Sector Report e-Health

Mexico

The Embassy of the Kingdom of the Netherlands
Introduction

The objective of this report is to inform the Dutch e-Health industry about opportunities in Mexico.

Healthcare in Mexico is provided by the public and the private sector, both occupying nearly an equivalent share. The public sector consists of several institutions, such as: the Mexican Social Security Institute (IMSS); the Government Workers’ Social Security and Services Institute (ISSSTE); the Mexican State-owned petroleum company (PEMEX); the Ministry of National Defence (SEDENA) and the Ministry of the Navy (SEMAR). These institutions cover the formal sector (firms, public services and government), retirees and their families. Inclusively, to ensure healthcare for the uninsured, institutions such as State Health Services, SESA, Seguro Popular and IMSS Oportunidades have been established.

The private sector is relatively expensive, hence only for those that with the capacity to afford it. It is made up of private health insurance companies and service providers in health centres, clinics and private hospitals. This sector includes non-governmental institutions and extends to the educational system. Private universities and academic institutions also provide medical care and social assistance.

Although Mexico has extensive healthcare infrastructure, the health services provided for the population depend on the institution they are appointed to. Any person who is insured by a social security institution has access to more benefits, while isolated rural communities have problems accessing specialized hospital services. The latter is due to the fact that specialized and highly specialized medical care is concentrated in hospitals located in large urban areas.

Moreover, while there is limited healthcare staff in rural communities, there is a high concentration of doctors in urban areas in Mexico. In addition, patients have to wait for a long time before accessing hospital services.

Finally, technological innovation and development programmes and initiatives in the private and public sectors are being integrated into e-Health. e-Health is the use of information- and telecommunication technology for support or improvement of health and/or healthcare. They
seek to help strengthen medical care services and bridge healthcare gaps between different communities in the country. e-Health can be of excellent use in Mexico by improving the services in healthcare centres and connecting rural areas with specialised medical centres. This report will also provide an overview what has been done in Mexico regarding e-Health and what plans the current government of Enrique Peña Nieto has with e-Health.
Executive summary

In Mexico, healthcare institutions first integrated e-Health systems in for administration and research. In a later stage epidemiological surveillance, statistics and teaching followed. e-Health advancements developed more in the private sector however. In particular, in the fields of: radiology, pathology and distance learning. These are advanced e-Health or telemedicine applications which application is relatively simple and do not require major interaction between professionals and patients.

The private sector mainly observes the international ICT supply market to purchase new equipment and modernize. Its equipment is rarely of Mexican origin, providing excellent opportunities for the Dutch e-Health industry. If the technology is of Mexican origin, due to limited training in the area of healthcare and process analysis the functionality of the system is limited to meeting basic operational needs. Improving current systems and increasing the flexibility for the use of the system in different institutions could be an opportunity for the Dutch industry. Private hospitals that have digitalized and utilize with great frequency e-Health are: Torre Médica Hospital, the ABC Hospital, Hospital Médica Sur and the Hospitales Ángeles network, some even use surgical robots. Private universities mostly use e-Health to connect different healthcare institutes and to improve learning facilities with virtual programs to stimulate distance learning. The Meritorious Autonomous University of Puebla and the Autonomous University of Nuevo León have the most implemented programs with a combination of telescreening, teleconsultation, teleclinics and telemonitoring.

The public sector has incorporated ICT applications with foreign technology as well, providing again good opportunities. Each institution uses its own system or program and hardly any cooperation can be seen between the different governmental entities. Federal states also do not coordinate their e-Health programs or share much of their experiences. The majority of these applications are for different purpose, but the main tasks where e-Health is used for are administrative and informative tasks. Although some public institutions use satellite technology in order to reduce the cost of transporting patients, the public sector does not use current technology as much as the private sector to improve care or reduce costs. Improvements however occur in an accelerating pace, hence it is catching up. The Mexican Social Security Institute
(IMSS) initiated operating with e-Health applications, despite the federal legislation is lagging behind. Currently it has created its own security framework for both patients and doctors and it uses a digital imagining system to support medical services in its hospitals. Moreover IMMS has implemented an electronic medical record to integrate numerous services. Similarly, the Government Workers’ Social Security and Services Institute (ISSSTE) also has information systems designed for administrative management and telemedicine. Other institutions also use electronic medical records, telemedicine services to supporting teaching by videoconferencing and telemedicine in order to launch medical centres in rural areas to acquire a diagnosis.

Despite the fact that comprehensive application of ICTs achieves the best results, this has not been the standard for establishing these technologies in Mexican public medical care. There has not been any prior planning and new applications have been partially implemented from below. The usual practice has been the introduction of computer equipment, followed by the assessment of critical problems and then stressing the need to integrate the scattered processes.

The president, Enrique Peña Nieto – EPN, has set three main ambitions to improve healthcare for ordinary Mexicans. These being: accessibility, quality and prevention. Although not explicitly mentioned how, this will involve the use of e-Health as the ambition to implement information and communication technologies in the Mexican healthcare system is formulated in the digital strategy of the president. EPN wants to improve the quality and accessibility of information by implementing an electronic medical record and registration, he plans to use more electronic equipment in hospitals so that healthcare will be more affordable and accessible in rural areas and he wants to synchronize medical database amongst other. In general, the Mexican market offers excellent opportunities in both the private (advanced e-Health products) and the public (simple e-Health products) sector.
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The State of Sinaloa

The State of Tamaulipas

The State of Veracruz

The State of Yucatan

Expenditure on private healthcare and public healthcare per state.

Private healthcare services and e-Health

CARPERMOR

The ABC Hospital

Torre Médica Hospital

Academic and other research institutions

University Corporation for Internet A.C. and Internet2 Development

Anáhuac University

Meritorious Autonomous University of Puebla

The Autonomous University of Nuevo León

National Polytechnic Institute

Centre for Research and Advanced Studies NPI

National Autonomous University of Mexico

National Council for Science and Technology

The National Institute of Public Health

The Autonomous University of Guadalajara

Panamericana University

Autonomous University of the State of Mexico

University of Colima

Metropolitan Autonomous University

Table Telemedicina Mexico

Political Initiatives in Mexico regarding e-Health

Aspirations of the President

The e-Health Action Programme
Background information

*Mexico (Demography and Health)*

Although Mexico is highly urbanized (78.03%), it has not reached the regional average. Mexico’s overall fertility and mortality rates are low. The country is currently in an advanced stage of demographic transition, despite the fact that the population’s natural growth rate is similar to that of countries completing demographic transition. Among other factors, this is because the country’s average life expectancy at birth for both sexes is over 76 years. The country’s overall dependency ratio was 56.9 in 2005.

As regards the epidemiological profile, the principal causes of mortality in Mexico are diabetes mellitus and ischemic heart disease, although perinatal conditions also have a significant effect on the mortality rate. Currently, nearly 70% of Mexico’s adult population is overweight, explaining why the healthcare sector is growing fast.

Within the framework of the Millennium Development Goals, Mexico has advanced 80.2% in terms of its target for reducing the percentage of persons living in extreme poverty. This percentage dropped from 18.7% in 1990 to 11.2% in 2008.

As regards the Millennium Development Goals relating to health, the under-five mortality rate in Mexico decreased from 44.2 per 1,000 live births in 1991 to 18.9 in 2009, advancing significantly towards the goal of reducing this rate by two-thirds between 1990 and 2015. The main cause of death related to certain disorders stemming from the perinatal period and congenital malformations, deformities and chromosomal anomalies.

As for the Millennium Development Goal that refers to maternal health, significant progress has also been made, although maternal mortality has not yet been reduced by three-quarters. This rate dropped from 72.6 per 100,000 live births in 2000 to 57.2 in 2008. Although there has been progress, additional efforts are still required. According to the figure reported in 1990 (89 per 100,000 live births), the goal of reducing this rate by three-quarters has not yet been reached.
74.4% of all births in 2005 were assisted by specialized personnel. This figure increased to 93.4% in 2006, even though there were still major differences throughout the country’s inland regions.

**e-Health**

According to KPMG e-Health is the use of information and communication technology for support or improvement of health and healthcare. By using e-Health patients will be able measure and monitor some values, communicate with caretakers over large distances and receive better treatment because doctors will have more information when diagnosing. In this report some applications are mentioned and an overview what is meant is given below.

Telecoaching: Support on distance. It is usually involved in a process with multiple moments of contact, e.g. physiotherapy or psychological help.

Teleconsultation: Consult a caregiver on distance by a patient or another caregiver.

Telediagnosis: Diagnosis on distance.

Telemedicine: Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance. It is mostly used as a synonym for e-Health.

Telemonitoring: The supervision on patients that are not in the same location as the caretaker. An example is a cardiologist that will receive a message when the sphygmometer and the scale of a patient warn that the chance of a heart attack has increased significantly. A built in defibrillator can give the exact position of a patient in need of care.

Teleradiology: Digitally sending results of medical images.

Telesurgery: Performing surgery on distance with the use of specialised robots.
Public services and e-Health

The Ministry of Health (SSA)

Remote consultations are provided in the United States since the 70s by the National Health Information and Documentation Centre (CENIDS) and the Medical Literature Analysis and Retrieval Systems (MEDLARS) at the National Library of Medicine (NLM).

A decade later, 1985, Mexico launched its first remote educational health programme known as the Mexican Centre for Health Education through television. This initiative was launched by Mexico Federico Gómez Children’s Hospital. Several ministries and governmental institutions actively participated in this (by then) revolutionary programme: The Ministry of Health, the Ministry of Communications and Transport (SCT) and the National Autonomous University of Mexico (UNAM). This programme aimed to complement and keep healthcare professional up to date by providing free medical education services. Digital transmission services were incorporated in 2006. This programme was successful and expanded as it now has coverage in Mexico and Latin America.

The Ministry of Health informatics development programme considered ICT as strategies for conducting the institution’s substantive and administrative tasks more efficiently. By the early 1990s, the State System of Basic Information (SEIB) was centralized and covered the 32 States in Mexico. In 1992, SEIB and the Universal Vaccination Programme operations were automated and the first local networks were installed in Mexican States. In 2000, the National Y2K Information Centre was created for the health sector in order to assist informatics conversion.

In 1995, the National Epidemiological Surveillance System (SINAVE) was created and it was coordinated by the Ministry of Health and relied on the Single Information System for Epidemiological Surveillance (SUIVE). The latter has a number of components including: the Automated Single Information System for Epidemiological Surveillance (SUAVE), the Hospital Network for Epidemiological Surveillance (RHOVE), the Epidemiological and Statistical Mortality System (SEED) and at least 22 special epidemiological surveillance systems. SUAVE is the technological system that gathers weekly information on events of epidemiological
medical interest from institutions that are part of the national health system. On a regular basis (weekly) the system notifies of new cases of exanthematic, transmissible, infectious, respiratory, intestinal and parasitic diseases. In addition, sexually transmitted diseases, vector-borne and zoonotic diseases, and diseases that can be prevented by vaccination are monitored by this system as well.

Since it was founded in 2001, the Seguro Popular Programme sought to make use of electronic medical records, as well as a card known as TUSALUD. This card was implemented at different stages throughout the 32 states of the Republic starting in 2005. It showed signs of success within the early stages of implementation by incorporating a significant number of pharmacies into the Seguro Popular to supply prescriptions. However, within a short period of time, interoperability and maintenance problems were reported in at least 15 states and for this reason the programme was cancelled.

From 2000 to 2006, the Directorate-General for the Ministry of Health established a policy to adopt systems based on free software and started developing the Hospital Administration System (SAHO). This system included several processes grouped into four divisions: medical services, management services, management of catalogues and management of medical agenda by professional and speciality. By late 2005, nearly 20 hospitals were operating with the first version of this system.

In 2007, SSA started developing the Mexican electronic medical record regulation in order to establish electronic health record system requirements encompassing interoperability, processing, interpretation and information security. The Ministry of Health proposed the components of the interoperability model to be implemented in six phases between 2007 and 2012.

For more information, consult their website: <www.salud.gob.mx>
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General Council on Health (CSG)

The General Council on Health (CSG) is an institute that has the responsibility over the *Cuadro Básico* (CB), the basic description, and is in charge of emitting all mandatory health regulations. Within the SCG the National Formulary commission, la *Comisión Interinstitucional del Cuadro Básico de Insumos del Sector Salud*, is the responsible commission for issuing the CB-code. Medication or any medical application or device needs have a CB-code in order to be used or sold in the market. The CB-code consists of a 10-digit code and a generic description of the technology, thus any brand whose characteristics match the description may use the code for commercial activities with the public health sector. There are four catalogues in which all drugs and medical devices & inputs fall: drugs, medical equipment, healing inputs and diagnostic auxiliaries. For each of these catalogues a special sub commission exists that evaluates if a CB-code will be given. The submission dossier, along with the sanitary registry and a complete description of the technology, must include a complete health economic evaluation. The price used to perform the evaluation is considered a reference price for future commercial activity.

The CSG consists of the most important public health institutions, such as IMSS, ISSSTE, public hospitals, Sedena and Semar, and is chaired by the minister of Health. Also the National Formulary commission consists of those entities. The formal statement of the CSG towards the submitted product comes after a multi-institution voting process. If the code is granted, the producer must then submit the technology to each individual public institution’s formulary mostly through public bid tenders, which are price-oriented. If the code is denied, the producer is notified and explained why the submission did not succeed, and may resubmit. The process of getting a CB-code can take some months until its resolution. The formulary of all public health institutions can only include technologies with a CB code, being the former the same throughout the institutions.

For more information, consult their website: <www.csg.gob.mx>

The Federal Commission for the Protection against Sanitary Risk (COFEPRIS)

In 2001 the Federal Commission for the Protection against Sanitary Risk (COFEPRIS) was found by the Ministry of Health. COFEPRIS is a decentralized organ with technical,
administrative and operational autonomy, whose mission is to protect the population against sanitary risks, through sanitary regulation, control and promotion. It regulates and promotes the production, commercialization, import, export of and involuntary exposure to health-related drugs and technologies, toxic or dangerous substances, products and services, health at work, risk derived from environmental factors and basic maintenance. Health-related drugs and technologies concern drugs, medical equipment and devices, blood and hemoderivatives, organ transplant and health services. This implies that if one wants to sell or use an e-Health product in the Mexican market it has to get an approval from COFEPRIS and that can take up to two or three years.

Since a few years COFEPRIS has given third parties, terceros autorizados, the authorization to help companies fill in parts of the documentation, perform tests and make an important report on that. This reduces the time of the process approximately by half, also because these parties are in direct contact with COFEPRIS and they submit the documents in a fast-track procedure. COFA, Dispomedic, DEFI Latina, NYCE, TAES, Tapvs and UVEDIM are some of the eleven official terceros autorizados.

For more information, consult their website: <www.cofepris.gob.mx>

For more information about the terceros autorizados individually please contact:
Víctor García Vargas – Director General, vhgarcia@cofaintegral.com.mx, <www.cofaintegral.com.mx>
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The National Centre of Excellent Technologies in Health (Senetec)

The National Centre of Excellent Technologies in Health (Cenetec) is an organisation within the Ministry of Health. It was created in 2004 to provide the best available and objective information on technological advances regarding healthcare in order to set the right policy. Its mission is to give information to policymakers and evaluate new medical technologies to make sure that the right decisions are made that facilitate better and more accessible healthcare facilities. It has four
departments; a department that evaluates new technologies, a department that want to integrate practical clinical guides, a department that focusses on biomedical engineering and a department on telemedicine. Senetec advices to the Comisión de Cuadros Básicos del Consejo de Salubridad General on what new technologies to include.

Its e-health division has a committee, *El Comité Interinstitucional e-Salud*, that coordinates national health institutes and public hospitals on what action they have to take regarding e-Health. The committee has representations of SSA, IMMS, ISSSTE, public universities and the Ministry of Communications & Transport (SCT). Within the committee there is also exchange on experiences the different institutes have when the implemented certain technological programs. The goal of this committee is to improve the implementation of e-Health and information technology to optimize the quality and accessibility of medical education and public healthcare.

It also organizes a lot of educational sessions on e-Health, published technical guides on how to use e-Health and writes reports on the technical advances. It has organised 42 teleconferences with national health institutes and hospitals, coordinated the medical system about the electronic medical record and participated in international meetings as the American Telemedicine Association.

For more information, consult their website: <www.cenetec.salud.gob.mx>

**The Government Workers’ Social Security and Services Institute (ISSSTE)**

The Government Workers’ Social Security and Services Institute (ISSSTE) has extensive experience in the area of electronic health which goes back several years. The institute implemented the use of ICT in: (a) the Integrated Medical Information System (SIIM) that has been used to control statistical information generated at the three medical care levels since 1991; (b) the Automated Detection and Diagnosis Clinic (CLIDDA) which started operations in 1975 using automated medical records; (c) Hospital 20 de Noviembre, which implemented the hospital information system (SIAH) in 1995; and d) the Automated Clinics System pilot project in 1996, designed to automate the Family Medicine Clinics (CMF) in Xochimilco and eight clinics in the Federal District.
ISSSTE launched the first institutional coverage e-Health programme in 1995. The programme was based on the use of satellite technology in order to reduce the cost of transporting patients to specialized and highly specialized centres concentrated in the principal cities of Mexico. Until 2007, this institutional network was used to conduct speciality teleconsultation between 11 general hospitals and hospital clinics, 6 regional hospitals and 20 Noviembre de National Medical Centre. Distance learning services were also provided over this period. In 2007, the programme started a new stage by incorporating digital technologies at medical units of the three care levels, thus increasing the network to 177 units. Its main objective was to increase speciality service coverage and reduce unnecessary patient referrals.

For more information, consult their website: <www.issste.gob.mx>
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The Mexican Social Security Institute (IMSS)

The Mexican Social Security Institute (IMSS) has a Family Medicine System (SIMF) that supports register and management of medical care at first level units. This system was developed in 2002 with the Engineering Faculty of the National Autonomous University of Mexico (UNAM) and was launched one year later. It is designed for family doctors, medical assistants, laboratory staff, X-ray staff, stomatologists and administrative staff in these units. The system enabled the statistical information from the first level units to be integrated into the Integrated Healthcare Information System (SIAIS). In 2004, improvements and support were incorporated into the system for carrying out outpatient consultations for second and third level hospital units.

Hospital medical care processes including emergencies, are supported by IMSS, the Hospital Outpatient Information System (SICEH) and the IMSS-VistA Hospital Information System. In addition, hospital and specialized medical care services are supported by the Digital Imaging System, which facilitates storage and viewing of medical images in the DICOM standard. Systems that support auxiliary diagnosis and treatment services, such as clinical laboratories, blood banks and haemodialysis, are integrated by means of the electronic medical record using messaging based on HL7 version 3.0. In 2007, IMSS electronic medical record enabled the integration of medical notes, orders and auxiliary diagnosis and treatment results, haemodialysis,
disabilities, stomatology, pharmacies and the medical agenda, among others. IMSS faces the challenge of integrating the wide range of systems that support medical care at different levels with the lowest costs and level of modifications into present applications.

Furthermore, in 2006 IMSS started operating the Digital Hospital that electronically integrates hospital services including critical areas and nursing. At administrative level, it facilitates monitoring of daily activities and productivity of the hospital. Indeed, the initiative to adopt electronic medical records at this institution is identified as a valuable intervention in its modernization plan and improvement processes.

For more information, consult their website: <www.imss.gob.mx>
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**Petróleos Mexicanos (PEMEX)**

The Mexican State-owned petroleum company Petróleos Mexicanos (PEMEX) has focused on the management of sensitive areas including expenditure and accounts by means of the Institutional Pharmacy Management System (SIAF). The main modules are appointment agendas, comprehensive care, PrevenIMSS (a health prevention programme), stomatology (odontontology) and auxiliary diagnostic services. This speciality is equivalent to odontology. This ensures centralized administration and generates pharmacy supply orders on a weekly basis. The digital prescription was operational at 44 medical units in 2006. The SIAH medical care module was connected with 11 Therapeutical Diagnosis Guides in a readable interactive version for supporting diagnosis and treatment. In addition, PEMEX has made important investments in the development of institutional electronic medical records.

For more information, consult their website: <www.serviciosmedicos.pemex.com>

**The Ministry of National Defence (SEDENA)**

In 1997, the Ministry of National Defence launched speciality units which incorporated a computer management system. From 2006 to 2008, it implemented the Women’s Health Clinic Hospital Computer Management System (SIAHCEM) project. This project was made up of 32
modules which support outpatient appointment management and control the management of medication at the warehouse, pharmacy, hospital wards, administrative procedures and use of medical files. The Central Military Hospital has been the medical unit of SEDENA with special focus on digitalizing its healthcare system.

For more information, consult their website: <www.sedena.gob.mx>
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Naval Secretariat (SEMAR)

SEMAR has an advanced system for hospital control called (SICOHOSP), used to automate the control of healthcare provided by SEMAR to its military staff, retirees and other people eligible for these services (families of the latter).

This system was developed by the staff at the Direction for Developing Computing Systems at SEMAR. Such system has the following modules: administration, users allocation; reception, enabling to create electronic records, scheduling and appointments allocation; medical consultation, general consultation, consultation for specialties and dentistry; warehouse, it also supports the control of drug stock; lab and X rays studies; naval healthcare, it controls the consultation done to the records; and preventive medicine that supports physicians in prevention treatments of diabetes mellitus and obesity.

For more information, consult their website: <www.semar.gob.mx>
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National institutions and highly specialized reference and regional hospitals

The National Rehabilitation Institute

In 1997, the National Orthopaedics Centre (CNO), currently known as the National Rehabilitation Institute (INR), began to explore ICT healthcare projects. The institute initially
adopted an electronic medical record that enabled the control of medical agendas, thus facilitating management control and reducing waiting time for an appointment. This record has gradually been incorporating clinical and imaging areas.

In 2000, CNO had Automatic Hospital Information System (SAIH) outpatient appointment, clinical file, emergency, nursing and hospital admission modules. It incorporated telemedicine services that same year, becoming a pioneer in supporting medical teaching by means of videoconferencing. The administrative area systemization process started in 2003. INR continued integrating ICTs into its operations in 2009.

For more information, consult their website: <www.inr.gob.mx>
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Bajío Highly Specialized Regional Hospital

The Bajío Highly Specialized Regional Hospital (HRAEB) was founded in 2007 and since it was launched the Ministry of Health incorporated a management model based on a hospital information system implemented in Spanish healthcare services. It is based on an enterprise resource planning (ERP) system that features several business intelligence and clinical management modules, among others.

For more information, consult their website: <www.hraeb.salud.gob.mx>

The National Institute of Respiratory Diseases

The National Institute of Respiratory Diseases (INER) finished installing its internal computer network between July and September 2004. In addition, it started implementing the Hospital Management System, a project designed to gain complete control of hospital operations, while cutting operating costs and helping to improve the quality of medical care services. INER also considered integrating its administrative and substantive medical areas by means of Government Resource Planning (GPR).
In 2006, the Hospital Management System was implemented which continually updated the web platform and was run as a pilot test in emergency services. GRP, the hospital information system, RIS-PACS imaging and laboratory services centralized their data in a single database.

For more information, consult their website: <www.iner.salud.gob.mx>
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The Salvador Zubirán National Institute of Medical Sciences and Nutrition

The hospital system developed by the institute’s informatics department partially supports its operation, which is made up primarily of surgery, operating room, teleconsultation, electronic record, medical note, laboratory and imaging modules.

For more information, consult their website: <www.innsz.mx>
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The National Cancer Institute

This Institute developed its electronic record system known as INCanet between 2003 and 2008. In 2006, the system consisted of 40 different modules and by late 2007 there were nearly 400 computers connected to the network with access to the electronic record, which included different integration levels with laboratory, pathology and X-ray services.

For more information, consult their website: <www.incan-mexico.org>
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The National Institute of Perinatology

According to the institute’s transparency portal, there was a significant investment in resources for the development and implementation of electronic clinical records in 2008.

For more information, consult their website: <www.inper.edu.mx>
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**The National Institute of Paediatrics**

In 2006, the Institute began evaluating possible technological solutions for integrating hospital services and management systems. In 2007, the Institute began adopting electronic medical records for the 175 services offered.

For more information, consult their website: <www.pediatra.gob.mx>

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**Manuel Gea González General Hospital**

This hospital has been gradually incorporating information technology since 1996. A system for managing payrolls and partial inventory control systems was introduced in different areas (general goods, pharmacy, clothing, stationery and supplies) between 1998 and 1999. In 2005, the HGMGG started to implement software that facilitated management duties at the hospital (SIGHO). Until 2006, the system controlled general patient data, the date and at which service the patient entered, but did not incorporate medical care processes into medical records. The impact of systematization has been very specific and it enabled to reduce the waiting time at cash registers and the elaboration of admittance cards.

**Gross investment in equipments at HGMGG 2002-2007**

<table>
<thead>
<tr>
<th>Gross Investments in equipments</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Percentage Increase %</th>
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<tbody>
<tr>
<td>Surgical Equipment and devices</td>
<td>129.1</td>
<td>132.6</td>
<td>143.0</td>
<td>172.5</td>
<td>182.3</td>
<td>224.7</td>
<td>74.1%</td>
</tr>
<tr>
<td>Machinery and tools</td>
<td>29.6</td>
<td>29.5</td>
<td>31.1</td>
<td>32.5</td>
<td>34.2</td>
<td>35.4</td>
<td>19.5%</td>
</tr>
<tr>
<td>Computing Goods</td>
<td>13.0</td>
<td>13.4</td>
<td>14.9</td>
<td>17.1</td>
<td>19.0</td>
<td>20.1</td>
<td>53.9%</td>
</tr>
<tr>
<td>Furniture and office equipment</td>
<td>12.3</td>
<td>12.2</td>
<td>13.0</td>
<td>14.1</td>
<td>14.8</td>
<td>15.5</td>
<td>25.6%</td>
</tr>
<tr>
<td>Medical instrumentation</td>
<td>4.2</td>
<td>4.4</td>
<td>5.8</td>
<td>8.0</td>
<td>8.2</td>
<td>8.6</td>
<td>103.1%</td>
</tr>
<tr>
<td>Transport Equipment</td>
<td>3.1</td>
<td>3.2</td>
<td>3.4</td>
<td>4.2</td>
<td>4.3</td>
<td>4.4</td>
<td>45.1%</td>
</tr>
</tbody>
</table>

For more information, consult their website: <www.hospitalgea.salud.gob.mx>
The National Transplant Centre

In 2003, the National Transplant Centre (CNT) automated the national waiting list in response to the need for timely and reliable information in order to make organs available for transplant at national level. To do so, the centre drew inspiration from the experience of transplant services at the Salvador Zubirán National Institute of Medical Sciences and Nutrition.

For more information, consult their website: <www.cenatra.salud.gob.mx>

Public services in the federal states

Implementing ICTs in public health services was initially designed for administrative management, as was the case in the private sector and social security. The use of electronic medical records has been limited. A number of pilot programmes in the field of telemedicine have been launched and some of them have been integrated into health services. Some telemedicine programmes noteworthy of mention are those in the southern region of Mexico, in Chiapas and Yucatán and in Nueva León in the north of Mexico.

The State of Aguascalientes

From 2004 to 2006, the Institute of Health in Aguascalientes (ISEA) executed a project to improve processes, known as the Integrated Health Management System and, at the same time, adopted electronic medical records. The system integrated federal health programmes, and provided a productivity and medication supply report for all automated units on the principal illnesses detected, data on diabetics, hyper tense patients and expectant mothers, information about studies and diagnostic supports, administrative information, care reports for patients insured by IMSS or ISSSTE and follow-up for patients referred.

For more information, consult their website: <www.aguascalientes.gob.mx/temas/salud>
Contact: Jose Francisco Esparza Parada – Minister of Health
+52 449 910 7956 y 910 79 57 francisco.esparza@isea.gob.mx
The State of Chihuahua

In 2004, the Coordination of Development and Modernization of the State of Chihuahua indicated that electronic medical records had been implemented at the Children’s, Central, General, Zubirán and Women’s Hospitals. The information and communications technology system for health had three fundamental parts: electronic records, a hospital care system and telemedicine. The state telemedicine network is focused on medical micro-units located in la Sierra in Mexico and provides care for the indigenous population.

For more information, consult their website: <www.chihuahua.gob.mx/ss>
Contact: Sergio Piña Marshall – Minister of Health
+52 614 4399900 or +52 614 4399901 (ext. 21500)

The State of Nuevo León

The Nuevo León State health services started a Telemedicine Programme in 2001 in order to address the scarcity of medical specialists. They launched the Penitentiary Telemedicine Programme in 2005, which included three state social rehabilitation centres.

For more information, consult their website: <www.nl.gob.mx/?P=sec_salud>

The State of Puebla

The first attempts to provide medical care and distance learning services in the State of Puebla were made in 2003. The initial services network included six general hospitals and four comprehensive hospitals.

For more information, consult their website: <http://www.ss.pue.gob.mx/>
Contact: Roberto Rivero Trewartha – Minister of Health
+52 222 7778000 (ext. 2001 y 2003) titular.ssa@puebla.gob.mx and robertorivero@saludpuebla.mx
The State of Colima

The State developed the Colima Medical Record Management System (SAECCOL) in conjunction with the Seguro Popular Programme. Electronic medical records were first implemented in 2006 at hospitals employing the Hospital Management and Medical System (SIMAH) project. The Ciudad Guzmán Hospital started a pilot programme and in 2008 was operating the Tepatitlán, Puerto Vallarta, and La Barca Hospitals, as well as the Tala Women’s Hospital. The system is designed to capture and consult medical/hospital records and facilitate administrative tasks at these hospitals.

For more information, consult their website: <www.saludcolima.gob.mx>
Contact: Agustin Lara Esqueda – Minister of Health
+52 312 316 2201 secretariosalud.colima@salud.gob.mx

The State of Queretaro

This state announced to establish 10 more telemedicine units for specialist consults in 2014. This expansion will greatly increase the coverage in the state. The incorporation of these telemedicine units avoids patients’ their travel to the hospital to acquire a diagnosis. It concerns speciality areas such as ophthalmology, otolaryngology, internal medicine, integrated medicine and surgeons, who can now perform remote consults and provide proper treatment to remote communities. It appears that Queretaro will be one of the leading states in teleconsultation and telemedicine.

For more information, consult their website: <www.queretaro.gob.mx>
Mario Cesar Garcia Feregrino – Minister of Health
+52 442 2519000 (ext. 7604) mario.garcia@salud.gob.mx

The State of Sinaloa

Sinaloa is probably the State programme whose electronic medical records have the greatest coverage and support. The informatics department of the State Ministry of Health developed the Medical Record System known as SiEC which was implemented and adopted at all first level State units in 2003.
In 2005, the Directorate General of Health Information (DGIS) of the Ministry of Health, together with Sinaloa State health services, promoted the development and implementation of the Hospital Management Information System (SIGHO) at Culiacán General Hospital. SIGHO was the result of the development of the SiEC initiative. Based on the results obtained at Culiacán General Hospital, SIGHO was established the management information system for the Ministry of Health hospitals at national level. In January 2008, there were 1,519 healthcare units with at least one SIGHO module, 2% of which provided some form of inpatient services, while the rest were primarily first level care units.

For more information, consult their website: <www.ssa-sin.gob.mx>
Contact: Ernesto Echeverria Aispuro – Minister of Health
+52 667 7141550 orl29@hotmail.com and ernesto.echeverria@saludsinaloa.gob.mx

The State of Tamaulipas

In 2013 Tamaulipas announced to creating an Electronic Health Record (EHR). This initiative is the first in Mexico of its kind and also relatively new in Latin America. The EHR is aimed for improving the quality, safety and efficiency of healthcare. This is part of recent efforts to modernize and digitalize the healthcare system of Tamaulipas. It will allow for laboratory results and images to be transferred electronically to a hospital administration system; and it will reduce risk in the emergency room as the medical staff will have immediate access to the patient’s relevant information – such as allergies, diseases and treatments.

For more information, consult their website: <www.salud.tamaulipas.gob.mx>
Contact: Jose Norberto Treviño – Minister of Health
+52 834 3186300 (ext. 205003, 205004, 205005 y 205006) ssa@tamaulipas.gox.mx
The State of Veracruz

The State health services developed the Comprehensive Health Care Management System (SIGAM). The system was designed to integrate patients’ electronic medical records and support medical care management. The programme started in 2006 and was implemented in 2008 and it is used at 2 hospitals and 36 primary care units located in the jurisdictions of Coatzacoalcos and Poza Rica.

For more information, consult their website: <www.ssaver.gob.mx>
Contact: Juan Antonio Remidib – Minister of Health
+52 288 842 300 and 824 3000 (ext. 3216, 3018, 3218, 3296)

The State of Yucatán

Traditionally, economic activity in this state has been low. However, the explosive recent growth, due to the exploitation of the tourism industry, this state provides excellent opportunities. Telemedicine found its way in 2007 to this isolated state. The Health Services of the State of Yucatán offer telemedicine services through: the General Hospital of O’Horán, Community Hospital of Ticul and the Community Hospital of Peto. In its first six months of existence, 410 teleconsultations were performed. This number is currently much higher.

For more information, consult their website: <www.salud.yucatan.gob.mx>
Jorge Eduardo Mendoza Mezquitla – Minister of Health
+52 999 9303054 and 9303050 (ext. 45004 y 45080) ssy@yucatan.gob.mx

Expenditure on private healthcare and public healthcare per state. Figures *1000.

Find below a table with financial information on each state regarding healthcare expenditure. Although not specified on e-Health, it provides a good indication of the potential of each state and its market size.
<table>
<thead>
<tr>
<th>State</th>
<th>Expenditure on private health</th>
<th>Expenditure on private health (MXP/17.8)</th>
<th>Expenditure on public health</th>
<th>Expenditure on public health (MXP/17.8)</th>
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<td>871.478</td>
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<td>24,547.581</td>
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</tbody>
</table>
e-Health in the private healthcare sector

Private healthcare institutions in Mexico have incorporated ICTs as they are a form of improving control of administrative management and they make cost-beneficial developments. The applications which are most often implemented by these organizations are Laboratory Information Systems (LIS) and Radiology Information Systems (RIS).

At present, local software development companies, which have limited training in the area of healthcare and process analysis, and distributors of systems developed overseas are catering for the laboratory information management systems (LIMS) market needs in Mexico and Latin America. For this reason, functionality of these systems is limited to meeting basic operational needs and they are not flexible enough to adapt to the specific processes of each laboratory. Furthermore, their development and implementation are generally complicated, slow and expensive, even when they do not interact with other systems.

CARPERMOR

As regards automated laboratory services in the private sector, perhaps the most relevant example is Grupo PROA which supports CARPERMOR reference laboratory operations and Chopo Medical Laboratories (Laboratorios Médicos del Chopo) services. The company started to develop its own LIMS in 1998, replacing the outsourced system that was inconsistent, expensive to operate and lacked local technical support. The company started to provide services to its customers online and in real time in 2000.

For more information, consult their website: <www.carpermor.com.mx>

The ABC Hospital

This hospital is arguably the most advanced private hospital of Mexico. It has a special focus on E-pathology and other digital medical services. Most of its equipment is purchased abroad.

For more information, consult their website: <www.abchospital.com>
Torre Médica Hospital

The surgical services at this health centre standout since they are supported by surgical robots and telepresence, which enable surgeons to perform and lead remote procedures from operating rooms and inpatient wards.

For more information, consult their website: <www.torremedica.com.mx>

Academic and other research institutions

Universities and NGOs provide healthcare services using ICT. Not only are ICTs used for telemedicine, but they have also created their own electronic medical record systems. To do this, they require infrastructure and they generate technological models.

University Corporation for Internet A.C. and Internet2 Development

This corporation was established in 1999 to encourage cooperation between national and international projects on the Internet2 network. Since it was launched, it incorporated several universities that had faculties of medicine. In 2006, it created the Virtual Network that integrates 14 national healthcare institutes. This network was used to develop healthcare projects that require informatics resources based on Internet2 at national and international universities and healthcare institutes.

Anáhuac University

The Anáhuac University Telemedicine Programme started in 2002, making use of mobile units for slums in the regions of Costa Chica in the State of Guerrero and Sierra Mixteca in the State of Oaxaca and providing services following Hurricane Stan and Hurricane Wilma. The
specialities supported by telemedicine in this programme are gastroenterology, nutrition, internal medicine, surgery, paediatrics and gynaecology.

For more information, consult their website: <www.anahuac.mx>

Meritorious Autonomous University of Puebla

The Meritorious Autonomous University of Puebla (BUAP) started using telemedicine in 2002, setting up a satellite network that supported several virtual healthcare programmes with national and international coverage. At the same time, the university installed teleclinics and operating rooms designed for telesurgery. The Electronic Medical Record Programme was incorporated into the Telemedicine Programme in 2004. In 2005, the Telemedicine Programme was incorporated into the Faculty of Medicine at the university and subsequently into the UNAM National Videoconferencing Network in 2006. Since 2007, the university has been actively participating on the inter-agency e-Health committee and it launched the Telemedicine and Telehealth Graduate Diploma Programme in 2009 in conjunction with the Open University of Catalonia (UOC). The programme had three teleclinics in the communities of Libre, Chignahuapan and Tehuacán in 2009, which were interconnected for specialist teleconsultation with the reference telecentre at the BUAP Faculty of Medicine. At present, the Faculty of Medicine at BUAP offers telescreening, telemonitoring and preventive telemedicine services. In addition, the university hosts an annual videoconference-based healthcare distance learning programme.

For more information, consult their website: <www.buap.mx>

The Autonomous University of Nuevo León

The Autonomous University of Nuevo León (UANL) has developed its telemedicine programme by means of the University Hospital and its University Healthcare Programme. In 2007, the programme had cable, fibre optics, microwave, ISDN and IP telecommunications systems. These interconnect five university clinics, four healthcare centres, an IMSS family medicine unit and the state-managed Children’s, Psychiatric and Metropolitan Hospitals, a dental unit, an IMSS
specialities clinic, two university auditoriums, the State Secretariat public telemedicine network and the Esquipulas Clinic in the State of Chiapas. These are currently interconnected with national videoconferencing networks in the United States of America, Central America and South America. In 2007, teleconsultations were carried out for 17 health specializations and 21 subspecialisations, providing teleconsultation services to three penitentiaries. The university has signed agreements with other States in order to provide healthcare distance learning, particularly in Chiapas where nurses at highly specialized hospitals are trained.

For more information, consult their website: <www.uanl.mx>

National Polytechnic Institute

Over the past decade, the National Polytechnic Institute (IPN) has helped to train healthcare professionals by means of continuing education programmes. In 1999, the Directorate of Distance and Continuing Education (DECyD) launched distance medical education programmes, including graduate programmes, courses, conferences and certifications. Staff from the principal hospitals in Mexico, in particular Hospital Juárez de Mexico Association of Surgeons, has been working with the IPN since 2000. Until 2008, over 5,000 doctors and healthcare professionals had participated in these programmes. At present, the IPN has 30 offices that make-up its healthcare continuing education programme. Access to programme sessions is provided through streaming and the EDUSAT network.

For more information, consult their website: <www.ipn.mx>

Centre for Research and Advanced Studies of the National Polytechnic Institute

The General Office for Information and Communication Technologies at this centre set-up the initiative to become involved in the information society and has executed some projects relating to electronic medical records and their interoperability.

For more information, consult their website: <www.cinvestav.mx>
National Autonomous University of Mexico

This university is the most important in Mexico and its Faculty of Medicine (FM) participated in the development of e-Health by means of teaching and researching in the area of health and medical informatics. The university is a pioneer in promoting the speciality of medical informatics and courses on decision analysis and medical computer science in Mexico.

For more information, consult their website: <www.unam.mx>

National Council for Science and Technology

In recent years, the National Councils for Science and Technology and the Federal Council have encouraged the development of new technological networks for e-Health and ICT clusters, with a view to making multisectorial agreements on e-Health research projects a common practice. Among its objectives, CONACYT has considered creating online healthcare education programmes for both the non-insured population and medical and paramedical areas.

Several initiatives have received CONACYT funding. For example, in 2004, the council collaborated on lines of research, teaching and assistance in telemedicine and teleconferencing projects led by South Medical Foundation (Fundación Médica Sur91). In 2006, the council provided support for the first telemedicine pilot project at Hospital General del Valle de Chalco Dr. Fernando Quiroz Gutiérrez and a telecare pilot project with eight patients. From 2007 to 2009, CONACYT helped to integrate medical devices with specific videoconferencing equipment using Med2VC software. At present, the council is working with the Ensenada Centre for Scientific Research and Higher Education (CICESE) on the Telemedicine Technology Transfer Project.

For more information, consult their website: <www.conacyt.mx>
The National Institute of Public Health

The National Institute of Public Health (INSP) was founded in 1922 and is one of the leading healthcare research and education centres in Latin America. The institute launched its first Virtual Education Programme in 2005, aligning its objective to generate knowledge and innovation in health systems with human resources training for public health care. This programme offers professionals in remote areas, who wish to complete graduate programmes or refresher training courses, a number of educational alternatives.

The INSP has a geographical information system which is designed to be the access and visual interface for statistical information from the Centre for Collection and Analysis of Health Information (NAAIS). This centre uses a number of information sources, for example, demographic information from national censuses, economic data from income and expenditures surveys and social information from marginalization and health indicators obtained from national surveys.

For more information, consult their website: <www.insp.mx>

The Autonomous University of Guadalajara

In 1997, the Department of Medical Informatics, together with the Civil Hospital of Guadalajara, started operating through the University Centre for Health Sciences. The first International Telemedicine Symposium was carried out in February 2010.

For more information, consult their website: <www.uag.mx>

Panamericana University

In 2006, the university launched its first telemedicine initiative through the International Telemedicine and Innovation Symposium. It also created the Rural Generic Telemedicine Project (PROTEGER) and electronic medical record at a rural clinic in the State of Mexico. The First International Symposium on Virtual Medicine was held in 2009.

For more information, consult their website: <www.up.edu.mx>
Autonomous University of the State of Mexico

The Virtual Diploma in Management of Electronic Medical Record Systems was launched in 2009 with the support of the UAEM Fund for Promotion and Development of Scientific and Technological Integration and the Ministry of Health General Directorate for Health Information (DGIS).

For more information, consult their website: <www.uaemex.mx>

University of Colima

The university helped in the field of learning material and immersion in the medical area and online programmes.

For more information, consult their website: <www.ucol.mx>

Metropolitan Autonomous University

This university participated in the development of ICT in health care by means of specialized research at the National Research Centre in the area of medical instrumentation and imaging at the Iztapalapa unit headquarters.

For more information, consult their website: <www.uam.mx>

Overview of Telesalud services in Mexico

<table>
<thead>
<tr>
<th>Institución</th>
<th>Entidades a las que da servicio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEMEX</td>
<td>Tabasco, Campeche</td>
</tr>
<tr>
<td>IPN</td>
<td>Oaxaca, Yucatán</td>
</tr>
<tr>
<td>UNAM</td>
<td>Estado de México, Morelos, Puebla, Querétaro, Guerrero, Colima, Veracruz</td>
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<tr>
<td>UNAM y/o Noroeste</td>
<td>Sinaloa, Baja California</td>
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<tr>
<td>Red del Noroeste</td>
<td>Guanajuato, Durango, Sonora, Chihuahua</td>
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<tr>
<td>Red Independiente</td>
<td>Tamaulipas, Nuevo León</td>
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<tr>
<td>Satélite</td>
<td>D.F., Quintana Roo</td>
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</table>
Political initiatives in Mexico regarding e-Health

More than a decade ago, in 2000, the Mexican government created several policies designed to incorporate Mexico into the information and knowledge society. The e-Mexico National System was established as part of the 2001-2006 National Development Plan. This system aimed to bridge the existing digital divide and increase the country’s competitiveness. Several ministries have been cooperating to realize this goal. The president, Enrique Peña Nieto, announced in 2013 that one of his main ambitions is to provide healthcare to all Mexicans, hereby addressing in particular the most vulnerable. Location should be no impediment for receiving adequate healthcare, hence emphasize will be laid upon medical consultations on distance. Furthermore, he announced that Mexico will soon be a leading nation in technological medical advancement. Investments in e-Health will play an important role in realizing this objective.

In 2007 the Ministry of Health (SSA) started to develop Mexican electronic medical record regulation. The SSA proposed the components of the interoperability model to be implemented between 2007 and 2012. In 2011 the SSA made a document on the use, requirements implementation of the electronic medical record. The SSA plans to implement the electronic medical record firstly for medical doctors individually in a shared program. The second stage is to share the medical information within a hospital department or medical centre. This stage is still very secure and confidential. The next stages are expanding the sharing of content to within the entire hospital, the region or city and finally to have a system that is accessible for doctors and caregivers in the whole nation. These stages will ask for a standardisation of the systems used and require the cooperation of insurance companies, governmental institutions, medical professionals and patients. The electronic medical record will first only contain basic information of the patient and later will be expended to regular medical care and lastly a complete dossier. An outline for the implementation of the electronic medical record is not given in the document, but it clearly emphasises that the Mexican government is very determent of implementing the electronic medical record. The following government of EPN has emphasized that it wants to continue with the implementation of the electronic medical record as it is formulated in the ‘México Digital’ strategy.
Aspirations of the president

The government of President Enrique Peña Nieto had formulated the ‘México Digital’ strategy for its term. The strategy states that it is necessary to make use of the great potential of technology. TIC (tecnologías de la información y la comunicación) should be implemented in various aspects and tasks of the government. Regarding healthcare it concerns a strategy that aims to increase coverage, the accessibility, quality of medical services and to utilize more efficiently the infrastructure and resources of this sector. This will be realized by implementing five strategies: 1) Utilize TIC to synchronize medical databases; 2) Create a single personality within healthcare; 3) electronic registration systems in the national Healthcare system; 4) Create and implement an electronic medical record, an electronic birth certificate and an electronic vaccination card and 5) Utilize medical devices on distance. For the Dutch e-Health industry it is advisable to anticipate at EPN’s plans for the coming years

The first regards incorporating TIC (tecnologías de la información y la comunicación) to realize unification and convergence among the many existent medical systems. In addition, when possessing a clear registration, the coverage could be expanded.

Second, Peña Nieto aims to create a single body of healthcare. This single body of healthcare will also provide information for professionals and unemployed or retired people. This is very ambitious and will take time.

The third involves that the Mexican government desires to create a forum or database that encourages the exchange of medical information between institutions to foster the transition of knowledge and patients conditions. The goal is to improve the national health system and the quality of healthcare.

Fourth, electronic registration systems such as the electronic medical record, the electronic birth certificate and electronic vaccination register will be created. It will register any medical developments of children from the moment they open their eyes. The aim is to provide at least 60% of the new-borns with this electronic birth card in 2014.

Last, Peña Nieto declared to purchase more e-Health equipment that can aid in providing medical services on distance. Prevention key to this approach, as diagnoses will be done in
isolated areas. In addition, the quality of medical services will increase. This means that patients in desolated areas will not have to travel too far for acquiring a diagnosis. Currently, Mexico has 478 units that facilitate this long-distance healthcare. EPN aims to have at least 2500 medical units prior to the end of his term.

The strategies involve the cooperation of SSA, IMSS, ISSSTE, SENER, SEMAR and SEDANA. The office of the President has to make sure that those public entities will work together in order to implement these aspirations.

Please find below an illustration that demonstrates Mexico’s ambitions for the coming years in the field of e-Health.

Please consult the official website of the Mexican government for more information on Peña Nieto’s plans for E-Health: http://www.presidencia.gob.mx/edn/
The e-Health Action Programme

As a result of the aforementioned public policy and considering the 2001-2006 National Health Programme, the Ministry of Health and the e-Mexico National System created an intersectorial working group to develop the first e-Health Action Programme. This group gave rise to the present Inter-agency e-Health Committee, which seeks to connect and integrate initiatives and stakeholders from the public and private healthcare sectors interested in the development of e-Health. EPN stated that this successful programme will continue to operate and be expanded.

The 2001-2006 e-Health Action Programme considers the use of ICT for medical care, public health, research, training, teaching and management of healthcare services. The main objective of this programme is to increase healthcare service efficiency and coverage, while making it available in the remotest regions without sacrificing quality and offering specialized online services that are affordable for the whole population.

Digital Community Centres (CCD)

One of the first actions executed by the e-Mexico National System was to provide Internet connectivity to support services for the different initiatives and sectors involved through the Digital Community Centres (CCD) network. In the case of health care, health centres located in rural communities were incorporated into the Internet satellite services network, highlighting the deployment of medical units belonging to the IMSS-Oportunidades programme. The healthcare sector had 1,025 CCDs in 2007.

The e-Health Portal

Part of the e-Mexico National System’s mission is to bring health care access closer to the citizens through the e-Mexico Portal. The portal is made up of four pillars: eGovernment, eEconomy, e-Health and e-Learning. It also included two major areas: DiscapaciNET and e-Migrantes.
The e-Health Portal was created in 2003 and its aim was to keep the population informed of activities promoting and preventing damage to health, as well as supporting government procedures and management of healthcare issues. In 2006, the e-Health Portal had become the official portal for the e-Mexico National System with the highest number of page views and the second most important portal in terms of overall contents available.
Sources:


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