Chapter 11

E-Health

This chapter examines how broadband-enabled information and communication technologies (ICTs) can improve health care systems in Latin America and Caribbean (LAC) countries. It provides advice on the range of policy options, conditions and practices that policy makers can adapt to their country’s particular circumstances. Accelerating adoption and effective use of these technologies can help meet pressing public health needs and improve access to care. The analysis draws upon the considerable body of recent literature and on lessons learned from LAC case studies. Information is central to health systems, and can be put to a wide range of uses. Broadband networks and broader ICTs that permit timely and accurate collection and exchange of health data can also enhance co-ordination of care and more efficient use of resources. The chapter shows how various policy dimensions must be addressed to realise the potential gains from e-health through improved use of broadband and the ICTs it supports.
This Toolkit surveys the many economic and social benefits broadband can bring to the Latin America and Caribbean (LAC) region. One area where it can realise significant gains is in facilitating the development of e-health. Telemedicine is not a new phenomenon, but broadband connectivity allows professionals to share data in new ways and overcome the barriers of distance. Meanwhile broadband networks, coupled with devices such as smartphones and the Internet of Things (IoT), can help health care professionals and individuals meet some of the challenges they face in everyday care and prevention. The fundamental benefit of broadband networks is that they can connect advances in the health care industry, whether transporting new imagery for diagnostics or even using virtual reality so that professionals and individuals can interact remotely. All these new developments require more bandwidth, which broadband networks can provide.

The use of information and communication technologies (ICTs) in general in the health sector, and broadband in particular, can result in care that is of a higher quality, safer and more responsive to patients’ needs, as well as more efficient (appropriate, available and less wasteful). Its advocates point to the potential reduction in medication errors as one critical advantage. There is also growing evidence that ICTs are essential for improving access to health services, particularly in rural and remote areas where resources and expertise are scarce or even nonexistent. This can help support the development of new, innovative models of care delivery over broadband networks (OECD, 2010).

Many e-health initiatives are emerging in Latin American and Caribbean (LAC) countries. The term e-health is understood here as the application of ICTs throughout the health system: educating and informing health care professionals, managers and consumers/patients; health promotion and prevention; improved care and innovation in health care delivery; and better performance in health systems, by informing programme, policy and funding decisions.

Despite their tremendous promise, incorporating ICTs into daily use has generally proven difficult. Taking advantage of the potential gains of ICTs requires careful planning, significant investment in infrastructure and collaboration between stakeholders. Understanding the challenges of adoption and effective use of ICTs across these various functions, and their broader economic effects, can help increase their penetration and realise the potential benefits. In order to encourage wide-spread adoption, a robust, balanced approach to privacy and security is essential to establish the high degree of public confidence and trust needed for health ICTs, and particularly electronic health records.

The main objective of this chapter is to contribute to a greater understanding of the role of telecommunication and broadband infrastructure in advancing e-health services. A particular focus is on compensating for physician shortages and closing the urban-rural gap in the LAC region. The availability of electronic health records over high-speed networks, for example, can reduce waste, improve patient outcomes and cut costs. Telemedicine
applications that make possible clinical care in real time, bringing together geographically
distant patients and providers, can help deliver the highest quality care to even the most
remote communities. Remote monitoring by broadband can facilitate post-operative care
and chronic disease management without hospitalisation or institutionalisation. The aim
of this chapter is also to contribute to the development and use of indicators to measure
progress and identify good practices in e-health, within the broader digital agenda framework
of LAC countries.

The following sections briefly review LAC countries’ efforts and current perspectives
on the state of health ICTs in the region, and the economic and social benefits that
can be realised. While no study has yet estimated the total cost savings possible from
broadband-enabled projects, the results of a variety of small programmes in the region
make clear the potential. The chapter then highlights areas that can be useful for sharing
information and developing indicators to monitor progress, presenting international
comparisons. It analyses specific examples of e-health applications in a number of
LAC countries, taking into account their main health needs and policy objectives. It
outlines the challenges of implementation and how countries have managed to resolve
bottlenecks. Concrete examples, taking into account local contextual issues, such as
public health needs or the extent of broadband infrastructure development, can support
decision-making on e-health initiatives and enhance health and living conditions in
the region.

Key policy objectives for the LAC region

ICTs are used to enhance health care systems in numerous ways. The main high-level
policy objectives include the following:

- **Efficiency gains and cost reduction.** The introduction of ICTs can improve the value created
  in the health sector (OECD, 2010), specifically, in efficiency gains and cost reduction. The
  most frequently cited advantage is the reduction of unnecessary health care services. For
  example, electronic health records (EHRs) can facilitate evaluation of health care
  interventions and their quality at practice level, and facilitate clinical research and
  public health planning. ICTs can also be used to provide the information for incentive
  programmes, such as pay for performance.

- **Improved access and health care delivery, supporting the goals of universal care coverage.**
  ICTs can improve the quality of care and make care more responsive by enabling timely
  access and supporting the goals of universal care coverage. Tele-health is increasingly
  seen as an important way of optimising continuity in care and improving access to health
  services, particularly in rural and remote areas where health care resources and expertise
  are scarce or even nonexistent.

- **Reduced medical errors and improved patient safety.** ICTs can prevent medication errors
  by making it easier for health care professionals to acquire and share information about
  patients. Electronic drug prescriptions (e-prescribing) can, for example, be integrated to
  check for patient information on any history of adverse drug reactions (ADRs).

- **Improved prevention and management of chronic diseases.** ICTs can also play an important
  role in increasing compliance with clinical care guidelines – or protocol-based care – which
  is particularly valuable in the management of chronic diseases such as asthma, diabetes
  and heart failure. It can also improve care co-ordination, which is essential for improving
  clinical outcomes in chronically ill patients.
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- **Improved data sharing for infectious disease monitoring.** ICTs, especially mobile devices, can enhance health workers’ ability to ensure that cases are diagnosed, reported and managed effectively. It can particularly help by facilitating adherence to treatment.

  Progress in these policy objectives can help make health systems more responsive to the patients they serve, while increasing their efficiency and sustainability. With this in mind, the Pan American Health Organisation’s (PAHO) 51st Directing Council passed a resolution adopting the “Strategy and Plan of Action on eHealth”. The Council approved the resolution with the goal of ensuring the sustainable development of member states’ health systems through the application of health care based ICTs and to achieve “substantial cost savings through effective and efficient health services delivery and epidemiological surveillance” (PAHO, 2011).

**Tools for measurement and analysis in the LAC region**

Complex challenges lie ahead in achieving widespread broadband adoption and leveraging ICTs to improve care. Many countries hope to learn from others’ successes and failures to inform their own policy development. This requires a shared understanding of terms and harmonised approaches to measuring availability, adoption and effects. This section focuses on efforts to measure ICT availability and use.

Since 2008, the OECD has led an effort to gather reliable statistics to compare ICT development and policies in the health sector (Adler-Milstein et al., 2014). This can help governments understand the barriers and incentives to ICT use and to realise the far-reaching economic and social benefits of their application. A model questionnaire was completed and published in 2013 (OECD, 2013a). Part I of the survey is addressed to general/primary care/family practitioners in ambulatory settings, and Part II to chief information officers and administrators in acute care settings. Indicators are grouped into four broad domains in which measurement of availability and use are policy priorities for most countries:

- **Provider-centric electronic records.** Systems used by health care professionals to store and manage patient health information and data, including functions that support the care delivery process (e.g. electronic medical records, or EMRs, EHRs, or electronic patient records, or EPRs).

- **Patient-centric electronic records.** Systems typically used by patients and their families to access and manage their health information and organise their health care (e.g. personal health records (PHRs), patient portals and other patient-centric electronic records).

- **Health information exchanges.** The process of electronically transferring (or aggregating and enabling access to) patient health information and data across provider organisations (e.g. e-transfer of patient data between ambulatory care providers or e-transfer of data at the regional level).

- **Tele-health.** A broad set of technologies that support care between patients and providers, or among providers in different locations (e.g. video-mediated consultations between physicians and patients, remote home monitoring of patients, teleradiology).

Further guidance on implementation is available in the *Draft OECD Guide to Measuring ICTs in the Health Sector* (OECD, 2013a). Some of the experiences in implementing the model survey, including in LAC countries, are reviewed below (Box 11.1).
Box 11.1. **Implementing the OECD model survey on e-health**

Since 2013, several countries have begun piloting the OECD model survey and/or mapping information from existing surveys and administrative data sources to indicators that would be derived from the model survey. Related data for additional countries is available in surveys of primary care physicians conducted by the Commonwealth Fund and of primary care physicians and hospitals commissioned by the European Commission.

The OECD model survey was also used as input for the development of a framework for the collection of ICT statistics by LAC countries. In particular, Brazil has been co-operating with the OECD through the Regional Centre for Studies on the Development of the Information Society (CETIC.br) since January 2012. In 2013, Brazil became one of the first countries to pilot the draft model survey questionnaire. The survey was administered to a probabilistic sample of public and private health care facilities, as well as to health care professionals (physicians and nurses). The results have made it possible to map the ICT infrastructure, the use of ICT systems and applications, and activities, motivations and barriers preventing the use of ICT by health care professionals. The use of this Health Survey has institutional and methodological support from an expert group composed of representatives from the government, academia, organisations from civil society and international agencies.

In 2014, the Government of Uruguay also started to collect data on ICT in the health care sector, as part of the Salud.uy programme, its national e-health strategy. The methodology is aligned with the OECD model survey and the Brazilian pilot project. The questionnaires were sent out between March and June 2014. The overall objective was to establish a baseline for the extent and quality of access, use and appropriation of ICT in the management of health service providers in Uruguay, as well as gaining insights on the appropriation of these technologies by health care professionals.

Building on OECD, Brazilian and Uruguayan experience, the ICT Working Group of the Statistical Conference of the Americas (SCA) of the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) produced a model survey in 2014 for measuring ICT access and use in the Latin American health care sector.

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**Overview of the situation in the LAC region**

In the last few decades, public spending in the social sectors in LAC has grown significantly. According to the United Nations Economic Commission for Latin America and the Caribbean (CEPAL, 2012), the region spent USD 461 per capita in 2005 on average around 1990, compared to USD 1 026 per capita by 2010. Public spending on health, education and social protection increased from 11.2% of GDP in 1990 to 18.6% of GDP in 2010. Growth of health spending and its long-term sustainability have, thus, become important issues on the political agenda of LAC countries, as growth in public spending puts pressure on budgets, provision of health care and household spending. This growth can be explained by several factors. Some are structural, such as the ageing of the population, urbanisation and the increasing availability of advanced medical technologies. Others are related to policy and the overall performance of health care systems.

Health care administrators and policy makers across the LAC face major questions regarding the allocation of scarce health care resources. LAC governments have a wide range of policy tools available to control the escalation of costs. “Command-and-control” policies, such as accepting a decline in the quality of services, a decline in the number of interventions or diseases covered, or a change in the balance between what is funded through the national budget and what people pay out of pocket can hold expenditures down
in the short term, but they often have unintended consequences in the long term. Many LAC countries already have high levels of out-of-pocket spending. In Brazil, for example, for the lowest 40% of the population, almost three-quarters of out-of-pocket spending is attributable to pharmaceutical spending. Such policies, moreover, do little or nothing to moderate the underlying pressures that continue to push health spending up. Other promising avenues are available for controlling health spending in the longer term. Improving the quality of health care, reducing duplication of services, increasing patient safety and co-ordinating care across health care settings can all help control costs. Shifting care out of expensive, acute care settings and into the community and the home has also gained greater acceptance as the prevalence of chronic diseases (and often multiple chronic diseases) increases in ageing populations. Recent evidence suggests that ICTs can play a critical role in achieving these goals.

In 2011, when the Directing Council of PAHO adopted Resolution CD51.R5 on eHealth, it urged the PAHO Secretariat and its member states to respond to public health challenges in the region by creating an environment that enables the use of innovative ICT tools and methodologies. Specifically, Resolution CD51.R5 called on member states to “promote internal dialogue within and co-ordination between ministries and other public sector institutions and encourage the forging of partnerships between government, the private sector, and civil society as a means of building national consensus and facilitating the sharing of experience on cost-effective models” (PAHO, 2011).

The general finding based on analysis of OECD/IDB questionnaires returned by LAC countries and the literature is that most of the LAC region is still at an early stage of health ICT adoption and use. One of the main obstacles to implementing e-health in the region is the lack of professionals with the skills and experience to develop and execute e-health projects (WHO, 2014d). Another important obstacle in the LAC region has been the deficiencies in the technology infrastructure due to instability of connections, limited spectrum, bandwidth and elevated costs of services (often with high upfront costs).

Health care systems in some LAC countries still face severe challenges that limit access to health, such as lack of information, lack of services, distance to services, or household budget constraints. The challenge in these countries is to expand the basic coverage and access to care to most of the population, particularly in rural areas, in a fiscally sustainable way. These countries face a dilemma: short-term and long-term policy priorities may point in different directions in relation to resource allocation. Without solid evidence on which to base decisions, spending on ICTs for health may become a matter of opinion – and often a political gamble. Policy makers therefore need a clear view of the “theory of the case”: that is, better evidence why they should support widespread use of ICTs in health care and how best to do this in the face of other priorities. The collection of reliable statistics on quality of care as well as on availability and use of ICTs can be helpful in guiding resource allocation decisions.

**Good practices in the LAC region**

This section includes countries that already have or are in the process of implementing e-health strategies. In some aspects, they can be considered the most developed in the LAC region. However, it is recognised that many pilot or other initiatives are in place in other countries of the region and are probably not reported in the official literature.
The sections below provide examples of how e-health applications can achieve the four policy objectives noted in the previous section.

**Improved mother and child care**

LAC countries face a variety of obstacles to improved maternal health: cost-effective e-health interventions can dramatically reduce maternal mortality. In the past 20 years, the LAC region has made significant advances in improving maternal health, and mortality rates have fallen over 40%. Many LAC countries have reached or exceeded the Millennium Development Goal (MDG) to reduce the maternal and child mortality rate, and many have or will soon achieve the new global goal of ending preventable child deaths (defined as an under-5 mortality rate [U5MR] of 20 deaths per 1,000 live births).

Coverage of antenatal care in the LAC region is one of the highest among all developing regions. In 2014, as many as 97% of pregnant women received at least four antenatal care visits during their last pregnancy, a substantial increase from 75% in 1990. National averages often, however, mask local inequalities (UNICEF, 2011). The child mortality burden still varies considerably within countries and can be high in pockets, even when, on average, a nation is doing well (Belizán et al., 2007). In LAC countries, over 180,000 children under 5 years old and nearly 9,000 mothers still die annually, most of them among poor, indigenous and marginalised groups (PAHO, 2012). Maternal mortality in the Caribbean remains particularly high, with 190 maternal deaths per 100,000 live births in 2013. And although Latin America has a much lower maternal mortality ratio, with 77 maternal deaths per 100,000 live births in 2013 (UN, 2015), maternal mortality ratios are 10-44 times higher in the poorest provinces of several countries in Latin America. LAC countries have also made slow progress in reducing adolescent childbearing, with the adolescent birth rate remaining high, at 73 births per 1,000 girls in 2015 (Pérez-Lu et al., 2015).

Information technology can play an essential role in supporting strategies to reduce maternal and child mortality, delivering information, facilitating access to care and enabling evaluation to better deliver timely resources. Two initiatives in the LAC region, one based in Peru and the other in Guatemala, have been operating successfully for over five years to support maternal health (Box 11.2). These initiatives found momentum from the Every Woman Every Child global movement launched by the United Nations’ Secretary-General Ban Ki-moon during the United Nations Millennium Development Goals Summit in September 2010, leading, in turn, to the creation of an accountability framework with three interconnected processes – monitoring, review and action, focused on countries that account for 98% of the world’s maternal and child mortality.

In 2013, the World Health Organization (WHO) and the International Telecommunication Union (ITU) ran a joint survey that explored the use of eHealth for women’s and children’s health, including in Peru and Guatemala. The report highlights the gains that have been made and offers them as models that other countries can emulate. It also shows, however, that effects on outcomes from e-health initiatives are not immediate. Many difficulties, dilemmas and barriers stand in the way of further progress. In the case of TulaSalud, change was noticeable only two years after the start of the programme, which indicates the need for sustained support and long-term political commitment in health support via mobile phones (m-health) and telemedicine projects for obtaining significant returns on investment (WHO, 2014a, 2014b).
Box 11.2. Examples of applications of tele-health and mobile phone health (m-health) to mother and child care

Peru's WawaRed Maternal

The WawaRed Maternal is a project led by the Universidad Peruana Cayetano Heredia. It was launched in 2010 with the support of the Inter-American Development Bank (IDB) and the International Development Research Centre (IDRC-Canada). It consists of three fundamental components: electronic health records for prenatal care, text messaging (SMS) and an Interactive Voice Response (IVR) system. Messaging is personalised and tailored to the health profile and gestational age of the patient. SMS content includes information on the importance of vitamins, nutrition, motivational messages, warning signs and reminders about the date of an appointment and other important information during the gestation period. The interactive voice response system consists of a telephone exchange with pre-recorded voicemails with information about warning signs and instructions for when patients should seek health care. WawaRed Maternal has been implemented in the region of Ventanilla-Callao in Peru (population 300,000); the local health jurisdiction has 15 health centres and one hospital. The system has found great success and acceptance among users; the implication of messaging for the outcomes of pregnant women is currently being evaluated in a randomised trial.


Guatemala’s TulaSalud for reducing maternal and infant mortality

With a Human Development Index (HDI) of 0.581, Guatemala is considered one of the least developed countries in Latin America. The country is divided into 22 administrative departments. Alta Verapaz is one of the largest, with 1.2 million inhabitants, 78% living in rural areas, 89% indigenous communities and 48% living in extreme poverty. In 2012, the maternal mortality rate in the department was 273 deaths per 100,000 live births. The main causes of death are hypertensive disease and postpartum haemorrhage. TulaSalud was established to address these high rates of maternal and child mortality. The initiative leverages the potential of m-health. It is based on the provision of a cell phone to community facilitators (CFs), volunteers in rural communities who perform health prevention, promotion and care. The programme also leverages the potential of mobile phone health for distance medical consultations and for community health promotion and prevention. With cell phones, the CFs are able to carry out consultations; send full epidemiological and clinical information related to the cases they attend to; receive continuous training; and help in prevention and promotion of community health through distance-learning sessions. Simple and actionable reports and maps are produced daily, aimed at improving the effectiveness and efficiency of clinical monitoring (e.g. making sure women are receiving timely and appropriate prenatal care and counselling) or at improving the effectiveness and efficiency of health worker monitoring (e.g. making sure CFs are interacting with local communities as expected and investigating any potential issues).

From 2008 to 2012, TulaSalud monitored 6,783 pregnant women and coordinated 2,014 emergency transfers, 298 of which were high risk pregnancies and 235 for children under the age of five. A control study showed that the populations involved in the m-health programme (TulaSalud) presented a significant reduction in maternal mortality (p<0.05) compared to the group served by community facilitators without ICT tools.

Empowering consumers/patients through health literacy

Information is a key factor for preventing diseases and improving health. Health literacy is still a challenging issue in both developed and developing countries. It can be defined as “the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions” (Bohlman, Panzer and Kindig, 2004). ICTs are a fundamental resource that can provide citizens health and wellness information. Given the recent developments in mobile health applications and social media, ICTs are now uniquely positioned to deliver prevention and wellness messaging, to help people change their lifestyle and behaviour to prevent diseases and to maximise well-being.

E-health promotion strategies today include a wide range of solutions, including the creation of websites, dedicated portals, social networks, SMS text messaging, etc. Recent studies and reviews indicate, for example, that SMS may be an effective low-cost method to promote sexual education and healthy behaviour among young people. Web 2.0 is particularly attractive to participants because of the potential of receiving individualised tailored feedback. Governments in LAC are also gradually using mobile health apps and online platforms to deliver medical information to consumers, promoting the healthy lifestyles and behavioural change often required to manage specific health conditions, particularly in vulnerable populations (Box 11.3).

E-health promotional initiatives hold much promise, but might suffer from the problem of a loss of users over time. Some users’ motivation tends to drop off after their curiosity has been satisfied by using the app a few times. Systematic research to examine both the effectiveness and the level of public participation in such programmes should include descriptive and predictive knowledge about active participation. Developers and researchers need to move beyond a narrow focus on early adopters and produce a population perspective on recruitment and retention of participants.

Improving the management of chronic non-communicable diseases (CNCDs)

The burden of disease worldwide has shifted in the past 20 years from infectious conditions to chronic non-communicable diseases (CNCDs) that are often the result of unhealthy lifestyle choices and environments: heart disease, stroke, diabetes, chronic neck and back pain, cancer and depression (IHME, 2013). Populations are ageing and many people are living longer, with multiple morbidities and disabling conditions. Since 1970, the average age at death has risen by 35 years worldwide, with gains in life expectancy throughout the globe.

For most of the 20th century, LAC countries had youthful populations, and it was not until the 1980s that the proportion of the population under 15 years dropped below 40%. In 2010, less than 30% of the population was under 15 years old, while the percentage of those of 65 years and over was around 7%, having been at most 5% for most of the century. In the next 40 years, however, a dramatic rise is expected in the number and proportion of older people in the region. By 2050, 22.5% of Brazil’s population and 22.1% of Mexico’s will be 65 and over. By 2050, according to recent forecasts, only in Guatemala will that segment of the population account for less than 10%.

In 2014, PAHO reported that annually, almost 4 million people in the region of the Americas die from NCDs, comprising 76% of all deaths. More than one-third of these deaths are premature (occurring before age 70), and most are preventable. Important CNCD risk
factors in the region are hypertension (affecting 20%-40% of the population); obesity (affecting 26% of adults, more than any other region); diabetes (affecting 5%-10% of the population); and tobacco use (about 22% of the population) (WHO, 2013; PAHO 2013).

Box 11.3. E-health promotion initiatives in LAC

**Colombia:** From 2002-2005, the teenage pregnancy rate in Colombia was estimated at 90 births per 1,000 women (79 per 1,000 in urban communities and 128 per 1,000 in rural populations). This rate is one of the highest in Latin America. In 2006, the Fundación Santa Fe of Bogota started a web-based medical counselling programme called "Doctor Chat". It is a free-access online consulting service in Spanish that allows them to submit health-related inquiries and receive personalised, accurate responses from a group of well-known physicians after submitting a simple, Internet-based form. The programme allowed unrestricted open discussion on sensitive topics such as sexually transmitted diseases and sexual risk behaviours.

The pilot phase of this project uncovered a particular need for information on sexual and reproductive health. The Fundación concluded that the expansion of the service to new platforms could help to lower the rate of teenage pregnancy in Colombia and the spread of disease, through innovative educational services. The web-based, mobile teleconsultation platform for DoctorChat was designed and developed in partnership with a software development group from the Universidad de los Andes, a private university in Colombia. Although the rate of the use of the service is inconsistent, user-satisfaction surveys indicate that such strategies are well-accepted among young adults.


**Mexico:** Part of the mission of the e-Mexico National System is to bring health care closer to citizens through the e-Mexico Portal. This includes four pillars: eGovernment, eEconomy, e-Health and e-Learning. It was created in 2003 to raise public awareness of activities promoting healthy lifestyles, as well as to support government procedures and management of health care issues. By 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. The Mexican Association for the Fight Against Cancer, a nonprofit organisation, has successfully used the portal to promote awareness of cancer symptoms and help reduce cancer mortality rates.

In the LAC region, more than 100 million adults are hypertensive, with rates among the highest in the world (Kearney et al., 2005). Most adults with hypertension and other CNCDs rely on primary care for disease management. However, many LAC countries still have weak primary care systems that lack capacity and resources to help patients effectively treat these conditions. This situation will become even more acute with the ageing of LAC populations.

The sustainability of LAC health care systems thus critically depends on improving the quality and efficiency of care for chronically ill and ageing populations. More productive interactions and better outcomes will require a major transformation of practice, combining redesign of delivery systems, better use of technology for real-time decision making and patient self-management support (Table 11.1).
Table 11.1. Implications of demographic change and the increasing burden of chronic conditions

<table>
<thead>
<tr>
<th>Demographic change</th>
<th>Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>An ageing population</td>
<td>The effect on overall demand will depend on trends in disability, but the nature of the care required will shift toward long-term patient-centred conditions and home-based support services.</td>
</tr>
<tr>
<td>Significant growth in the number of patients living with chronic conditions</td>
<td>New models are needed to manage care and prevent acute conditions, by pro-actively planning care in a primary/community-based setting and promoting patient self-management.</td>
</tr>
<tr>
<td>Increased incidence of multiple complex symptoms and comorbidities</td>
<td>Greater co-ordination across the continuum of care will be required.</td>
</tr>
<tr>
<td>Workforce availability</td>
<td>The ageing of the workforce and increased demand will affect workforce availability. It will also require the effective use of health practitioner skill sets, and investment in information technology and primary/community-based infrastructure.</td>
</tr>
<tr>
<td>Greater prevalence of chronic conditions and lifestyle choices</td>
<td>Need to make greater use of patients’ personal resources and self-management.</td>
</tr>
</tbody>
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In view of these resource constraints, innovative e-health care models to improve patient monitoring and self-care support are especially important (Box 11.4). Since m-health services have low marginal costs and high availability, they have the potential to reach large numbers of patients between in-person clinical encounters. The LAC region has 109 mobile phone subscriptions per 100 population (ITU, 2014), which highlights the potential for conducting health interventions using these devices.

Many studies have shown that m-health services, including short-message service (SMS or text messaging) and interactive voice response (IVR) calls, can improve NCD self-care support (McMellon and Schiffman, 2002). Text messaging, in particular, is a powerful tool for behavioural change because it is widely available, inexpensive and instantaneous. Its potential is growing as more features become available on smartphones.

The progression of chronic disease often involves unpredictable changes in symptoms and physiological risk factors. Patients, particularly those with diabetes and hypertension, may report very good health when visiting ambulatory care and suffer poor health a few weeks later. Regular in-between-visit follow-up via IVR or other m-health tools is useful to catch emerging problems before they become acute. Local language content is as essential as connectivity to offer meaningful opportunities for NCDs self-care. It must also be recognised that seniors are generally less at ease with ICTs.

**Solutions for improved infectious and parasitic disease management and monitoring**

Infectious diseases are the world’s leading cause of death for children and adolescents. They are also the second leading overall cause of death, after heart disease. Continuous outbreaks of infectious diseases have been reported in the past decade in the LAC region. In particular, the disease burden from neglected tropical diseases (NTDs) is high in the region. Most NTDs are chronic and disabling parasitic infections such as the intestinal helminth infections, schistosomiasis, lymphatic filariasis, food-borne trematode infections and onchocerciasis, as well as selected bacterial and viral infections such as trachoma and dengue. In Brazil alone, NTDs affected approximately 20 million people in 2008 (Hotez, 2008, 2010).
**Box 11.4. Examples of e-health solutions for the management of non-communicable diseases**

The Plurinational State of Bolivia (hereafter “Bolivia”) has a population of 10.5 million, 51% of whom live at or below the poverty line and 35% live in rural areas. Since the passage of national reforms in 2007, all Bolivians have a legal right to access health care. However, due to economic, geographical, cultural and social barriers, 77% of the population still reports limited access to basic health care. In 2013, the Institute of Applied Engineering at the Universidad Católica Boliviana in La Paz and the Servicio Departamental de Salud initiated a multi-year project to better understand how m-health interventions could help Bolivian health officials improve patient monitoring and self-care support. The aim was to adapt to the Bolivian context an m-health platform for non-communicable disease (NCD) self-management support, developed at the University of Michigan, and to test the efficacy of an IVR platform, an automated telephony system that gathers information and routes calls to the appropriate recipient.

A 2013 survey indicated that the IVR programme was associated with better medication adherence and overall outcomes, 95% of participants reporting that they would recommend the system to a friend. However, 37% of survey respondents with diabetes or hypertension reported that they speak a non-Spanish language in the home (an estimated 35% of people in Bolivia speak the indigenous languages of Aymara or Quechua). Translation of programmes into the language in which patients are most comfortable is necessary in order to not miss opportunities to have a meaningful effect on NCDs self-care. In addition, older adults tend to have greater difficulties understanding how to navigate IVR systems.

**Chile’s COSMOS Project: System for Monitoring and Mobile Communication in Health (SCSM)** was led by the Pontificia Universidad Católica de Chile’s Nursing School in Santiago. The goal of this year-long project, conducted in Puente Alto in 2011, was to design a mobile communication and monitoring model, to improve timely diagnosis and initiation of treatment for Type 2 diabetes. The system includes personalised communication, automated voice communication and automated written communication, using SMS. The study included 102 patients (73.5% women, of a mean age of 50.95 years, SD = 8) in Puente Alto for 13 months (from February 2011 to March 2012). Results indicated that 87.5% of the patients had undergone diagnostic testing within the past 45 days (primary outcome) and 96.1% within the timelines set for the project.

**Colombia: SINCan Project (Sistema de Información Nacional en Cáncer).** Established in 2012, Colombia’s National Cancer Information System combines and processes data from different sources to provide the information needed both for planning health services and investigating the causes and determinants of cancer. The programme is consistent with the Ten-Year Plan for the Control of Cancer in Colombia 2012–2021. The SINCan programme aims to address not only the needs of patients, health workers and health system stakeholders but also of their families and caregivers. The SINCan system offers include alerts, information support for policy planning and support for other strategies to improve the quality, access, timing and outcomes of patient care.


**Source:** Rivillas et al. (2014), "Advances in eHealth in Colombia: Adoption of the National Cancer Information System", www.ncbi.nlm.nih.gov/pubmed/25211575.
Due to the diversity of diseases included in the grouping, NTDs have a wide array of symptoms, including blindness, growth delays, anaemia, organ damage, increased risk of complications during childbirth, increased risk of endangering the mother’s health, loss of limb function, cardiac failure, arrhythmia and disfigurement (Lindoso and Lindoso, 2009). These symptoms greatly reduce quality of life, especially because those most affected belong to the lowest socio-economic class. Only with combined intervention, including early detection, prevention and measures to inform and promote education, can appropriate control be achieved (CDC, 2016; Shapiro et al., 2011; WHO, 2014c).

Infectious and parasitic disease control programmes require good information on local epidemiology, as well as on the organisations operating in the area and the services provided. Mobile phones have the potential to **support informal infectious disease surveillance networks in LAC countries**. One example is Alerta DISAMAR in Peru, directed to Navy personnel, which has collected information on more than 90,000 cases and 31 disease outbreaks since its inception in 2003. While some e-health solutions to follow patients affected by NTDs are now available in the LAC region (Box 11.5), effective scale up still requires: open standards for data storage and exchange; increased interoperability between EMR systems, lab systems, pharmacy systems and mobile health systems; and a shift from vertical disease-specific designs. Finally, it is especially important that systems and strategies are **developed collaboratively** to encourage local development, innovation and support.

**Improving access to care through telemedicine**

Tele-health is increasingly viewed as an important tool for optimising continuity in care and improving access to health services, particularly in rural and remote areas where health care resources and expertise are scarce or nonexistent. Data exchange through telemedicine can be asynchronous or synchronous. Asynchronous data collection and transmission is less demanding and can be done on 3G mobile networks, because speed and latency are less relevant. Data-intensive real-time monitoring, on the other hand, demands high upload and download speeds.

The **role of reliable and affordable infrastructure** in advancing e-health is most evident when dealing with telemedicine practices, due to its bandwidth requirements. For telemedicine, the lack of high bandwidth broadband infrastructure is perhaps the most important obstacle to its widespread implementation. Policies to improve access to health care to ICTs should aim to overcome this barrier, such as by including telemedicine considerations, goals and indicators in their broader broadband plans, to realise the potential of e-health and telemedicine.

The lack of high-speed connections required for high-intensity services can often be circumvented by the store-forward method of delivery for services that do not require live communication. Teleradiology is an example of a high-intensity service that does not require synchronous communication and can often be conducted using the store-and-forward method.

Telemedicine services can be mapped into four quadrants based on the **intensity of the information exchanged** between participants of the telemedicine process (usually measured by the size of the files used, speed/resolution of the video required, etc.) and **duration of the service delivery** (Figure 11.1). Low-intensity services are typically delivered via low-speed connections. The typical teleconsultation encounter, involves usually a short, intensive session between a clinician and a patient. The consultation process however, often requires continuous and frequent monitoring of the patient’s functionality to test the delivered therapy and/or adapt it to the patient’s progress.
Traditional telemedicine, such as teleradiology and telepathology, mostly falls into the high intensity/short duration quadrant. This type of service requires very reliable high-speed connections. It usually involves a short, one-time encounter that either does not repeat or only repeats a few times. At the other end of the spectrum, chronic disease management involves monitoring over long periods. The interaction and communication in chronic disease management is usually of low intensity. Chronic disease management using telemonitoring can thus be categorised in the low intensity/long duration quadrant. Telerehabilitation services also require continuous interaction over a long time span. The LAC region has seen a number of telemedicine initiatives of varying intensity and duration. (Box 11.6).

Box 11.5. Improved infectious disease management and monitoring
Peru: Electronic Medical Record System to support multidrug-resistant tuberculosis (MDR-TB) treatment

Tuberculosis (TB) is a leading cause of death and disability in developing countries and continues to be a public health threat worldwide. Multidrug-resistant TB (MDR-TB) is recognised as a major and growing threat to health worldwide, with a large incidence reported in the LAC region. Peru has the highest incidence of TB in Latin America and in the last decade, around 3% of patients were diagnosed with MDR-TB. MDR-TB is a complex disease that predisposes to chronicity. It generally requires two or more years of treatment, with complex and often toxic drug regimens. The scale-up of treatment requires a long-term relationship with the patient, accurate and accessible records of each patient’s history, and methods to track patients from initial diagnosis and throughout their treatment. This can be best achieved with the implementation of based electronic medical record (EMR) systems.

For this purpose, supported by the Bill & Melinda Gates Foundation and subsequently the Global Fund for AIDS, TB and Malaria, the Partners in Health (PIH) developed a web-based EMR system in 2000. The system was set up and managed by Socios en Salud (the PIH sister organisation in Peru) and expanded to support the management of patients in the National TB programme (NTP), ultimately handed over to the Peruvian NTP in 2007. The goals of the PIH-EMR were to: support direct clinical care, teleconsultation and quality improvement, allow reporting to funders, the NTP and WHO, support clinical research, and improve medication management, including prescribing, dispensing and forecasting of requirements. Customised tools have since been developed for data quality control, clinical data access and data analysis.


Colombia: Dengue eMocha

The electronic Mobile Open-source Comprehensive Health Application (eMocha) is a free, open-source application developed by the Johns Hopkins Center for Clinical Global Health Education, used on smartphones for the prevention of dengue fever. It provides real-time information on ecological, biological and social indicators to evaluate interventions and reduce dengue vectors. Field workers can conduct surveys, gather geographic data and collect water samples. The encrypted information is then sent to a server for review and analysis. As of May 2013, 4,419 households in Colombia had been visited and 10,913 water containers examined and sampled. Advantages of using eMocha include reducing the time needed to identify, act and implement preventive measures.

Figure 11.1. **Telemedicine service according to intensity of information exchanges and duration of the sessions**

- **Low intensity**
  - Teleconsultation
  - Telerehabilitation
- **High intensity**
  - Telemedicine
  - Teletherapy


**Box 11.6. Improving access to care through telemedicine in LAC countries**

**Brazil: TelessaúdeRS**

The TelessaúdeRS is a research project conducted by the Graduate Programme in Epidemiology at the School of Medicine of the Federal University of Rio Grande do Sul. The main purpose of the project, established in 2007, is to support GPs through teleconsultations (clinical problem-solving and medical regulation), telediagnosis, tele-education, and the delivery of remote care. From 2007 to September 2015, 15 536 health care professionals from 1 241 primary care services in 497 municipalities in the state of Rio Grande do Sul were registered as users of TelessaúdeRS. During this period, 31% of the registered users, as well as 86% of the primary care units and 88% of the municipalities, had submitted at least one request, for a total 15 441 queries, of which 85% were asynchronous and 15% were synchronous (e.g. Voice over IP [VoIP]). The highest number of requests came from nurses (36%), community health agents (25%) and physicians (15%). Limitations for the expansion of TelessaúdeRS include infrastructure and uncertainty over the legal framework and regulations.


**Peru’s Enlace Hispano-Americano de Salud telestethoscopy project**

Acute respiratory infections are the leading cause of childhood mortality. The lack of physicians in rural areas makes their correct diagnosis and treatment difficult. The main goal of the Enlace Hispano-Americano de Salud (EHAS) Foundation was the development of a telestethoscope system that allows a physician to receive real-time cardio-respiratory sounds by remote auscultation, as well as video images showing where the technician is placing the stethoscope on the patient’s body. The system was tested in Peru in 2013, between Santa Clotilde health center and Loreto Regional Hospital, over a 180-kilometre-long wireless network. The project has since been launched in the Napo River area to remotely monitor cases of acute respiratory infections and provide second opinions on cardiology patients. Several studies have documented the positive impacts for patients and health care personnel.

Box 11.6. Improving access to care through telemedicine in LAC countries (Cont.)

Guatemala’s Healthy Pregnancy Project

Another project demonstrating the uses of telemedicine is the EHAS Healthy Pregnancy project in Guatemala. This equips nurses with a portable ultrasound, a folding solar panel (for battery charging) and a system for blood testing. The goal is to detect early obstetric complications (foetal malposition, placenta praevia, infections and anemia) and delivery risks that cannot be carried out in rural centres without medical assistance. A study of 1,000 pregnant women was successfully completed in 2013, significantly reducing neonatal (65%) and maternal (100%) mortality.


Venezuela’s SOS Telemedicine programme

Venezuela’s SOS telemedicine programme at the School of Medicine of the Central University of Venezuela (UCV), funded through the Organic Law of Science, Technology and Innovation, is designed to provide expert support to health professionals and students working in primary care facilities. The aim is to improve access to medical services and offer consultations with specialists to patients who cannot easily visit specialists. The programme offers teleconsultations and telediagnosis free of charge, provided by qualified professors in various medical specialties. The service also helps health care personnel improve the quality of diagnosis and care.


Panama’s Telemedicine Programme

Telemedicine in Panama dates back to 1998, when the Medical School of the University of Panama created the Medical Documentation and Information Centre (CDMI). Remote stations were created in Chiriquí, Santiago, Chitré, Aguadulce, Penonomé and El Valle, with support from the Ministry of Health and the Fundación para el Apoyo al Diagnóstico (FADDoM). Using a patient information record, the remote stations request assistance from CDMI, thus making it possible, through a computerised network, to obtain evaluations and diagnoses.

Costa Rica’s National Telemedicine Programme

A national telemedicine programme was established in Costa Rica in 1997 by the Social Security Fund (CCSS) which provided all hospitals with the technological equipment to carry out remote consultations. The programme has been fully operational since 2004. According to data from the Directorate of Health Services Network, by 2013, the system had handled 10,864 teleconsultations. In the first quarter of 2014 alone, 1,914 were recorded. The system has been particularly useful in Costa Rica’s Ngöbe region, which has scattered settlements of itinerant indigenous populations with low literacy rates.


Asynchronous IT infrastructure is used by a significant number of health care service delivery sites across the LAC region. Asynchronous communication stores and forwards data to the physician; this allows data retention over long periods. In asynchronous communication mode, large data files can be transmitted in small chunks over low- to medium-bandwidth channels, which makes it possible to use common household connections.
Tele-education for capacity-building of the health workforce

Distance learning, specifically e-learning, has gained in popularity in the past decade, but its use is uneven in medical schools and it appears to be more common in basic medical science courses than in clinical education. Distance learning does not preclude traditional learning processes; frequently, it is used in conjunction with in-person classroom or professional training procedures and practices. Tele-education has mostly been used in biomedical education as a blended learning method, which combines tele-education technology with traditional instructor-led training, in which a lecture or demonstration is supplemented by an online tutorial (Box 11.7).

**Box 11.7. Examples of applications of distance learning in health care**

**Brazil: Health Informatics Specialisation Degree Programme**

The Open University of Brazil (Universidade Aberta do Brasil [UAB]) is an integrated system for public universities offering higher education courses through distance learning to populations that have difficulty accessing university education. The UAB System was established by ministry legislation in 2006, for “the development of education in the distance mode, in order to expand and internalise the offer of courses and higher education programmes in the country.” The goal is to promote distance learning in public institutions of higher education and to support research on innovative learning methodologies. It also encourages collaboration between the Union and the federal entities and encourages the establishment of permanent training centres through classroom support in strategic locations. The UAB System provides development, interaction and execution of initiatives that stimulate the partnership of the three levels of government (federal, state and municipal) with public universities and other interested organisations, as viable alternative mechanisms to develop undergraduate and postgraduate consortia.

In recognition of the importance of capacity building in e-health, an online specialisation degree in Health Informatics was established recently by the Universidade Federal de São Paulo (UNIFESP).


**Guatemala: Course for Community Auxiliary Nurses by Tele-Education (CAEC)**

In 2004, to improve primary health care, the Tula Foundation, through the TulaSalud Association, launched a three-year distance training course for nursing technicians and a one-year course for nursing assistants, using a multi-videoconference system. Training is carried out in collaboration with the Cobán School of Nursing and has involved more than 1100 students in 29 remote locations across the country under the supervision of the Guatemalan Health Ministry’s Human Resource Department. The aim was to deliver a bivalent Auxiliary Nurses programme (i.e. distance learning that would cover fundamentals both for hospital work and for prevention). The positive results have allowed the project to expand to the departments of San Marcos, Totonicapán, Baja Verapaz, Petén, Zacapa and Chiquimula, training professionals of health Services and organisations to practise in rural and neglected areas.


**Cuba’s Red Nacional de Enfermería Informática**

The Red Nacional de Enfermería Informática is a network for sharing experience in collaborative, creative and innovative ways to improve nursing skills. Good practices are disseminated to enhance nursing services that can improve the health and quality of life of the Cuban population. The objectives are: i) develop the Nursing Informatics Network Cuba (RedENFI-Cuba) using ICTs; ii) create groups or communities of practice on specific topics, enabling a fruitful exchange of information, lifelong learning and members’ scientific development, and keeping them up to date with trends of computer science in nursing, helping to identify priorities; iii) facilitate co-ordination among network members and groups, with a user-friendly platform that allows the exchange and strengthening of nursing, continuing education and research; iv) linking the network to other specialised nursing or other health sciences and social networks in general; v) helping to co-ordinate the operation of other nursing networks in Cuba with international networks specialised in computer science in nursing.

Co-ordinating care and patient safety through electronic health records

Electronic health records (EHR) are a key component of e-health, providing a foundation for greater care co-ordination and improved clinical management. Rolling out EHR implementation, however, is a notoriously complex and expensive undertaking (Sittig and Singh, 2010). Setting up a hospital EHR system is more a continuous programme than a project with an end point (Boxes 11.8 and 11.9).

Box 11.8. Functional characteristics of an electronic health record

One the basis of advice from an expert panel, in 2008, DesRoches and colleagues defined the key functions that constitute an outpatient EHR system. Using a modified Delphi process, the panel reached consensus on the functions necessary to classify a system under one of two categories, a basic and a fully functional system. Fully functional systems include four domains: recording patients’ clinical and demographic data, viewing and managing results of laboratory tests and imaging, managing order entry (including electronic prescriptions), and supporting clinical decisions (including warnings about drug interactions or contraindications). The four domains are associated with 16 unique functions. The distinction between the two types of EHRs is defined by the absence of certain order/entry capabilities and clinical-decision support in a basic system. A fully functional system has all 16 functions.

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<thead>
<tr>
<th>Health information and data: five functions</th>
<th>Basic system</th>
<th>Fully functional system</th>
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<tbody>
<tr>
<td>Patient demographics</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Patient problem lists</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Electronic lists of medications taken by patients</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Clinical notes</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Notes, including medical history and follow-up</td>
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<tr>
<th>Order-entry management: five functions</th>
<th>Basic system</th>
<th>Fully functional system</th>
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<tbody>
<tr>
<td>Orders for prescriptions</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Orders for laboratory tests</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Orders for radiology tests</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Prescriptions sent electronically</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Orders sent electronically</td>
<td></td>
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<tr>
<th>Results management: three functions</th>
<th>Basic system</th>
<th>Fully functional system</th>
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<tr>
<td>Viewing laboratory results</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Viewing imaging results</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Electronic images returned</td>
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<tr>
<th>Clinical decision support: three functions</th>
<th>Basic system</th>
<th>Fully functional system</th>
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<tbody>
<tr>
<td>Warnings of drug interactions or contraindications</td>
<td>x</td>
<td></td>
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<tr>
<td>Out-of-range test levels highlighted</td>
<td>x</td>
<td></td>
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<tr>
<td>Reminders regarding guideline-based interventions or screening</td>
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Given the upfront costs, the decision by a primary care establishment or a hospital to adopt an EHR system depends both on the financial returns expected and the potential collateral benefits. These might include improved patient safety, better health outcomes and patient retention. Robust evidence is now available to demonstrate that EHRs can help reduce medication error and promote co-ordination of care. The literature also shows that, in a hospital setting, value for money is achieved with high-level, fully functional
EHR systems (according to HIMSS Electronic Medical Record Adoption Model staging), but that satisfactory return on investment occurs only after five to ten years (Amarasingham et al., 2009). Successful deployment of EHRs requires long-term political commitment and leadership at the highest level of governance.

Box 11.9. An example of EHRs in Argentina for improved co-ordination of care in the hospital setting

Argentina’s Hospital Italiano de Buenos Aires EHR

The Hospital Italiano de Buenos Aires is a private, nonprofit organisation with two hospitals (medium and high complexity), 25 primary care and ambulatory centres, 750 beds, 200 of which are for critical care and over 1 000 beds for home care. It treats both private patients and patients admitted under Argentina’s social security system. Since 1998, the hospital has been using an in-house Health Information System with a unique, modular, problem-oriented and patient-centred web-based system, to collect all information generated in emergency, home care, in-patient and ambulatory settings. The EHR system, known as ITALICA, also offers access to the patient through the Portal Personal de Salud (PoPeS), which has provided health care information, medication lists, results on laboratory and complementary exams since 2007.

ITALICA allows users to order ancillary tests, prescribe medications and view results including imaging through an integrated picture archiving and communications system (PACS). The EHR has a relational database record and also a repository (based on Clinical Document Architecture R2), which is digitally signed by professionals responsible for health care delivery. This repository is used to interact with payers and other EHRs, and to make information portable for patients or other external health care providers.


Long-term sustainability and financing

For many ICT projects, once the initial funding runs out, the most significant challenge is developing a sustainable business model. Long-term sustainability and financing appear to be the most challenging and, in most cases, unpredictable aspects of e-health initiatives. The focus is often on adoption and the technical feasibility of the project, while the financial aspects of the approach often play a secondary role. Ultimately, however, it is the economics and the value to society that determine whether a system can survive.

There is no magic bullet for the options or strategies necessary for long-term financial sustainability. Many initiatives are still struggling to begin exchanging health information, whereas more mature initiatives need to confront how to expand their services in a financially sustainable way. Financial sustainability is a critical issue and stands out as a persistent concern, even for those initiatives that are relatively more mature and directly funded by government.

Health care organisations, public or private, need to project a positive return on investment (whether financial or otherwise), to win financial, institutional and political support for their efforts. Although health care organisations could (and in many cases do) improve care and address unmet public health needs by implementing e-health (the “social case”), they typically have difficulty demonstrating an economic benefit (the “economic case”), including whether their own financial performance improves.
It would seem that the return on investment (ROI) or value for money from implementation of ICTs should be relatively straightforward to assess, yet the evidence today is weak and difficult to interpret. One common problem is that while the costs of implementing health ICT solutions are incurred up front, the benefits (financial or otherwise) are not always immediately realised (see Box 11.10). Moreover, returns may go not to investors but to other parties who may not have been involved in the intervention at all. One health care entity’s short-term ROI may be another’s loss. For example, if an ICT can save money by reducing emergency department and inpatient care for congestive heart failure, the local hospital may well suffer a loss of revenue.

For these reasons, many health care organisations in LAC countries still question the value proposition of ICTs.

**Box 11.10. Delayed benefit realisation**

Studies suggest that the financial benefits of ICT implementation are often realised only many years after the investment was made or only when a level of functionality is reached that truly serves the needs of clinicians and system planners. In a report for Canada Health Infoway, Booz Allen Hamilton suggest that the national, systemic fiscal cost-benefit after ten years is actually negative, at CAD 1.5 billion, having reached a positive cash flow by Year 7 and breakeven only by Year 11. By Year 20, the systemic (national) savings is estimated at almost CAD 20 billion.

This is supported by a 2007 study by PricewaterhouseCoopers of nearly 2 000 hospitals in the United States, which found that productivity improvements and improved service efficiency followed on average two years behind initial health care ICT investment. The same study, however, concludes that the financial breakeven point will strictly depend on the levels of investment. Above a certain level of ICT investment – or tipping point – the cost impact levels off and is associated with cost reductions. The levelling off occurs despite the added costs of more ICT capital; that is, ICT capital at some point pays for itself by displacing costs elsewhere in the hospital.

The European Union’s e-Health Impact Project, covering ten case studies in different countries and contexts, identified a 2:1 return on e-Health investment when benefits were given a euro value; the average breakeven point for the ten e-Health initiatives studied was five years.


**Conclusion**

The cases discussed in this chapter point to a number of e-health practices or approaches that can be employed in efforts to address public health priorities in the region. In many LAC countries, primary care is the entry point into the health care system for an individual’s health care needs and problems. It provides ongoing person-focused care, and co-ordinates or integrates care provided elsewhere or by others. The primary health care system also serves essential public health interests by providing an infrastructure for detecting outbreaks, and a vehicle for rapidly disseminating information and care during a national health emergency.
Not surprisingly, in the countries covered by the cases considered here, ICTs are central to efforts to renew primary care, generally by targeting three areas of considerable need: improvement of chronic care, better monitoring and care of infectious diseases, and better mother and child care. These objectives are not necessarily mutually exclusive, and are indeed closely linked. Choosing these targets has ensured that projects that could have otherwise drifted and become “technology for the sake of technology” in fact had a discernible health focus and have proven sustainable in the longer-term. These conditions require regular monitoring of patients to track trends in clinical parameters and rapidly identify any deviations. This task can be dramatically facilitated by ICT.

The adoption and use of health ICTs, however, typically imply trade-offs with competing goals. Policy makers must thus determine whether the expected benefits from these practices are likely to outweigh the costs in each particular situation. This highlights the importance of independent, robust monitoring and evaluation of programmes and projects. Most of the cases reported had included some sort of post-implementation evaluation to determine the actual payoff from the adoption and use of ICTs.

Measuring the effects of ICTs is, however, difficult for a number of reasons. ICT implementation may have effects that are multidimensional and often uncertain in their reach and scope, and difficult to control. In addition, the realisation of benefits from ICT implementation strongly depends on contextual conditions. For example, moving to an EHR in its fullest form is not just a technical innovation; it is a cultural transformation. Change management is vital for successful uptake, and failure to build in processes for effecting the necessary organisational transformations will reduce both uptake and effectiveness.

The challenges described above place health ICT investments in a space that is quite different from other capital investments in the health sector, for example a hospital building or medical equipment. But health ICT projects are still often evaluated using traditional appraisal techniques, limiting evaluation to the objectives of sound financial management. However, providing decision makers with direct cost-analysis cash-flow projections, financial figures etc., is not enough, since the ultimate strategic objective is to improve the efficiency and quality of clinical care and patient outcomes through health ICTs.

Despite a plethora of anecdotal information, the hard evidence available today on the implications of e-health is, therefore, inconsistent, which makes it difficult to synthesise and interpret. Failure to collect the data necessary to evaluate the effects of ICTs is one of the core challenges to achieving widespread adoption of high-performing ICT initiatives.

Notwithstanding the difficulties entailed, the cases reported cast no doubt on the potential ability of LAC countries to make major progress toward key policy goals, such as improving access to care in remote areas or better care co-ordination for chronic diseases, through implementing ICTs. In particular, they prove that cost-effective solutions for remote and rural areas are possible.

One of the major challenges of introducing a new ICT platform is that the productivity of users may actually decrease in the initial months of the implementation. With complex clinical applications in particular, learning new ways of working can lead to high levels of user dissatisfaction, in addition to lowered productivity.

One shared characteristic of the programmes reviewed here is that they all required the full support of all stakeholders to achieve their goals. Notable facilitators included dedicated community caregivers and physician leaders who envisioned the specific changes needed, and were able to overcome organisational and cultural barriers and unforeseen technical
challenges at implementation. All initiatives had **dedicated funding**; many were launched as **pilots** through dedicated grants and against specific public health goals. Although there are limits to the generalisation of results, the case studies covered here illustrate the interdependence between various policy dimensions, which are difficult to disentangle, but must be addressed if countries are to achieve the intended efficiency gains from ICT implementation. The following points summarise the main findings:

- **Align incentives with health system priorities**: To achieve the intended benefits from ICT technology, governments and payers need to set targets associated with unambiguous public health gains, such as improved management of highly prevalent chronic diseases, which are strongly associated with preventable hospitalisations. They must also align resources, processes, and physician compensation formulae to match the nature of the gains to be achieved.

- **Ensure long-term political commitment**: Effective operation requires strong leadership at the national, regional and organisational level. The government's regulatory and supervisory role is imperative for successful implementation. There are three ways governments can intervene to promote the adoption and use of ICTs: direct regulation; economic instruments; and persuasive measures.

  - With direct regulatory measures, also known as “command and control instruments”, the government prescribes a specific outcome or target and/or the process or procedure by which it is to be achieved, and enforces compliance by appropriate regulation.

  - Economic instruments may include both financial incentives and market stimuli to persuade users to change their behaviour. They also may involve using disincentives, such as withholding payments for noncompliance, to stimulate the desired behaviour. To be of any use, and to have an effect, economic incentives need to affect the cost-benefit structure of the economic activities of the target. The greatest advantage of economic instruments is that they allow individuals to respond to the instrument in the way that is most cost-effective for them.

  - Persuasive measures, which are often combined with economic instruments, include support, such as providing education and training, and the use of social or peer pressure and recognition. They are intended to change an individual’s perceptions and priorities by increasing awareness and conferring ownership of decision-making. They help to address the information asymmetry often associated with technological innovation.

- **Support infrastructure development**: There is a dynamic interaction between information technology infrastructure and e-health development. The availability of infrastructure promotes the development of new services, and the need for services can stimulate new infrastructure. To take full advantage of e-health and particularly telemedicine, it is not only necessary that all regions be able to receive broadband, it is also necessary for everyone to get access to stable and high bandwidth connections. In most LAC countries, infrastructure is still a challenge due to the high cost of connectivity – both in telephony and broadband.

- **Establish robust security and privacy protection**: A robust, balanced approach to privacy and security is essential to establish the high degree of public confidence and trust needed to encourage widespread adoption of health ICTs, and particularly EHRs. As noted in Chapters 14 and 15 on security risks and privacy, the number of countries with privacy laws is growing in the LAC region, but implementation has been difficult.
None of the countries in the LAC region have a comprehensive national privacy strategy or programme. This situation is not surprising considering that the concept of national privacy strategy is relatively new. Law enforcement continues to be a challenge in the LAC region. The proportion of countries with an independent national Data Protection Authority (DPA) is very low. Only two countries (Mexico and Uruguay) have a fully independent and autonomous DPA. In other countries, the DPA is part of a ministry, e.g. Colombia (Ministry of Economy), Costa Rica and Peru (Ministry of Justice) and Ecuador (Ministry of Telecommunications and Information Society).

- **Strengthen monitoring and evaluation**: High-quality evidence is a fundamental source for decision-making processes. Information systems need to be well designed and evaluated to ensure they are quick and easy to use by the often overloaded clinical staff and community facilitators. Governments have much to gain in supporting the development of reliable and internationally comparable indicators. Risk, delay and cost can be minimised by learning from good international practice.

- **Promote user-friendly solutions and capacity-building**: Information technologies must be user-friendly, at the right place and time; poor user interfaces or connectivity can doom adoption. Health care providers as well as consumers/patients need the skills, trust and confidence to use the new technologies. Ensuring that their privacy is respected and that they perceive the systems as secure, as well as creating opportunities for education and training, will be essential. Content and presentation for older people in online information and services is also an important issue, requiring further attention if older people are to embrace and benefit from these services.

- **Accelerate and guide interoperability efforts**: While health care organisations are increasingly equipped with ICT products and systems, linking them remains a serious problem. Information systems in separate health care business entities must be able to exchange clinical information on patients (i.e. be interoperable), if ICT to be of value in clinical settings. Consistent implementation of standards and appropriate organisational changes are necessary to facilitate this process. Resolving interoperability issues will require government leadership and the collaboration of the relevant stakeholders to establish standards and develop innovative solutions (Indarte, 2012).

**Notes**


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Further reading


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