrelationship with the other sectors to increase the efficiency of the health system, as well as the number of beneficiaries in the population.

Furthermore, it is necessary to understand that ICTs define a new type of citizen, who is: a) informed and, therefore, demanding better products and services, and b) participative, constantly interacting and taking responsibility for their reality. These characteristics are present in every aspect of their life, including health. This new citizen needs the presence of an eGovernment and, in turn, of eHealth.

MATERIALS AND METHODS

This chapter was developed using individual research, development of surveys, and, particularly, using the input coming from network dialogues, within the framework of the "eHealth Conversations" project, organized by PAHO/WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by him/her and the participants, suggesting work directions, and compiling the conversations. Some authors submitted documents for discussion of different issues.

This conversation used the virtual campus provided by the Hospital Italiano de Buenos Aires (HIBA), which has the following working tools:

- General discussion forum: to actively carry out the exchange of ideas on different topics to be addressed according to the conversation assignment. Each message posted in the forum sends an e-mail to the participants.
- Wiki: this site enables the joint creation of the document.
- Resource library: this site is devoted to sharing support documents on which opinions and/or thoughts will be based. This section includes articles of journals, chapters of manuals and books, or full texts.

A virtual seminar was organized titled "eGovernment and its importance for eHealth: The experience of the Organization of American States (OAS)," in which Miguel Porrúa, specialist in electronic government from the Department for Effective Public Management of the Secretariat for Political Affairs of the OAS, was the special guest. The conversation was complemented by the publication of a series of tweets with the hashtag "#ehealthtalks," in PAHO's Twitter account on eHealth (@ehealthpaho).

Each conversation lasted eight weeks and, based on the issues addressed, a document was elaborated including the main recommendations resulting from the exchange of ideas and experiences. The conversation on eGovernment was attended by 58 participants coming from the following countries: Argentina, Chile, Colombia, Costa Rica, Cuba, El Salvador, Mexico, Peru, Spain, United States, and Uruguay.

STRATEGIC INFORMATION

The following questions were prepared to guide these conversations and to be the main focus of participants' reflections. These questions were aimed at reaching a conclusion on this topic and, based on this, formulate adequate recommendations. The questions were the following:

- Is there a direct relationship between eHealth and eGovernment in the countries of the Region?
- Should eHealth depend on eGovernment, for instance through a Ministry of ICT, or should it depend on the Ministry of Health?
- Is eHealth a project of eGovernment?
- What are the current experiences of eHealth and eGovernment in the different countries of the Region?

After analyzing the experiences, two types of relationships were suggested between eGovernment and eHealth:

Directly dependent on eGovernment: in a centralized fashion, the national government develops ICT innovations in topics considered essential, such as health. Likewise, the government defines interoperability and infrastructure standards that are adopted by the entire public sector, facilitating communication between governmental agencies as well as evolution of digital life in the public sector. The experience of Colombia, which has a Ministry of ICT, shows this kind of relationship.

Dependent on the health sector: a specific governmental agency (ministry or secretary of health, social development, etc.) is in charge of the application of ICTs in health, and defines interoperability and infrastructure standards. In this case, it is necessary to establish communication networks with other government sectors in order to guarantee that all are aware of the ultimate objectives of its operation at the digital level and avoid work done in isolation. The example of "Mas Salud Jujuy," in Argentina, shows that if eHealth depends on the ministry of health, it can function successfully.

In both situations, it is important to consider that, to be attained, eHealth objectives have to be well defined and well understood by all stakeholders, and interoperability standards should be agreed upon.

Citizen Participation

The importance of ICTs as a driver of efficacy in public services should be emphasized. The experiences shared by the participants prove that citizen participation has improved thanks to the availability of new communications channels offered by ICTs, demanding the systems to respond in a more efficient and transparent manner. It is important to add that discussion and information groups that communicate through ICTs are a means of reaching agreement between groups with different interests, as in the case of NGOs, or the participation of public employees or universities.

One example of this is the 2011–2015 Digital Agenda of Uruguay, which show that when objectives are aligned and ICTs are made available for the community, the efficacy of services is increased, thus favoring all citizens. Another example is the "Salud.uy" program, in Uruguay, with its unified electronic medical record, which will reduce the amount of unnecessary paperwork and allow all the information on an individual's health to be concentrated in only one site, allowing the patient to be cared for in any city without delays or loss of documents. The Salud.uy program is a clear example of how ICTs contribute to the transparency and effectiveness of processes.

Knowledge Development

Another topic that was highlighted during the conversations was the need to foster the creation of original content through new initiatives that encourage knowledge development in the Region. This content would have to be based on appropriate needs and resources, using ICTs as the means to have access to and share them.

It was also emphasized that the public sector should associate with universities and private companies to develop innovation projects in health to increase the access of the entire population to health systems, taking advantage of the knowledge and contents generated. Likewise, they should favor the development of portals containing open information categorized by object identifiers (OID)/unique identifiers (UID) for widespread use in social applications and services.

Profile of Specialists *[1]

Miguel A. Porrúa Vigón

He is a senior specialist in eGovernment with the IFD/ICS Division of the Inter-American Development Bank. He formerly worked as a senior specialist in eGovernment in the OAS Secretariat for Political Affairs, and was Government Affairs Director of the electronic government company govWorks for Latin America. He graduated in Economy and Enterprise from the University of Oviedo (Spain) and received a MBA from Thunderbird School of Business (Arizona, USA). He was co-editor of the book América Latina Puntogob and his most recent article "e-Government in Latin America: a review of the success in Colombia, Uruguay, and Panama" was published in the Global Information Technology Report 2013 of the World Economic Forum.

Osmán de Jesús Argüello Sequera

He is a physician and surgeon, and serves as president of the Venezuelan Association of Health Informatics, treasurer of the Regional Federation of Health Informatics for Latin America and the Caribbean (IMIA-LAC), president of Tecnología, Salud y Creatividad C.A., ICT Advisor in Health, and coordinator of the Regional System for Health Information CORPOSALUD TACHIRA, Venezuela.

José Luis Tesoro

He is researcher and coordinator of the National Institute of Public Administration of Argentina and professor in several universities. He coordinates the e-Government Forum of the Secretary for Political Affairs of the Organization of the American States (SAP-OEA). He was Regional Coordinator of the Virtual Campus of the SAP-OEA and general academic coordinator of the Inter-American Network for e-Government Training of the Las Américas School, Inter-American University Organization.

Walter Curioso Vilches

A native of Peru, he is a physician and surgeon with a master's degree in public health and a PhD in biomedical informatics. He has written more than 100 publications related to the use of information and communication technologies in health, mHealth, and telemedicine. At present, he works as Director General of the General Office of Statistics and Informatics of the Ministry of Health of Peru and serves as president of the Peruvian Association of Biomedical Informatics.

PAHO/WHO Specialists

The Pan American Health Organization has specialists in this field within the Region of the Americas. In order to get in touch with them, please forward an email to: ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the process of virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information.*

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Web Sites *2

Journal of Translational Medicine

An open-access journal that publishes articles focusing on information derived from human experimentation so as to optimize the communication between basic and clinical science. Available at: http://www.translational-medicine.com/

Journal of Medical Internet Research

One of the main scientific journals covering health issues and ICTs. Available at: http://www.jmir.org/

Directory of Open Access Journals

Directory of scientific and scholarly journals that meet high quality standards by using peer-review or editorial quality control and which are free, based on the definition of free access adopted at the Budapest Open Access Initiative (BOAI). The aim of the Directory of Open Access Journals (DOAJ) is "to increase the visibility and ease of use of open access scientific and scholarly journals, thereby promoting their increased use and impact." Available at: http://www.doaj.org

Red de Gobierno Electrónico de América Latina y el Caribe (Red GEALC) (Electronic Government Network of Latina America and the Caribbean)

The GEALC network gathers the authorities of eGovernment of the OAS member States. Available at: http://www.redgealc.net/

Instituto para la Conectividad de Las Américas (ICA) (Institute for Connectivity of the Americas)

The institute promotes the implementation of innovative uses of ICTs for development in the countries of the Region of the Americas. Available at: http://www.idrc.ca

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data or products presented in those sites, or guarantee of validity of the information included thereof. The only purpose of offering links to external sites is to provide information regarding the existence of further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not represent the opinions of PAHO/WHO.*

Successful Experiences

Ministerio ICT, Colombia

"The Ministry of ICT has the objectives of designing, formulating, adopting, and promoting policies, plans, programs, and projects of the ICT sector, in accordance with the Political Constitution and the law, with the purpose of contributing to the economic, social, and political development of the nation. Likewise, it should encourage the development and strengthening of the information and communications technologies sector, and promote research and innovation in competiveness and technological progress that is aligned with the national and international environment."[4] This successful experience is opening the way to eHealth, since eGovernment is regarded as a State policy and, therefore, health will be addressed among the most important agenda topics, along with education.

Mas Salud Jujuy, Argentina

This is an articulated health information systems model,[5] that allows the registry of information on health care management. It links all the information produced by providers, production data , and epidemiological data, thereby representing a key decision support system. It benefits patients who are assigned a number when they arrive at a health care facility and which will be recognized by the entire network, and, therefore, information needs to be entered only once, thus expediting all health care processes.

Red Nacional Internet (National Internet Network), State connectivity plan in Panama

The Panama government intends to offer free access to the Internet by means of WiFi connections in public areas, together with different programs for digital inclusion in the education, health, science and technology, commerce, and ICT sectors.[6] This policy is paving the way for eHealth, with digital inclusion of the whole country.

User Identification System, Hospital San Rafael de Alajuela, Costa Rica Social Security Funda

The information system is an initiative to make the most of hospital resources, with the aim of reducing non-payment for medical services rendered, and improving health care for all those covered by insurance. The system is based on a real time application connected to the General Directorate of Immigration. The telecommunications company, Radiográfica de Costa Rica (RACSA), initiated this system, with the participation of the Technical Secretary of Digital Government.

The system allows the Rights Validation Office and the platform of the hospital's Emergency Services to be connected in real time with the database of the General Directorate of Immigration, allowing immediate identification of migration status of people requesting the service. This system started to work in January 2012 and during the first month the hospital center received 63 million colones from collections and billing.[7]

Digital access for social inclusion: Plan CEIBAL, Uruguay[8]

This innovative plan, a pioneer in the world, intends to provide a portable computer to each child and teacher in public schools. Plan CEIBAL carries out training, support, evaluation, and follow-up, in order to promote education proposals and the creation of content through the public primary school system. It has been able not only to modernize educational processes but also to provide a social basis for meaningful and equitable digital inclusion. This project helped Uruguay to become a leader in the transformation of a country through the use of ICTs and is evidence that governments can foster the creation of content, and, as proposals for education have been created, so can proposals for health.

Digital Agenda 2011–2015 de Uruguay[9]

The eHealth initiative in Uruguay is operated through the "Salud.Uy" Program which, in turn, is developed according to an inter-institutional agreement between the Presidency of the Republic, the Ministry of Economy and Finance, the Ministry of Public Health, and the Agency for Electronic Government and the Information Society.[10] The Salud.uy Program is focused on strengthening the national health system, supporting the formation of the health care network through the use of ICTs, and creating the tools that contribute to improving citizen access to quality health services, all over the country. The main objectives of the agreement are to: define a unified and shared electronic clinical record; create and implement a national teleimaging system; create the national databank of electronic clinical records; and interconnect all health care facilities of the country, among others. As part of the Digital Agenda, Uruguay has made major improvements regarding privacy and protection of personal data and electronic signature.[11,12] Today, Uruguayan citizens enjoy improved participation and benefits by having access to the new technologies offered by the government in all sectors. Concerning health, the Salud.uy Program is achieving health as a right for all, eradicating the inequalities of the system and benefiting the whole population.

Conclusions

- eGovernment is important for eHealth because it promotes the establishment of interoperability and infrastructure standards, which allows alignment and sharing of networks, forming a unified information system. This facilitates improved access to information in real time and, therefore, better decision making, both in the health field as in others directly involved;

- eHealth, as a State policy, offers equity in the access to information, in the collaborative building of knowledge for the common good, and fosters decision making and management skills for eHealth projects. Likewise, it favors the development of bandwidth expansion for an entire country, and clear and strong legislation regarding data protection, electronic documents, and open data. eGovernment is one of the ways to foster more active participation of citizens in decisions and expression, thereby favoring democracy and governance;

- The health needs of the population are always changing. Therefore, eHealth is still health, but using ICT as a tool. ICTs are the best catalyst for resource efficiency in the public sector, offering society better attention to its health needs and improved health care;

- In the information age, eGovernment enables the development of spaces to collaborate and foster the creation of content on different topics, including health, through different institutions and methodologies.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations.

- Develop digital literacy programs aimed at civil servants to attain collective understanding of the usefulness of ICTs, thus leading the change in all sectors, including health;

- Create a total inclusion policy of the players in the health system, guaranteeing access to tools and procedures, and facilitating and acknowledging citizen contributions;

- Work in the development of interoperability standards which, apart from considering the health services, facilitate the integration of all existing government systems. For that purpose, it is necessary that the eGovernment propose these standards, as well as the necessary infrastructure;

- Promote and encourage the creation of knowledge that can be replicated through academic credits, and integrate university networks in all the cycles of content production. Disseminate the content through ICTs such as social networks, special portals, etc;

- Foster public-private partnerships, including with the academic sector, in order to innovate ICT and health projects which will help to expand the access of the whole population to health systems.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Strengthen the availability of, and encourage educational initiatives on eHealth and eGovernment;

- Foster communication initiatives between different countries of the region, so that they share their experiences with eHealth and collaborate regionally to implement plans, thereby advancing more quickly and making greater improvements regarding eHealth.

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ANNEXES

List of people and institutions

We gratefully acknowledge the collaboration of the following participants:

- Ariel Leonardo Fernández
- José Carlos Reyes Landaverde
- Miguel Ángel Domínguez
- Alejandro Mauro
- Olga Lucía Rodríguez Arévalo

Video interview with author(s)

eHealth Conversations: eGovernment

http://www.paho.org/ict4health/podcast/Entrevista-eGobierno.mp3

Available in Spanish only

Podcast: Recommendation on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/eGobierno.mp3

Available in Spanish only

Messages for Twitter on #eGovernment and #eHealth

#ICTs define a new type of citizen, who interacts, is informed, and participates in all the sectors, including the health sector.

Challenges of #eGovernment and #eHealth: Strengthen qualifications of human resources in the management of ICTs in health.

Challenges of #eGovernment and #eHealth: Improve technological infrastructure and increase investment of economic resources.

What #eGovernment and #eHealth: Digital literacy programs for civil servants.

What #eGovernment and #eHealth: Generate legislation for data protection, digital signature, and electronic documents.

#eGovernment can support the development of ICT initiatives and the creation of digital content.

Relationship between #eGovernment and #eHealth: ICTs are a catalyst of efficiency in the public sector. They should be used in health.

Relationship between #eGovernment and #eHealth: Governments can use ICTs to improve access to health in the Americas.

#eGovernment and #eHealth: By bringing forces together and with a good strategy, health can become a right for all.

#eGovernment and #eHealth: are the way toward improving the access to health in the Americas.

Tweetchat of #hcsmla on the "Relationship between eGovernment and eHealth" available at:

http://www.hcsmla.com/wp-content/uploads/2013/06/hcsmla-65.pdf

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A veterinarian specializing in eHealth, in 2010, she founded #hcsmla, the Latin American Chapter of the Healthcare Social Media virtual community, a space for the discussion on health and social media issues. At present, she is working in NimbusMD, an initiative which offers solutions using new technologies in the health sector. She also is the organizer of Quantified Self Bogotá. She worked in clinical research in an oncology center as head of the Research Department; she also carried out research in the pharmaceutical industry.

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Born in Uruguay, he is a computer engineer and has a master's degree in direction and management of health services. He is the national coordinator of Electronic Clinical Records in the Salud.uy Program of Uruguay. He managed the Health Project of the Banco de Previsión Social del Uruguay, Prestaciones de Salud, and he was a representative of the Institute of Social Security Social for the Uruguayan Society of Standardization, Exchange, and Integration of Health Services Data and Information. He coordinated the implementation of the National System for Labor Certification.

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Born in Colombia, he is a physician and surgeon, with a master's degree in administration and general direction, and is candidate for a master's degree in telemedicine at the Universitat Oberta de Catalunya. He is member of the Health Node of the Innovation Sub-system, Colombian Ministry of Information and Communication Technologies and the Colombian Association of Health Informatics. He was Director of the School of Medicine in Cali and consultant for the Ministry of Social Protection in the area of Health Services Quality.

Néstor Gustavo Tejera

Born in Uruguay, he has worked in the development of bioinformatics systems since 1986. He created the InfoMed Series which required parameterization to align interests of different medical specialties and styles of accounting management. In 1999 he became a consultant in intelligent interoperability. He created and implemented the KW Foundation to enhance the services of knowledge sharing on standards.

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General Disclaimer

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Management

The Application of ICTs in Health Management Processes

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SUMMARY

The rising costs of health care have had a big impact on national budgets, and many health systems have suffered declines in funding. One way to meet these challenges is to improve the efficiency and quality of health care. Health systems can use information and communications technologies to manage resources more effectively and efficiently, while obtaining the necessary information to improve the quality of care and access to services.

This publication, "eHealth Conversations," by the Pan American Health Organization, provides strategic information for decision makers on the use of information and communications technology (ICT) for health in the Region of the Americas. The publication details the characteristics, conditions, and applicability of management models in the Region, where computerization of health systems is expected to undergo fast growth. It identifies and describes successful efforts, and discusses the basis for management models.

A group of experts who discussed the technologies concluded that if citizen registration systems are interconnected, health professionals can make accurate diagnoses and ensure more efficient treatment, minimizing the problems of duplication of tests, overlapping medications, and other secondary effects. The experts asserted that when health services, both public and private, can count on having these records in electronic form, they can design, implement, and measure outcomes of health policy and specific health campaigns, thereby increasing efficiency and patient care.

The experts recommend that national institutions should take a series of measures, including adopting a management model for administration, and defining clinical and administrative standards involved in transactions. They also suggest adopting and adapting information systems to function in real time, using electronic media and seeking alternatives for cases with lack of connectivity. Technologies in health management can strengthen accountability, and plans should continue to promote connectivity in schools and health systems.

INTRODUCTION

The World Health Organization (WHO) defines eHealth as the use of information and communications technologies (ICTs) in the health sector. ICTs provide considerable benefits not only regarding health goals but also in providing evidence of achievements and their cost. ICTs also provide the means to get the correct information to the correct place and to the correct person, using secure electronic media, in order to optimize the quality and the efficiency of health care, research, education, and knowledge.[1]

The added value that health administration can offer to beneficiaries is good management of allocated resources, and this requires information. In general, health information systems would have to be aligned with beneficiaries' needs and with modern concepts of management. On the other hand, the comprehensive incorporation of ICTs to the management of public or private health administrations represents an advance toward transparency and universal access to health.

In a wider sense, eHealth should provide the "continuum" of clinical information from the patient to the networks of health care providers. This improves the flow of information by electronic means to support the delivery of medical services and people-oriented administration of health systems, thus facilitating equity in the access to health systems.

This conversation explores some current management models in order to identify the tools that can be used to improve health management using ICTs. To that end, four discussion areas were suggested: a) basic management assumptions, b) priorities in the Region, c) components of a management model, and d) implementation strategies.

MATERIALS AND METHODS

The chapter was elaborated based on individual research, development of surveys, and, particularly, the input from network conversations within the framework of the eHealth Conversations organized by PAHO/ WHO. Each conversation was led by a coordinator responsible for moderating the process, generating open debates on issues raised by him/her and the participants, suggesting work assignments, and compiling the discussions. Some authors submitted documents for the discussion on different topics.

This conversation used the virtual campus offered by the Hospital Italiano of Buenos Aires (HIBA), which has the following working tools:

- General discussion forum: to actively carry out the exchange of ideas on different topics to be addressed according to the conversation assignment. Each message posted in the forum sends an e-mail to the participants.
- Wiki: this site enables the joint creation of the document.
- Resource library: this site is devoted to sharing support documents on which opinions and/or thoughts will be based. This section includes articles of journals, chapters of manuals and books, or full texts.

The conversation was complemented by the publication of a series of tweets with the hashtag #ehealthtalks, through PAHO's Twitter account on eHealth (@ ehealthpaho). Each conversation lasted eight weeks and, based on the issues addressed, a document was prepared including the main recommendations resulting from the exchange of ideas and experiences. The conversation on Management was attended by 108 participants coming from Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Guatemala, Italy, Mexico, Peru, Spain, United States, and Uruguay.

STRATEGIC INFORMATION

Basic Assumptions

These assumptions emerged after analyzing administration management of several health services where information on health care transactions is processed by offices with interconnected databases, hereinafter known as transaction management.

- eHealth management platforms are, basically, networks interconnected to the financing entity or administrator;
- Basic data on health care transactions are captured in real time, at the time and place of service, validating the transaction against centralized databases;
- The clinical record of the patient can be accessed from these centralized databases, which contains the minimum required information for management;
- The on-line management model of health service validation proves to be the most effective in the use of resources to produce information that is reliable and verifiable;
- Health care providing organizations, as any service organization, should use operational information for management;
- It is necessary to measure health care processes in order to improve results.

This conversation was mainly focused on the analysis of transaction-based management systems, taking into account that, in the Internet era, health care transaction management has developed over the years, nourished by ICTs.

For several decades, these management systems have developed in parts of Western Europe, based on very significant technological infrastructure. France, for example, implemented an intelligent card with localized transactions. In the Region of the Americas, the United States is currently regulating the 5010 transaction standard of the Health Insurance Portability and Accountability Act (HIPAA). Likewise, its pharmaceutical system works with prescriptions regulated by the standard of the National Council for Prescription Drug Programs (NCPDP).

On the other hand and for 20 years now, the Argentine Republic has progressively used this model in the public sector, in provincial and national social security, and in the private sector of health. Other countries of the Region are already operating with real time validation systems for health care transactions, such as Chile, Brazil, Colombia, Costa Rica, Mexico, and Caribbean countries like Jamaica, the British Virgin Islands, and Belize.

In general, there is little information about the health administration model in the countries, despite the support given by multilateral organizations to developing its management.

Priorities in the Region

At present, the increasing costs of health care are translated into inadequate budgets and, in the last decades, a de-financing of health systems has been observed. During the conversation, some priorities were identified which should be considered when designing and implementing a health management system, taking into account that they depend on the analysis of administrations, as well as on the technical and economic capacities of their facilities and human resources.

When choosing the implementation models developed in this document, namely: "top-down", "bottom-up", or "middle-out", and paying attention to difficulties in implementation, it is particularly important to recognize priorities. One priority is to increase health care efficiency and quality. In order to attain this goal, health administrations should guide their actions toward the efficient and effective administration of allotted resources and, at the same time, obtain the minimum required information to improve the quality of care and access to services.

Another priority is to establish a technological architecture design to support the management model. This design should be oriented toward establishing a network of providers with a normalized population database, a minimum basic data set (MBDS), [2] and socio-health data integrated to service delivery data from different members of the network, regardless of their level of complexity, thus allowing for an adequate use of resources.

Components of a Management Model

The following are the priority components to be taken into account in the application of ICTs to health management.

Univocal identification of patients

Apart from being essential for management, unique and univocal identification of each patient is an individual right. This issue, however, has not been resolved in most countries of the Region of the Americas. In order to attain it, citizen registration systems would have to be interconnected. In this way, health professionals could establish an accurate diagnosis and the most effective treatment. Besides, issues such as test duplication and drug overlapping would be reduced, as well as other secondary effects related to drug administration which may bias a diagnosis. By having the set of these records, both private and public health care administrations could design, apply, and measure the results of health policies and specific health campaigns.

The information that reaches the unique patient record should have the following characteristics to achieve greater and more efficient data capture:

Capture at the time and place: it is necessary to electronically capture the information at the time and place it is produced, preventing the need for transcription and manual upload. Information should be captured by a health care worker when the patient comes to the institution. That information would be even more reliable if validated against master databases (e.g., beneficiaries, providers, service delivery, medications). It is at this point where connectivity could provide support to the methods according to their objective, considering the human and technological resources available.

Available information: patient information, coverage, medical history or clinical record with basic information on patient visits, should all be available at every site of the health network. In this way, the professional responsible for the patient will have, under any circumstances and from any site in the network, a set of quality transaction data that will enable him/her to make decisions. This set of data also enables referral and counter-referral of patients requiring more complex medical attention. Ultimately these data are returned to their place of origin with a reference to procedures, treatments, prescribed medication, etc.

Qualified staff: The patient admission area should be staffed with personnel trained to capture the necessary data in order to enter patient information into the database, or to update it.

Manual vs. On-line Processes

When planning health systems, we generally think of manual processes based on forms. The logistics for the distribution of these forms is designed, and they are then consolidated and transcribed into informatics systems for further processing.

By definition, every manual process that uses forms generates incomplete, many times late, and often unreliable information. Only the validation of a transaction in real time against central databases, at the time and place of service, guarantees authentic and reliable information.

Thanks to the convenience offered by technology, it is possible to plan the on-line capture of transactions, e.g., through electronic forms, from the beginning. Nevertheless, documents signed by patients, such as the informed consent, represent a challenge, since the electronic signature is not yet regulated in most countries of the Region.

On the other hand, it is important to consider the major organizational change implied by the incorporation of ICTs in the health field, especially regarding health professionals. This new culture is not attained overnight; the replacement of paper forms by on-line access should be progressive, gradual, and accompanied by digital literacy both of health professionals and the general population.

Management Accountability

As mentioned above, WHO defines eHealth as the use of information and communications technologies (ICTs) in health[1] eHealth improves the flow of information, through electronic means, to support health care and to manage health systems. ICTs offer important benefits not only in achieving health goals but also in providing evidence of these achievements and related cost.

The issue of management in administration and accountability is an essential part of eHealth, and illustrates the key role that research and development initiatives in the informatics and medical community of the Region should have. Likewise, it shows the need to reformulate priorities and define the best implementation strategies for each administration, according to its ICT infrastructure, human, and financial resources.

The Scientific Council of the Latin American Center for Development Administration (CLAD) refers to institutional measures to demand accountability in public management. The political scientist Guillermo O'Donnell defines the following terms:

"Horizontal accountability, refers to the existence of state agencies with the legal authority and that are factually willing and able, to undertake oversight actions.

“Vertical social accountability, refers to the control mechanisms of political authorities resting on the actions of a multiple set of citizen associations, social movements, and communications media; this action is aimed at showcasing governmental errors, bringing new management to the public agenda, or activating the functioning of horizontal agencies.” [4]

One of the priorities in health systems is accountability so that public or private health administrations can account for the use of the resources they administer; this includes not only knowing how much money is spent but also how it is spent.

Expenditure Control

During the conversation, the following question was raised: What public and private controls should be available to guarantee both transparency and confidentiality of health information?

Integrating information in a unique patient record is essential to define questions such as the financing of the health network, health care protocols, and priorities in the use of resources. It is desirable to adopt management models that foster productivity, quality, and processes that can be audited. It is also necessary to have objective measurements based on reliable data coming from the operational information retrieved from transaction databases. One of the examples is the measurement of productivity and efficiency that can be performed when validating all transactions, processing the operational information of this database.

Training of Human Resources

During the implementation of a management model based on the use of ICTs, it is necessary to emphasize the training of all personnel involved in the management process. This includes the elaboration of definitions and shared standards, and the development of a sense of accountability in management. In this way, better interaction between players can occur, supported by technological interconnection provided by the infrastructure.

Measurement

Measuring the performance of all system players, based on operative data, results in improvement and change. For that purpose, reliable operative data should be obtained from transactions or services delivered. ICTs provide a key support in achieving the objectivity of data to be measured, as long as the minimum transaction data required for assessment are properly identified.

Incentives

At present, most incentive systems that are used are oriented toward documentation and reward, particularly for the services provided rather than for improved health status and patient satisfaction. Implementing a measurement or assessment system that focuses on the quality of the service and its relationship with the incentive system would imply substantial improvement and change in the health system, with a direct and positive impact on access to services.

Efficiency and Quality in Health Management

To guarantee social well-being and health and, especially, to improve the quality of life of the population, the health system should elaborate strategic plans with the objectives of effective and efficient administration and high-quality health care, using ICTs.[5]

WHO states that quality medical care requires a high level of professional excellence, an efficient use of resources, and a high degree of satisfaction for the patient, apart from achieving final outcomes that improve health.[6]

Efficiency is an extremely important condition in the administration of healthcare services, since it is necessary to take into account that resources are limited and getting the best results from them guarantees that services can be improved either in the public or private sector.

Efficiency is an extremely important condition in the administration of health care services, and getting the best results from limited resources ensures improved services whether in the public or private sector.

Today, a health model that attains efficiency and quality is required to improve processes or to obtain "continual improvement." "In order to improve processes it is necessary to measure; if we don´t measure we cannot progress." This statement implies, then, that results-based management and ICTs applied to health represent the tool for quantification and measurement (physical goals; outcome goals; and indicators for processes, management, results, productivity, impact, etc.). Undoubtedly, this implies a major challenge for the agents for change in eHealth.

Murray and Frenk [7] conclude that efficiency is closely related to the performance of a health system and that this performance should be evaluated on the basis of objectives. Likewise, they believe that efficiency is the degree to which objectives are attained by a system, using available resources. Efficiency includes expenses and costs related to the efficacy or effectiveness attained. The three concepts are linked, since efficiency is not possible without effectiveness and, in turn, it is meaningless without efficacy.

A health system is considered efficient when it can provide a satisfactory health product for society, using minimum resources. Attaining health efficiency also means attaining the best results with available resources. Therefore, when certain results are pursued, the most efficient ways to accomplish them should be clear, as well as the technical processes used to efficiently attain them.

Standardization and Interoperability

The application of ICTs to the health field has favored the spread of information systems developed according to users' needs rather than to the needs of the organization as a whole. Today, the same health organization can have different automated information systems used for the same tasks, resulting in varied platforms and data semantics. This also has the effect of data being forwarded in a disorganized fashion to centralized health management.

The development of automated solutions in isolation, as well as the current need for sharing data with other systems of the organization (financial, administrative, etc.), show the compelling need for solutions that treat health data as a whole and, in turn, take advantage of what has already been developed.

In its eHealth Strategy and Plan of Action, PAHO/WHO defines interoperability as "the communication between different technologies and software applications for the efficient, accurate, and sound sharing and use of data. This requires the use of standards, that is, rules, regulations, guidelines, or definitions with technical specifications to make the integrated management of health systems viable at all levels."[3] The resolution of the standardization and interoperability issue in the health sector includes two major factors for success:

Management of change in human resources participating in eHealth: It is necessary to change the way automated solutions are designed and developed in the organization so that health data are integrated with patient identification data, insurance and financial data, etc., based on a unified health model..

Definition of ICT architecture and semantic definition of data: ICTs have rapidly evolved and they currently offer a wide range of solutions which, applied to the health field, would allow the effective and timely promotion of health. Likewise, they allow for health management to be based on real time data, and integrated with other systems, facilitating more accurate health projections.

The interoperability component in eHealth requires an ICT architecture that enables automated information systems from different platforms to share data, and that can be viewed as a single information system, and also, that changes made in one system do not affect other systems.

One example is the Service-Oriented Architecture (SOA), a concept of software architecture that defines the use of services to provide support to the requirements of the establishment. It provides flexibility and scalability, since it can be implemented either with commercial or open-source software. The SOA also enables the creation of highly scalable information systems which reflect the business of the organization. It provides a well-defined way to make available (or expose) services, and to invoke (or interface) services (in general, although not exclusively Web services), which facilitates the interaction between different systems, whether of the owner or of third-party systems. In order to achieve standardization and interoperability, it is necessary to consider and take advantage of what is already working and homogenize the semantics of health data.

Implementation Strategies (see Annex D)

Up until 2000, solutions related to the use of ICTs in the health field were the result of administrative and organizational needs that arose at the points of service provision. Since the last decade, many developed countries put forward solutions at the national or regional level, framed in projects to build integral solutions for their needs.

These projects seek to make improvements in areas such as: coordination and continuity of care, improvement in the use of medications, and efficient management of transfer and counter-transfer between primary care and specialized care. Similarly, there are possible efficiencies which include the reduction of duplicated services and the collection of timely and better quality information for decision making. These projects gave rise to important organizational and workflow changes, which posed a huge challenge.

In order to attain integration of health information systems at the national scale, the gap that separates the traditional scheme and the new model should be resolved. This demands cultural, economic, technical, and political changes to achieve the goal, and which includes the following stages: [8]

Stage 1: Establishment and recognition of ICTs by professionals

Stage 2: Official reports and political awareness ("white papers")

Stage 3: Support of actions to coordinate autonomous projects

Stage 4: Regional and national strategic plan

Stage 5: Government acceleration plan

These five stages require long periods of governmental organization, strategic planning, and political decisions.

Two approaches have been described for implementing these strategies: top-down and bottom-up; to these, a third one is added, the " middle-out," proposed by Coiera. [9]

The top-down approach follows a hierarchical administrative in deciding on the priority of plans and actions, and considers that centralized management of actions and priorities will be more effective in attaining goals, as well as doing it more efficiently.

The bottom-up approach focuses on generating the conditions in the market and defining the laws, rules, and regulations so that the work of different agents proposes and implements solutions that are later evaluated and promoted for mass implementation This model prioritizes the innovation capacity of organizations where rules are clear, the environment is collaborative, and the market/State later rewards the solutions that can best improve the quality or the efficiency of the health system.

Both the top-down and the bottom-up approaches are information processing strategies that began as application methods in software development science, and by extension, were later applied to social and other sciences.

The middle-out approach seeks to join health professionals, ICT providers, and the government in the same scenario, through the creation of common technical goals, the development of standards, including support for their implementation. This approach recognizes that professionals and governments have different goals and resources, but places administration more in the position of promoter than regulator, seeking the development and adoption of ICTs.

Up to this moment, there is no conclusive evidence of the best strategy, since these are long-term projects that are highly dependent on the context where they are developed.

Advances in technology and the emergence of Web services have added new tools to attain goals. The service-oriented approach allows each service to keep their interfaces and, through services defined in the "middle," local information can be handled, respecting the data models and logic of common business, and subsequently enabling adequate interoperability and information systems that are integrated and of high quality.

Transaction Management Model (see Annex C)

Based on fundamental premises of management systems in eHealth, this model analyzes the relationships between different players: the administrator, the provider, the beneficiary, and the patient.

- **Administrator:** administrates and finances
- **Provider:** provides the health service
- **Beneficiaries:** population covered by the health system
- **Patient:** when a beneficiary intersects with the benefits network to ask for a service
- **Transaction:** each contact of the beneficiary with the benefits network

Every time a beneficiary accesses the health system to ask for a service, a contact and a transaction occur. When validating the transaction, the minimal required data for this transaction are captured, allowing efficient administrative management of health.

Through ICTs, different processes are automated, such as:

- User identification
- Transaction validation
- Capture of basic transaction data

- Integration with the electronic medical record
- Inclusion of additional benefits
- Electronic drug prescription

The model includes a transaction database containing operative information of the health system and its network. The latter should be fully contained in the MBDS which regulates the national health system.

Profile of Specialists *1

Karl Theodore

He is Director of the Centre for Health Economics at the University of the West Indies, and Professor of Economics at the St. Augustine Campus, where he has taught health economics and supervised research in this area. He has authored many publications and has led a multidisciplinary team of professionals in producing a number of technical reports for governments and international agencies. He is now responsible for training economists in areas aimed at strengthening the health systems throughout the Caribbean.

Roberto Raggi

He is a physician specializing in public health and works as an advisor on health informatics, health information systems, health economics, feasibility studies and business plans for health structures and services, audit programs, and creation and assessment of primary health care and hospital care. He also specializes strategic development for health care providers and pharmaceutical companies. He has provided technical assistance in public health planning in Africa and Asia.

Mariano Soratti

He is an electronic engineer specializing in information systems engineering. He is also an Oracle Certified Professional Project Administrator. He has received training in and has a vocation for public administration; he has 20 years of experience in the health sector, led the National System of Information for Procurement and Transplantation project of the Argentine Republic, and leads the DONASUR projects Mercosur Donation and Transplantation Registry and the Integrated Health Information System of Argentina, Ministry of Health, Argentina.

PAHO Specialists

The Pan American Health Organization has specialists on this field within the Region of the Americas. In order to get in touch with any of them, please send an e-mail to ehealth@paho.org.

*1 *The list of specialists published here is the result of recommendations made during the virtual discussions and does not represent sponsorship by PAHO/WHO. PAHO/WHO gives no guarantee or representation as to the accuracy, completeness, or authenticity of the information published herein and reserves the right to change, restrict, or discontinue any part of that information at its discretion. PAHO/WHO assumes no liability for damages derived from the use of this information..*

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Web Sites *2

Health Level Seven International

Founded in 1987, Health Level Seven International (HL7) is a non-profit organization accredited to develop ANSI standards and devoted to provide an integral framework and standards related to the sharing, integration, distribution and retrieval of electronic information in health that supports clinical practice and administration, provision and evaluation of medical services. Its 2,300 members include around 500 corporate members which represent more than 90% of health information systems retailers.
Available at: http://www.hl7.org/

e-Infrastructure Reflection Group (e-IRG)

It is a European initiative to create a technical, political and administrative framework to share and reuse electronic resources within the EU.
Available at: http://www.hl7.org/http://www.e-irg.eu/

Colombia

This text compiles a set of laws and norms generated in Colombia, aimed at promoting ICT use in the government sector. The annex for consultation is available at:
http://www.managementensalud.com.ar/OPS_TomasSandor/eSalud_en_Colombia.docx
The *Nodo de Innovación de Salud* is formed by public entities, the academy, centers for technological development, centers of excellence, and companies of the private sector. This space will foster the creation of products, services, and solutions for sectors, in order to minimize and contribute to closing the health inequities gap, based on the use and ownership of ICTs within the framework of the *Estrategia de Gobierno en Línea* (GEL) (On-line Government Strategy), with the aim of building a more efficient, transparent, and participative State, improving the current health model.

Argentina SISA

The *Sistema Integrado de Información Sanitaria Argentino* (SISA) (Argentine Integrated System of Health Information) contains the federal records of providers, professionals and pharmacies; the record of the MSBD, ongoing research, heart diseases, of national programs such as *Remediar* and *Redes*, etc., and, under development, the citizen record.
Available at: https://sisa.msal.gov.ar/sisa/

There are Provincial Administrations of Health Insurance such as APROSS and IPS, in Misiones, that are autonomous entities financially independent. Their function is to organize and administrate a system of medical care insurance for the population of the provinces of Córdoba and Misiones, in order to provide health care to the population through medical attention coverage with the community-oriented support of all its affiliates.

Costa Rica

The *Caja Costarricense del Seguro Social* (CCSS) (Costa Rican Department of Social Insurance) and the Legislative Assembly (2012) have issued a report: Reconstitution of the Costa Rican social pact with social security, in order to consolidate the national system of health information. Annex F is available at: http://www.managementensalud.com.ar/OPS_TomasSandor/BEA_CCSS_cs.pdf

The SICERE *Ventana Virtual* (Virtual Window) was implemented, where members of the social security fund can make consultations and registration.

*2 *Hyperlinks to web sites external to PAHO/WHO do not imply endorsement by PAHO/WHO of opinions, ideas, data, or products presented in those sites, or guarantee the validity of the information included thereof. The only purpose of offering links to external sites is to provide further information on related topics. The ultimate responsibility for the opinions expressed herein lies with those providing information and do not necessarily represent the opinions of PAHO/WHO.*

Successful Experiences

Univocal Identification of Patients: Jujuy, Argentina

http://www.msaludjujuy.gov.ar:8082/

The public health system of Jujuy, Argentina, is carrying out a program in the network of hospital providers and primary care centers which implements the unique record per patient and the use of the identity card as the only admission record. The networks of providers where this experience is being carried out are interconnected, with centralized databases, complying with the patient's MBDS and its service delivery records, a subset of the electronic clinical record.

Univocal Identification of Patients: Individual Record of Health Benefits in Colombia

http://www.ripscolombia.com/

The aim of the eHealth strategy is to foster the use and adoption of ICTs in all the processes of the health sector in order to contribute to the goals of the health system, by means of a standardized and systematic exchange of data, information, and intra- and trans-sectoral knowledge, within the framework of the ICT National Plan, for which connectivity infrastructure is essential.

Standardization of (clinical and administrative) data is essential for its later validation, with a "unique record per patient" through the Individual Record of Health Services Delivered (*Registro Individual de Prestaciones de Salud*, RIPS). The management model of on-line validation of services delivered is still being developed, to capture the information at the time and place of service.

Univocal Identification of Patients: Hospital de Alajuela, Costa Rica

http://www.hospitalsanrafael.sa.cr/

The information system of the Hospital de Alajuela is an initiative to make the most of resources with the aim of, on the one hand, reducing payment evasion for medical services rendered and, on the other, improving the health care for all those covered by insurance. The system would be based on a real time application linked to the General Directorate of Migration.

Radiográfica de Costa Rica (RACSA) initiated this system, with the participation of the Technical Secretariat of Digital Government, which allows the Rights Validation Office and the platform for emergency services of the hospital to be connected in real time with the database of the General Directorate of Migration, allowing immediate identification of migration status of the people requesting the service.

Management of Change to On-line Processes: "*Vive Digital*" Plan, Colombia

http://www.colombiadigital.net/opinion/columnistas/rafael-orduz/item/458-plan-vive-digital-colombia-ii.html

The ICT Ministry of Colombia is responsible for establishing connectivity and guaranteeing the necessary infrastructure to carry out on-line processes, taking into account the geographic and institutional diversity in the country. The "Vive Digital" Plan of the ICT Ministry develops the *Gobierno en Línea*, GEL (On-Line Government) strategy, with a view to facilitating the efficiency and collaboration in and between State entities, as well as in the population in general, promoting, in addition, citizen participation through electronic means. The health field is one of the core concepts of the ICT National Plan, where transaction validation in real time against central databases is being strengthened. This is accomplished through the articulation of components of the Integrated Social Protection Information System (SISPRO) in order to guarantee reliable information in sectoral decision making.

Transaction System: Provincial Health Institute, Misiones, Argentina

http://www.primeraedicionweb.com.ar/nota/impreso/36178/el-ips-tendra-mayor-control-de-las-prestaciones-diarias-a-sus-afiliados.html

The Provincial Health Institute in the province of Misiones, connected, during its first year, more than 1,000 providers, with different technologies (Internet, POS, IVR, and integration with management software of health facilities). It is worth mentioning that the province of Misiones is located in the Argentine Northeast, and borders Brazil and Paraguay. It is characterized by its geographical, cultural, and infrastructure diversity, with several communications alternatives in the cities. However, in remote areas only telephone access is available, and that is frequently of low quality.

Transaction System: *Administración Provincial de Seguro de Salud*, Córdoba, Argentina

http://www.apross.gov.ar/

http://archivo.lavoz.com.ar/08/09/15/secciones/sociedad/nota.asp?nota_id=240145

The *Administración Provincial de Seguro de Salud* (APROSS) (Provincial Health Insurance Administration) in the province of Córdoba, was able to connect, during the first year, 5,000 providers and currently provides on-line validation to more than 10,000 providers. These achievements are due to the joint efforts of the people performing the tasks and the political will on behalf of social services. Without such collaboration results will always be incomplete.

In the above-mentioned cases, health providers correspond to all the disciplines and include health services and benefits related to social services: outpatient services, diagnostic studies, treatment, dentistry, hospitalization, medication, special health plans, funeral services, etc. Having accurate, timely and complete information about the population allows administrators to allocate resources more efficiently, design health campaigns, track their application, and observe the results, particularly those that can be measured in the short- and medium-term.

Interoperability: Costa Rica

The Costa Rica Social Security Fund (CCSS) developed the *Sistema Centralizado de Recaudación* (SICERE Project) (a centralized collection system), consisting of a unique, automated system in the country to invoice, collect, and distribute workers' and employers' quotas, both to health regimes and to mandatory and supplementary pension regimes.

One of the SICERE communications requirements was the on-line transaction capacity with 79 branches of the CCSS in the entire national territory, and also, the functionality of collection with different banks of the country and other private collection entities. The branches of the CCSS used the same centralized system in a web environment; the problem was to achieve interoperability with external collection agents (banks, cooperatives, and others), since each had its own platform. It was decided that their own SOA server would be built and, in parallel, the messenger standard that would be used for bidirectional transfer of data for bill payment was established jointly with external agents. In 2001, interoperability was successfully started and the same scheme is still in use, with the addition of more external collectors. This experience allowed the CCSS to continue applying the SOA for interoperability in the health systems.

Conclusions

- For public or private health administrations, it is possible to use a successful management model by defining the standards intervening in transactions and generating data interoperability to facilitate the access of all players in the health system.
- Any public or private health organization can only provide services based on existing resources. The added value that a health administration can offer is good administration of those resources by using ICTs.
- One of the priorities of the health systems is accountability so that public or private administrations can answer for how the resources they are administering are used, which includes not only knowing how much is spent but also how the resources are used.
- State agencies play a strategic role in horizontal accountability, establishing monitoring and control management actions within health areas, including citizen participation in social control in the case of unfulfilled demands that trigger strategies for improvement.
- In order to achieve eHealth standardization and interoperability, it is necessary to take advantage of what is already in place and make the semantics of health data conform. The architecture should be flexible and scalable where no limitations exist and the cost of implementation is low.
- Cost-benefit or cost-effectiveness analyses show that, in the public sector, ICT initiatives in health reduce costs and optimize functions and processes.

Recommendations

Recommendations to provide direction to national institutions (governments, universities, NGOs, the private sector) and international organizations

- Adopt a management model for one's own administration, defining the clinical and administrative standards that influence transactions;
- Adopt and adapt information systems to operate in real time, using electronic means and look for alternatives in cases lacking connectivity;
- Promote the use of ICTs in health management and strengthen management responsibility or accountability as added value;
- Plan ICT-based management to promote connectivity in health facilities.

Recommendations to provide orientation to PAHO/WHO and its eHealth strategy

- Publicize successful cases of ICT application in health management processes and models to facilitate the exchange of experiences in the Region;
- Promote models applying ICT in their implementation and development, which can be adapted in the Region.

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ANNEXES

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Video interview with the author(s)

eHealth Conversations: Management

http://www.paho.org/ict4health/podcast/Entrevista-Gestion.mp3

Available in Spanish only

Podcast: Recommendations on eHealth presented in digital audio

http://www.paho.org/ict4health/podcast/Gestion.mp3

Available in Spanish only

Messages for Twitter on the use of ICTs in health management

The WHO defines #eHealth as the use of information and communications technologies for health management.

Health systems can use ICTs to focus their actions on the effective and efficient administration of resources.

Health systems can use ICTs to gather the necessary information to improve the access to quality health services.

#ICTs provide important benefits not only to achieve health goals but also to show what was achieved and at what cost.

The incorporation of #ICTs in management of health administration represents an advance toward transparency and universal access to health.

#eHealth provides patient clinical information to providers' networks, improving the flow of information using electronic means.

#eHealth supports the delivery of medical services and people-oriented administration of health systems.

eHealth facilitates equity in access to health systems.

The unique identification of each patient is essential for management and is a right that is still unresolved in a large part of the Region.

If citizen registration systems are interconnected, accurate diagnosis and more efficient treatment can be established.

ICTs can strengthen the responsibility of health management, which should promote connectivity in health facilities and systems.

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General Disclaimer

This publication was developed by the Knowledge Management, Bioethics and Research Department of the Pan American Health Organization (PAHO/WHO), within the framework of the activities of the project "eHealth Conversations: Using Information Management, Dialogue, and Knowledge Exchange to Move Toward Universal Access to Health." The information and opinions expressed in this publication are the exclusive responsibility of the authors and may not represent the opinions of PAHO/WHO.

Conceptual Model

Conceptual Model of eHealth of the Pan American Health Organization

BACKGROUND

The Pan American Health Organization (PAHO/WHO) Resolution on the eHealth Strategy and Plan of Action (2012-2017) was approved by the health authorities of PAHO Member States during the 51st Board of Directors held in September 2011.

This strategy is aimed at improving the access to health services and their quality in Latin America and the Caribbean through the use of information and communications technologies (ICTs), training in digital literacy and ICTs, the access to information based on scientific evidence and continuing education, and the implementation of different methods that foster progress toward more informed, equitable, competitive, and democratic societies.

Within this context, the PAHO/WHO eHealth Strategy and Plan of Action has four major objectives:

1. Support and promote the formulation, execution, and evaluation of effective, integrated, and sustainable policies on the use and implementation of information and communications technologies in the health sector.

2. Improve public health through the use of tools and methodologies based on innovative information and communications technologies.

3. Foster and encourage horizontal collaboration between the countries for the development of a Digital Agenda for Health in the Region.

4. Promote knowledge management and digital literacy and training in information and communications technologies as key elements for health care quality, health promotion, and disease prevention, guaranteeing training and better access to information in an equitable manner.

Components of the eHealth Strategy and Plan of Action

In order to achieve the abovementioned objectives, the Strategy focuses on the following eHealth components:

Component	Description
Electronic medical record (or electronic clinical history)	Electronic record containing health information of each patient that can support health professionals in decision making and treatment.
Telehealth (including telemedicine)	Delivery of health services using information and communications technologies, especially in places where distance is an obstacle for receiving health care.
mHealth (or health by mobile devices)	Practice of medicine and public health with the support of mobile devices such as mobile phones, patient monitoring devices, and other wireless devices.
eLearning (including distance training or education)	Application of information and communications technologies to learning. It may be used to improve quality of education, improve access to education, and create new and innovative forms of education for a larger number of people.
Continuing education in ICTs	Development of professional courses or programs on health (not necessarily formally accredited) to facilitate abilities in information and communications technologies to be applied in health. This includes current methods for the exchange of scientific knowledge such as electronic publication, open access, digital literacy, and the use of social networks.
Standardization and interoperability	Communication between different software technologies and applications for the effective, precise, and sound exchange and use of data. It requires the use of standards, i.e., norms, regulations, guidelines, or definitions with technical specifications to ensure the integrated management of health systems at every level

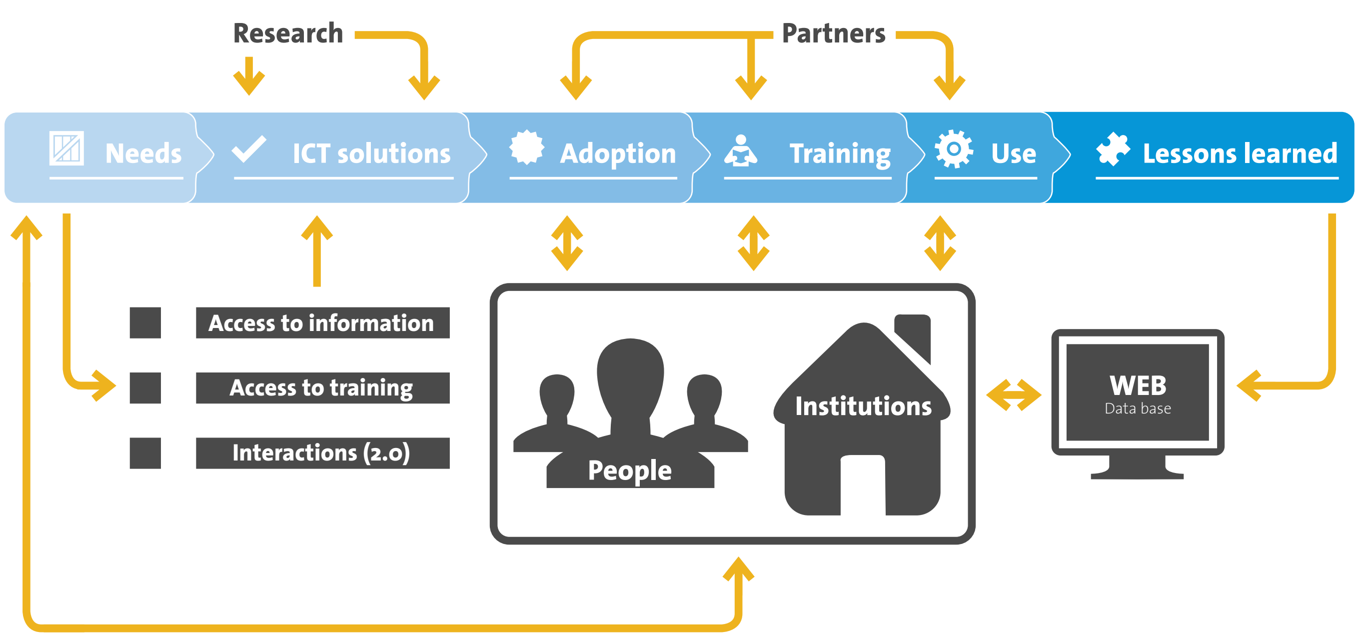
Conceptual Model

The PAHO/WHO eHealth conceptual model is based on three components: (1) access to information; (2) access to educational material; and (3) interaction management within the context of the Web 2.0 which includes the patient-physician relationship and all the aspects related to telemedicine and telehealth.

The PAHO/WHO eHealth conceptual model focuses on:

- Obtaining a political and strategic commitment from the countries of the Region of the Americas;
- Building reliability and acceptance;
- Providing legal and ethical clarity as well as promoting the protection of personal clinical data;
- Working in the development of issues related to interoperability;
- Linking eHealth policies to competence, innovation, and research policies, as well as to social cohesion and inclusion policies.

The chart below depicts the conceptual model of the PAHO/WHO Strategy and Plan of Action.



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