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FOREWORD

The Latin American region is home to many converging realities encompassing a broad and diverse social spectrum. Future challenges include not only bridging economic development gaps but also meeting a series of goals relative to health, education, public security, democratic stability, etc.

One of these goals is the implementation of Information and Communication Technology (ICT). This is a crosscutting development that would bring together the efforts from different sectors aimed at enhancing and improving the standard of living for Latin Americans.

BrechaCero.com was created in consideration of this trend, particularly regarding wireless broadband network use. BrechaCero.com is a blog by 5G Americas that will disseminate and showcase these initiatives. It is a free-access site that describes the technology initiatives, services and trends that raise people’s standard of living. Additionally, it includes insight from industry analysts and personalities in the way of reviews and interviews.

BrechaCero.com activities further include a series of papers on specific issues that focus on the use of ICT as tools to strengthen the development of vertical industries, thus becoming a permanent consultation forum.
INTRODUCTION

The countries of Latin America have general similarities from an economic, cultural and social structure point of view. While each of them does have specific features, there are more shared aspects that enable an analysis of the region as a group of emerging nations with the chance of making the most of the digital revolution.

Among the concerns of the many countries in the region, the health sector stands out. The opportunity to improve service and data storage for individuals is an important step for this sector, where Information and Communication Technology (ICT) comes as a revolutionary tool. The possibility of storing patients' electronic medical records gives the health sector an infinite number of advantages.

It should be noted that Health is part of the 2030 Agenda for Sustainable Development goals according to the United Nations Development Programme (UNDP). As explained by UNDP, while there have been achievements that improved the overall conditions in the sector, such as a 50% reduction in child mortality since 1990, there are still various goals.

At a global scale, health is part of the 2030 Agenda for Sustainable Development goals according to the United Nations Development Programme (UNDP). As explained by this entity, since 1990, preventable child deaths were reduced by more than 50%; maternal mortality fell by 45%, while new cases of HIV/AIDS infection were reduced by 30% from 2000 to 2013. However, it is underscored that more than six million children still die before turning five, and 16,000 children die every day as a consequence of preventable diseases, such as measles and tuberculosis, and AIDS is now the leading cause of death among teenagers in Sub-Saharan Africa.1

For the purpose of avoiding these deaths, the Sustainable Development Goals represent a commitment to put an end to AIDS, tuberculosis, malaria and other communicable disease epidemics by 2030. It is pointed out that this goal may be achieved through prevention and treatment, education, and vaccination and reproductive and sexual health campaigns.

In this context, the possibility of having a document that enables a simple and efficient approach to health information by a significant portion of the population is an important tool for authorities to make decisions on the policies required to prevent and improve the living conditions of citizens. Thus, ICT is a tool that offers the capacity to streamline patient data storage processes, providing opportunities for authorities to quickly find out the leading causes of consultation and admission.

Incorporating technology into medical records results in what is known as an Electronic Medical Record (EMR). According to the World Health Organization (WHO), it is an "electronic record (as opposed to a paper chart) of a patient's history. [It i]ncludes information such as test results, medication and general history. [It c]an be made rapidly available through ICT to authorized personnel providing patient care."2

ICT has come to be an opportunity for the healthcare sector to use reliable, organized information. By using it, patient care conditions can be improved and healthcare professionals can also draw from a larger number of tools in order to make decisions when faced with urgent cases. It is therefore important to have a unified network with this information at a national level, as well as to draft protocols for patient data protection in order to prevent sensitive information from being used for different uses than those intended.

In this scenario, connectivity is a differential tool for health centers to exchange information and enable healthcare professionals to offer efficient services to patients. It should be underscored that EMR "creates means for communication between members of the healthcare team and patients so as to improve diagnosis and treatment time frames and continuity of care. As for patients, EMR enables them to immediately access their health information as stored in their medical record, and to monitor chronic conditions or record any discomfort."3

Applying ICT makes it possible for different health centres to access this information, as the various professionals share information on the treatments they implement. That is to say, "ICT can also be useful for health record security management systems, by making accurate, comprehensive information available as and when needed, with access restricted only to authorized individuals."4

Thus, it is fundamental for government authorities to work for health centers to have access to ICT so that they can share potentially critical information in real time. The possibilities offered by technology enable not only the creation of EMR in each healthcare center, but also remote exchange of EMR and the implementation of nationwide networks that make accurate information on each patient available to each healthcare professional.

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Interaction with the private is also important for local authorities to increase the scope of EMR. The interoperability of installed systems is fundamental for patients that go from one sector to another to have the same level of information available, thereby enhancing healthcare conditions.

Setting up a solid EMR system where all healthcare entities converge can become an ambitious project that is difficult to materialize; its implementation opens the door to different possibilities. Broadband offers authorities an opportunity to interconnect healthcare centers. That is why it is important for authorities to foster broadband connectivity implementation.

In particular, wireless technologies enable fast implementation thanks to their features. Technologies such as LTE, or 5G in an immediate future, have the capacity to enable authorities to interconnect healthcare centers across the country. Thus, policies that foster mobile broadband are necessary for EMR to be developed more efficiently.

In order for these wireless technologies to be developed, authorities need to make larger portions of the radio spectrum available to the telecommunications market, as well as establishing an agenda that enables industry actors to be informed of upcoming public bidding processes.

It is also important to make existing bureaucratic requirements concerning the deployment of fixed and mobile telecommunications networks more flexible, and for the requirements enforced by government agencies in connection with the deployment of new technologies to be coherent.

Another measure to enhance the adoption of wireless technologies is the reduction of the tax burden on network components and access terminals. The former enables operators to plan for the deployment of new technologies in a more efficient manner, while the reduction of taxes levied on devices makes them more affordable for citizens, thereby increasing the number of citizens that can be connected.

According to data from the consulting firm Ovum, disseminated by 5G Americas, by the end of 2018, Latin America had 700 million mobile connections, from which approximately 577 million were mobile broadband access points (300 million were HSPA connections and 277 million were LTE connections). This consulting firm expects the region to reach 508 million LTE lines by 2023.

This progress in terms of mobile technology also presents an opportunity for EMR to increase its presence in the regional market. This would not only enhance connectivity in healthcare centers, but also multiply the number of relevant applications aimed at raising the standard of living of inhabitants of the region.
ELECTRONIC MEDICAL RECORD

Information and Communication Technology (ICT) is a necessary tool to enhance telehealth services; that is to say, for ICT to increase the efficiency of this sector. Its implementation enables an enhancement of service and organizational opportunities both in the public and private environment.

One of the advantages offered by telehealth is the possibility of compiling, storing and using patient information by electronic means. This practice is known by several names: e-medical record, e-patient record, e-health record, computer-stored patient record, ambulatory medical record y computer based patient record. In this paper, we shall use the term Electronic Medical Record (EMR), as used by the WHO, according to whose definition an EMR is an “electronic record (as opposed to a paper chart) of a patient’s history. [It i]ncludes information such as test results, medication and general history. [It c]an be made rapidly available through ICT to authorized personnel providing patient care.”

The first EMR experiences took place in 1986, when the United States National Library of Medicine began working on the preparation of a Unified Medical Language System. The purpose of this initiative was to develop a system that enabled healthcare employees, professionals and researchers to store and access data in an efficient, quick manner. This initiative sought to make available not only information on each patient, but also on the various practices implemented so as to share them and enhance the body of knowledge in the sector.

Thus, EMR has come as the almost natural next step from paper medical records. It has evolved along with technology:

- Initially, medical records were digitalized by each healthcare center, i.e. each patient’s data were stored in computers. Generally speaking, during this first stage data was migrated to a format that had better chances of being stored while occupying less space and standing the passage of time better.

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- The development of hospital intranets, as well as the evolution of the Internet, made it possible for storage to be more effective and shared by different areas. Thus, the information originally available ceased to be static and was capable of being shared by the various professionals working at the healthcare centers in real time.

- Finally, the evolution of the Internet enabled the implementation of a more comprehensive version of EMR. While this is an ongoing process, it implies an opportunity for various healthcare centers to be interconnected with accurate information on different patients. Additionally, records can be kept on different specialties, and information and images—including from medical procedures—can be stored in an EMR.

Thus, evolution towards EMR enables an enhancement of the conditions in all healthcare centers, swiftly providing professionals with a comprehensive history of their patients. In other words, the Internet enables all physicians to have historical data on their patients at the time they receive a consult, thereby reducing the error margin at the time of diagnosis.

The information contained in an EMR comes from various, interacting sources: the information provided by the patient at previous consults is the core, but it is supplemented by information from other sectors, such as "records on evolution notes, consults, drug prescriptions and supplementary examinations, display of results, and a structured admission system classified by specialty and pathology. The episodic record includes special input modules, such as anesthetic, surgery, nursing and other records."  

In other words, EMR are made up of data from various healthcare sector participants. Its composition also concerns all parties involved, which are capable of generating information and using the previous data to improve their service. This is therefore a case of vertical cooperation by the various stakeholders involved, which, in the end, put together a more comprehensive, efficient EMR.

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8 At "Manual de salud electrónica para directivos de servicios y sistemas de salud". By ECLAC
https://repositorio.cepal.org/bitstream/handle/11362/3023/1/S2012060_es.pdf
Thus, healthcare professionals can use each EMR differently provided that there are interoperability protocols in place at each healthcare center, university and research center, and the usefulness and benefits of EMR can be enhanced in different ways. According to the Mexican Secretariat for Health\textsuperscript{10}, there are primary and secondary uses of EMR:


Primary and secondary uses of EMR

<table>
<thead>
<tr>
<th>Primary use</th>
<th>Secondary use</th>
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<tbody>
<tr>
<td>Healthcare service performance</td>
<td>Education</td>
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<tr>
<td>Medical service management</td>
<td>Regulatory purposes</td>
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<tr>
<td>Healthcare process support</td>
<td>Research</td>
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<tr>
<td>Financial and administrative process support</td>
<td>Public health and safety</td>
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<tr>
<td>Personal care management</td>
<td>Policy support</td>
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There are a number of EMR formats, ranging from sophisticated systems interconnecting various healthcare centers to simpler systems that merely collect basic internal patient information. These variations depend on several factors, some of the most prominent being national healthcare plans, the structure of relevant sector ministries, and the possibility of interoperability between the various healthcare centers.

Having global information exchange standards in the field of EMR also enables more ambitious strategies that include inter-country sharing. It is important for these standards to also include sector stakeholders beyond healthcare centers, i.e. including laboratories, pharmacies, universities and healthcare centers.

Information in an EMR: flow chart

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It is based on this information sharing that a more efficient EMR can be obtained for the benefit of patient care. This is how an EMR achieves its main purposes, as explained by ECLAC\textsuperscript{13}:

- **Care**: the main purpose of any medical record. A clinical record is the repository that stores patient information (all actions by the healthcare team are recorded there) in order to ensure continuity in the healthcare process.

- **Teaching**: it is a source of information for clinical case-based learning, provided that it is an accurate record of the healthcare process.

- **Research**: both clinical and epidemiological research, as it constitutes a major source of data for the draft of retrospective analysis and studies, both for individual and for populations.

- **Management**: in terms of both clinical and clerical management, it helps support medical care billing and clerical processing. EMR is also helpful to assess and manage health resources and the quality of services rendered.

- **Legal**: as evidence of the actions taken and the diligence of the healthcare provided.

The implementation of these tasks makes it possible for EMR to offer a series of benefits both to the patient and to the healthcare system. On the one hand, it enables access to information from different locations, so that any patient can seek healthcare at different healthcare centers and still have the same data available. It also enables different healthcare professionals to simultaneously see a patient’s information, and access documents in a number of formats (text, image, video). An EMR can also be a channel to communicate with the patient.

Since it is possible to add data to each EMR, there can be a greater amount of health-related information available on each patient, thereby achieving more efficiency at the time of diagnosis. Thus, each patient’s status can be analyzed in context.

\textsuperscript{13} At "Manual de salud electrónica para directivos de servicios y sistemas de salud". By ECLAC: https://repositorio.cepal.org/bitstream/handle/11362/3023/1/S2012060_es.pdf
All of these conditions lead to a higher cost, higher efficiency result for the health sector. Additionally, the implementation of EMR enables patients to receive better healthcare: they no longer have to carry paperwork and prior documents to their appointments, while it also makes it easier to set up appointments and consults. The healthcare professional, in turn, in addition to being able to quickly access prior studies and diagnostic imaging, can also have reliable information on previous patient conditions.

In summary, EMR enables access to relevant information for patients and healthcare professionals, so that they can efficiently use it in their consults or treatment. However, in order for adequate implementation, there must be prior architectural work as regards the information exchange network.

A number of steps must be taken for these initiatives to perform well. First, the authorities must have the political will for the initiative to be carried out. There must also be a regulatory framework in place that ensures the confidentiality of patient data, as well as the strictly professional use thereof. Finally, information technology architecture is fundamental for operation.

The latter needs a software system that enables interaction between physicians that can be adapted both to desktop computers and to mobile smartphone apps. This information also needs to be able to be cloud-stored, so that it can be accessed from any healthcare center. In order to achieve this, the platform must also be interoperable.

It is likewise important to have hardware support—from desktop computers to laptop computers or smartphones—that enables healthcare professionals to be connected. Also required are peripheral devices that can intercommunicate with the database and automatically upload information to each patient’s EMR so that it can be accessed remotely.
In order for this kind of initiative to evolve favorably in the healthcare sector, market connectivity needs to be increased. Providing healthcare centers with broadband access is a necessary step for EMR to operate adequately; in particular, with access to wireless broadband technologies whose features enable broad coverage in a faster, less expensive way, especially to service areas far from major urban centers.

In this context, technologies such as LTE, and, in the near future, 5G, appear as alternatives to offer rural healthcare centers high-speed access with robust connectivity. Thus, there are more opportunities for robust apps associated with healthcare services to be offered to the public.

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In order to increase the number of healthcare centers that have wireless broadband, authorities need to deploy strategies to expand the coverage offered by such services in the market. In particular, it is important to implement policies aimed at stimulating private sector investment.

Larger portions of the radio spectrum need to be made available to the telecommunications industry for mobile broadband services. In other words, each administration should set the goal of allocating the radio spectrum shares recommended by the ITU for mobile broadband service development (a total of 1960 MHz per market by 2020).

Also, telecommunications authorities need to establish an agenda that sets out future public bidding processes for mobile services. The possibility of giving foreseeability to the industry is important for planning new access technology networks.

Authorities also need to reduce the existing bureaucratic barriers to telecommunications network installation. A nationwide standard needs to be implemented to respond to the demands of municipalities and provinces, so that operators can efficiently plan for their new networks.

The public and private sectors need to work together towards the creation of an EMR that enables the entire healthcare sector to interact. This is an important measure, since the strength of EMR lies in more information being shared for the sake of citizens.

Authorities also need to reduce the tax burden placed on access devices. The purpose of such measure is to increase the penetration rate of terminals among physicians and the general public, which leads to a greater number of EMR users and to more information being shared, since tax reductions make these devices more affordable.

Thus, in order for EMR to reach the necessary transformations within the health system, they must be accompanied by policies aimed at increasing connectivity in the market—especially those offering wireless and mobile broadband services.
ELECTRONIC MEDICAL RECORD IN LATIN AMERICA

The implementation of Information and Communication Technology (ICT) in various healthcare services enables an enhancement of the standard of living for citizens. Its application in the region encompasses a number of instances, ranging from sophisticated and complex national plans to applications developed by small start-ups to address specific conditions.

In this broad scope of technology applied to health, Electronic Medical Records (EMR) offer a step towards better care, efficiency, cost reduction and enhanced knowledge in the sector. These initiatives enable the countries in the region to progress, not only in terms of healthcare, but also in terms of research, prevention and evolution in the health sector.

While a number of these initiatives are independent at the country level, there is a Latin American initiative. The American Cooperation Network on Electronic Health (RACSEL) is a project supported by the Regional Public Assets initiative of the Inter-American Development Bank (IADB). Some of the countries that are part of this initiative are Chile, Colombia, Costa Rica, Peru and Uruguay.

Its core purpose is for those involved to be able to exchange knowledge and experiences in order to determine common standards to make progress in the field of EMR. Among other goals, the aim of the initiative is for the countries that participate in the various practices and procedures to cooperate so as to make the most of it by enhancing efficiency and effectiveness, and by improving the quality of healthcare services.

The sharing of experiences seeks to enhance the development of institutional capacities and to transfer knowledge. Also, technical documents and operating guides can be drafted in order to enhance the implementation of this kind of initiatives, which will enable the setting of common standards and technical criteria.

The RACSEL is implemented through the permanent work of the Technical Regional Committee (CTR), the Ricaldoni Foundation— in charge of project implementation and management—and a coordinator, who supports the connection with the IADB. In order to carry out their duties, these participants prioritize four fields: institutional and legal framework, standards, pharmaceutical terminology, and architecture.

These activities have operative work groups, where specialists in each field exchange information. Based on this cooperation, recommendations are made and carried out between member countries so that they can implement them in their EMR experiences.
Cooperation between the countries in the region in order to enhance the use of EMR is a positive measure that can improve each of their experiences. Such cooperation even offers the possibility of future deployment of a regional network, where countries share patients' information in order to improve the quality of health care, enhance the operation of the health sector, and foster research in the field.

A similar initiative is carried out by the Latin American and Caribbean Network for the Strengthening of Information Systems (RELACSIS). This project is an online discussion forum for those responsible for EMR implementation in different countries from the region. Recommendations, opinions and strategies are debated in this forum in order to implement EMR in each of these markets.

RELACSIS is an academic community that seeks to foster the use of information technology systems in the region. Its operation is based on “cooperation among professionals, the training of human resources in the countries of the Region, the generation of common actions and the gathering and dissemination of good practices for the reinforcement of”\(^{16}\) the use of technology in this sector.

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\(^{15}\) At “Historia Clínica Electrónica Regional. Red Americana de Cooperación de Salud Electrónica.” By Juan Cristóbal Palma Orellana, Head of the Modernization and Digital Government Unit of the Ministry General Secretariat of the Presidency, Chile. At http://www2.redgealc.org/site/assets/files/6367/chile_-_historia_clinica_-_redgealc2017.pdf

The purpose of this initiative is "on the one hand, to make available a reference framework and the standardized methods and instruments to assess the performance of HIS in the countries of the Region, the identification of documentation and the dissemination of successful experiences, key processes and lessons learned in the HIS diagnostic exercises in the countries of the Region, as well as the design of strategic plans for the strengthening of the HIS in selected countries."\(^{17}\)

It should be underscored that EMR is one of components considered fundamental by the Pan American Health Organization (PAHO) to implement telehealth. As defined by PAHO, EMR is "a real-time longitudinal electronic record of an individual patient’s health information that can assist health professionals with decision-making and treatment."\(^{18}\)

In addition to the countries that agreed to participate in RACSEL and RELACSIS, there are other EMR implementation experiences in the region. According to ECLAC, “the cases of Argentina, Belize, Mexico, and the Bolivarian Republic of Venezuela\(^{19}\) stand out, and in Argentina, note is made of the example set by “the Buenos Aires Hospital Italiano, as well as the interconnection of the 43 hospitals managed by the Ministry of Health of the City of Buenos Aires. In 2008, the nationally-accessible Belize Health Information System (BHIS) was inaugurated, with digital, centralized medical records. In Mexico, the Secretariat for Health began developing EMR in 2007."\(^{20}\)

These countries, in addition to others that are at an earlier stage, are working on implementing EMR in the region. The aim is to create a dynamic interface so that all professionals from the healthcare sector can record their work and have updated information available on each of their patients.

Thus, EMR “comprises a number of input interfaces, respecting the recording needs of outpatient treatment (longitudinal record that stores contacts) and the other types of treatment that provide care on an episodic basis (time periods with a clearly-marked beginning and end). The backbone of both kinds of record is the list of issues that serves as an integrator of the patient’s burden of disease."\(^{21}\)

\(^{19}\) At "El Rol de las tecnologías de la Información y de las comunicaciones en la reducción de inequidades en salud“. By ECLAC. http://www.summit-americas.org/sirg/2011/120711/cepal_tec_salud_es.pdf
\(^{20}\) At "El Rol de las tecnologías de la Información y de las comunicaciones en la reducción de inequidades en salud“. By ECLAC. http://www.summit-americas.org/sirg/2011/120711/cepal_tec_salud_es.pdf
\(^{21}\) At "Manual de salud electrónica para directivos de servicios y sistemas de salud“. By ECLAC. At https://repositorio.cepal.org/bitstream/handle/11362/3023/1/S2012060_es.pdf
According to ECLAC, the other components of the EMR structure have basic features shared with most of the records of this kind. Prominent among said features is patient evolution, consults, drug prescriptions, diagnostic imaging, and an admission system structured based on professional fields of specialization and the conditions of each patient.

Thus, the potential of EMR would lead to benefits both from a clerical point of view and a clinical point of view. As described by ECLAC, its implementation enables "the support of clerical processes, such as appointment scheduling, patient admission and discharge, and healthcare eligibility; it enables the management of supplementary test results, and of requests for drug prescriptions and surgery, among other things."\(^\text{23}\)

ECLAC points out that some notable advantages of EMR are "simultaneous and remote access, secure and confidential treatment of the record, and data processing."\(^\text{24}\) It is also underscored that its implementation improves aspects such as "document organization and uniformity; legible, inalterable and available, and therefore, accessible information; confidentiality guarantee and clinical information easily dissociable from patients'...

\(^{22}\) At "Manual de salud electrónica para directivos de servicios y sistemas de salud". By ECLAC. At https://repositorio.cepal.org/bitstream/handle/11362/3023/1/S2012060_es.pdf

\(^{23}\) At "El Rol de las tecnologías de la Información y de las comunicaciones en la reducción de inequidades en salud". By ECLAC. http://www.summit-americas.org/sirg/2011/120711/cepal_tec_salud_es.pdf

\(^{24}\) At "Salud electrónica en América Latina y el Caribe: avances y desafíos". ECLAC. At https://repositorio.cepal.org/bitstream/handle/11362/32848/lcl3252_es.pdf?sequence=1&isAllowed=y
personal data, which enables information processing and knowledge management, while respecting individuals' right to intimacy.\textsuperscript{25}

In order to implement this kind of initiative, it must be supported at an institutional level. As has been explained, several countries have made progress on the implementation of strategies that aim to increase ICT inclusion in the health sector by means of EMR; however, this evolution must be accompanied by policies that also seek to improve various aspects concerning the sector.

In other words, digital evolution in the health sector must be supported by analog efforts by the authorities—from the design of a global telehealth plan that includes EMR to the incorporation of healthcare centers accessible to all inhabitants and equipped for new technology. This "analog" type of measures is necessary to foster the adoption of ICT in the health sector.

As explained by ECLAC, the "adoption of EMR implies making certain decisions, such as the minimum set of information an EMR should contain (...) progress and challenges in the work of healthcare professionals, and epidemiology management and oversight decision-making, among other features."

Whereas in order to "design the EMR, professionals from the first, second and third tier of healthcare services will need to converge to identify the information flow model, the scope of EMR and the way in which patients or other actors external to the system will participate."\textsuperscript{26}

A key aspect of the work that authorities need to carry out as they implement EMR is that their approach must seek to protect patients' rights. From the ECLAC's point of view, it is important for personal data protection and access to public information laws to be in force, among others aimed at protecting the right to intimacy and privacy of citizens.\textsuperscript{27} In other words, structuring EMR requires joint, multidisciplinary work by government authorities that takes into account the various alternatives for its implementation.

Another key point is the work involved in training healthcare personnel as regards EMR. It is important to have a plan that enables all of the personnel available to learn quickly and efficiently how data are inputted and shared with the rest of the professionals, in order to attain optimal operation.

\textsuperscript{25}At "Salud electrónica en América Latina y el Caribe: avances y desafío". ECLAC. At https://repositorio.cepal.org/bitstream/handle/11362/32848/lcl3252_es.pdf?sequence=1&isAllowed=y
\textsuperscript{26}At "Salud electrónica en América Latina y el Caribe: avances y desafíos". ECLAC. At https://repositorio.cepal.org/bitstream/handle/11362/32848/lcl3252_es.pdf?sequence=1&isAllowed=y
\textsuperscript{27}At "El Rol de las tecnologías de la Información y de las comunicaciones en la reducción de inequidades en salud". By ECLAC. http://www.summit-americas.org/sirg/2011/120711/cepal_tec_salud_es.pdf
The human factor is of vital importance to implement EMR, which is why healthcare employees’ training is so fundamental for adequate operation. Courses that can be adapted to the needs of each professional in order to participate in EMR must be created in coordination with technological implementation.

The strategies that the governments of each Latin American country need to implement in order for EMR to have a positive development in the market include increasing connectivity in the market. It is important to note that the development of health services in rural areas is a subject in which most Latin American markets are lagging. Hence, the benefits offered by EMR may improve conditions for the people who live in those areas.

In this context, bringing broadband access to the various health centers that assist the public is an essential step towards making EMR available nationwide with optimum performance. The ability to instantly and efficiently share information among the various healthcare facilities is positive to the citizens and to the health system as a whole. For this reason, it is important to have connectivity throughout the industry, including the private sector, so that information may be shared and capitalized on for the benefit of patients.

In this context, and considering that many of the markets in the region include large territories with little population that are covered by small health centers, wireless broadband emerges as an ideal solution. This is because its qualities allow covering large territories more rapidly and economically, hence reaching health centers in rural areas. Technologies such as LTE, and shortly also 5G, may provide an alternative for access at great speed and with strong connectivity.

In order for wireless broadband to reach an optimum level of development, authorities need to implement policies that stimulate investment in the industry. Strategies should be aimed at improving service coverage without neglecting providers’ needs.

Therefore, there is a need for authorities to implement policies providing the telecommunications industry with greater portions of the radio spectrum for mobile broadband services. It is important to emphasize that as of April 2019, the average spectrum allocated by market was 379.6 MHz, very far from the 1300 MHz suggested by the International Telecommunication Union (ITU) for 2015 and the 1,960 MHz for its “high scenario” in 2020.

The most developed countries in terms of spectrum allocation in the region barely reached 50% of the spectrum goal suggested by ITU for 2015. In Brazil, which country has allocated a total of 609 MHz, it reaches 46.8% for 2015 and 31.1% in a high scenario for 2020; whereas in Mexico, which is the second-largest allocator of spectrum, the total amount is 584.3 MHz, with a compliance level of 44.9% for 2015 and 29.8% for 2020. In addition, there are other markets that fall even further behind in spectrum allocation, such
as Guatemala, which has barely allocated 210.6 MHz in spectrum for mobile services, that is, 16.2% for 2015 and 10.7% for 2020.

As can be seen, the region is in a deficit in the amount of spectrum allocated for mobile services. For this reason, it is very important for authorities to prepare a spectrum allocation plan for mobile services. Another action that should be taken is the establishment of an agenda involving future bidding processes. This would bring predictability to the industry, thus allowing a more efficient planning of the installation of networks for new technologies.

It is also important for the various governments in the region to hold talks regarding the spectrum bands to be offered for tender. Building consensus among governments to enable spectrum coordination at the regional level is essential to boost technology scales. Moreover, enhancing the affordability of services is also necessary in order for mobile broadband services to develop in the various countries in such a manner that allows improving connectivity at health centers.

Another strategy that authorities should consider is reducing the bureaucratic barriers affecting the installation of telecommunication networks. In order to provide coverage throughout a country, it is important for providers to be governed by clear rules on the installation of infrastructure. In this sense, having a nationwide framework law that contains the demands for each municipality would be ideal. This avoids the risk of having regions with different requirements as new technologies are developed, hence undermining their implementation.

With a similar purpose in mind, the tax burden on network components should be reduced. This kind of strategy reduces the costs for providers and allows them to accomplish more rapidly the coverage needed for health centers removed from major cities to have access to services.

In addition, it is important for the public and private sectors to work together in building the EMR so as to enable interaction in the health sector. This sort of collaborative work and actions is indispensable so that EMR may be more efficient, as the more information is shared, the more the system will benefit.

Moreover, in order to increase the number of users with access to the service, authorities need to reduce the tax burden on devices for access. This reduction will translate into greater affordability of devices, which will make it possible for a larger number of people to get access and to improve penetration of services. Such action would result in a greater number of users being able to benefit from EMR.
EMR presents itself as an opportunity to boost the level of care in health centers across the country, and is one of the changes needed to modernize the sector in the region. For this reason, governments need to create all the conditions necessary to set it in motion, in particular the coverage of mobile and wireless broadband services.
EMR IMPLEMENTATION IN LATIN AMERICA

There is a wide range of examples of ICT development in the health sector involving the implementation of Electronic Medical Record (EMR) in Latin America. There are various cases that illustrate this kind of initiatives in the region, some of which are shown below:

LATIN AMERICA MAKES PROGRESS IN THE CREATION OF AN ELECTRONIC HEALTH NETWORK

Various Latin American countries are working towards the creation of a regionwide information network in connection with citizens' health. The project is known as RACSEL (Spanish acronym for Inter-American Cooperation Network on Electronic Health) and has already been inaugurated with four workshops held in Costa Rica and Peru. Colombia, Chile and Uruguay are also part of the initiative. Its implementation is in the charge of the Uruguayan organization “Fundación Julio Ricaldoni” and it is jointly funded by the Inter-American Development Bank (IDB) and member states.

The aim is to create and set in motion a cooperation network based on dialogue, coordination and the sharing of knowledge and experiences relating to EMR—in other words, the ability to share patients’ EMR among markets in order to improve care and optimize assistance procedures.

In this sense, the goal is to hold meetings involving four core working groups: the system’s architecture for interoperability, the legal framework, and standards relating to technical and semantic aspects, i.e. terminology. One of the objectives behind that exchange was getting to know the various stances on how to address the core topics mentioned above.

Those topics are critical to coordinating a system that may be efficient moving forward. On one hand, the interoperability systems will provide an opportunity for access across countries through the coordination of the various technologies in use. Similar efforts are made to improve the technical and semantic standards. On the other hand, the legal framework within each country is essential, as it is the aspect that will enable implementation and provide the opportunity, among other sensitive issues, to share each patient’s information.

Building on different meetings, the aim will be to create a series of references to prepare recommendations for the conduct of EMR projects. In addition, a review was made of best
practices followed in the various experiences not only in Latin America but also worldwide. The purpose is also to set a common strategic agenda for EMR development in Latin American and Caribbean countries.

Despite being at its initial stage, RACSEL has some ambitious goals, prominent among which is the creation of a website to keep electronic health professionals updated and with access to the network’s achievements, the provision of opportunities for direct exchanges among countries regarding EMR, the creation of spaces for Technical Assistance, and the adoption of agreed rules for international data sharing. To this end, it needs to prepare a work plan that must be ready by 2018.

This initiative is important to provide the health systems in the region with better tools. EMR allows health professionals to have more information available when assisting patients, thus improving the level of care, prevention and treatment. It consists of projects that not only allow improving early care, but are also very helpful for the implementation of long-term treatments.

In addition, the ability to have access to documents regarding procedures conducted in relation to different medical conditions provides an opportunity to improve new patients’ care. In other words, experience-sharing improves the knowledge of doctors across the region, thus enabling better treatments for patients.

HEALTH APP IN BARBADOS SEEKS TO ADVANCE EMR

In Barbados, MedRegis EHR is an app aimed at medical staff that allows them to have, among other things, electronic medical records (EMR). This app seeks not only to change the way health care works in Barbados, but also to expand across the rest of the Caribbean.

MedRegis EHR’s development involved more than five years’ work, during which efforts were made to ensure that medical staff would be able to benefit from its features. In particular, it makes it possible to shift from physical to electronic records, which is helpful not just to health professionals, but to everyone involved in the health system, including its beneficiaries.

MedRegis seeks to boost the use of technology at the service of health in the Caribbean. To this end, one first goal is to eliminate paper in outpatient care through the integration of technology among doctors, nurses and other staff who assist the public. Another goal is to enhance workflows and the dynamics involved in assistance, beating the amount of time that current paperwork demands.

This app seeks to expedite assistance for patients at doctors' offices, clinics and hospitals. It aims to achieve significant reduction in the amount of time that people need
to spend on their check-ups and doctor visits, thus providing more free time and improving their quality of life.

Another benefit brought by this app is that it allows medical staff to store information on each patient. That is to say, it provides the means to compile patients’ medical records in digital form, enabling the conduct of more efficient diagnoses and potential treatments. Additionally, it allows storing files in image format as a supplement to recorded diagnoses.

Moreover, the app will allow medical staff to prescribe medication in electronic form. This information will also be entered in the EMR, providing all specialists in charge of a given patient’s care with the information they need in treating a condition, preventing not only the duplication of drugs that have already been supplied, but also the prescription of contraindicated medication.

This mass of information compiled and provided by the app allows each doctor to have an EMR for each patient. This is a significant step forward, as it enables health professionals to improve care, prevention and treatment thanks to information. Furthermore, it provides an opportunity to improve not just early care and to enhance long-term treatments.

As can be seen, the creation of an app that provides doctors with EMR is very important to a nation’s health. Nonetheless, support from authorities in relation to connectivity and broadband access is necessary in order to enable an efficient use of the app.

**CHILE MOVES FORWARD WITH THE IMPLEMENTATION OF ELECTRONIC MEDICAL LEAVE**

Chilean authorities are putting into practice Electronic Medical Leave, a program designed to facilitate workers’ conditions when asking for leaves of absence on health grounds. To this end, they resort to ICT. In order for this service to be available nationwide, its filing, processing, decision and calculation of the Electronic Medical Leave’s amount have been recently activated in the Magallanes region.

With this initiative, the granting and processing of medical leaves will be more easily available to the locals in the area through ICT use. Hence, implementation seeks to increase the number of benefits for the various stakeholders involved in the process, acknowledging the local reality and needs in each Chilean region.

One further goal of the Electronic Medical Card [sic] is reducing paper use, thus seeking to scale down the high costs generated by this type of transactions for the various individuals and entities that take part in the process. In addition, given its characteristics,
it is better equipped to oversee and control medical leaves, with greater accessibility to their information.

The project is led by the Office of the Superintendent of Social Security, and is seen by Chilean authorities as having a great impact and public value given its capacity to solve problems in an intricate current scenario, enabling the processing of electronic medical leaves to be quicker, less expensive and safer.

Some of the most salient characteristics of Electronic Medical Leave include:

- it is voluntary, that is to say, it serves as an alternative to the use of paper forms in granting and processing medical leaves;
- it is available at no cost, so it makes no difference and carries no deductions for workers;
- it is safe, as it incorporates authenticity, integrity, nonrepudiation and confidentiality features;
- it protects personal data: its contents are only known to those authorized to that effect.

Hence, Chilean authorities have a useful tool to improve the conditions of workers and the health system. As can be seen, the incorporation of ICT brings safer, more efficient opportunities to workers when they need to ask for leaves.

**EL SALVADOR IS TAKING THE FIRST STEPS TOWARDS ELECTRONIC MEDICAL RECORD**

The Ministry of Health (MINSAL) and the Salvadoran Social Security Institute (ISSS) have taken the first steps towards implementing EMR in the country. To that end, different evaluations have been made of document management and personal data protection in medical files of the Integrated Health System (SIS).

In order to conduct this project, the Office of the Director of Information and Communications Technologies (DTIC) of MINSAL has developed a special information system in the form of a Free Software, based on MINSAL and the country's needs, for recording and backing up information. Hence, the ultimate goal is to achieve a single health electronic record (or EMR) that enables the design of document management and the protection of information pertaining to each resident.

As part of its efforts towards a new medical record format, Salvadoran health authorities have started working on coordinating all SIS institutions in order to agree on a body of rules focused on document management. The idea is to adopt legislation that provides for
an adequate treatment of medical and administrative records, in order to overcome any weaknesses found during the evaluation.

It is important to emphasize that, through implementation, MINSAL is seeking to overcome the weaknesses found in an evaluation conducted in 2017. That experience involved 207 participants, medical staff and archivist staff at the “Rosales” and “San Rafael” national hospitals pertaining to MINSAL, and at the “Médico Quirúrgico”, “Hospital General” and “Unidad Médica de Illopango” hospitals pertaining to ISSS, with EUROsocial’s support.

Part of a cooperation program between Latin America and the European Union, EUROSocial seeks to help overcome inequalities in Latin American countries with a view to improving Social Cohesion and institutional strengthening. To this end, it supports administrations in the processes for the redesign, reform and implementation of public policies, focusing on the areas of gender, governance and social policies.

The project receives technical assistance from a team of research experts working for the Health Service of Castilla La Mancha; “Hospital Clínico San Carlos” (a hospital in the Community of Madrid), the Office of the Vice Director of Government Archives of the Ministry of Education, Culture and Sports, and the Spanish Agency for Personal Data Protection.

Salvadoran health institutions must rise to the challenge in order to make a significant difference in the systematization of information and the preparation of guidelines for the sector. In doing so, the purpose is to ensure protection of citizens’ sensitive data, standardize document management and the protection of personal data in SIS’ medical records.

The project is at an initial stage that involves the proposition of document management guidelines for medical files. In other words, the idea is to complete the digitization of the information contained in physical files and the efforts to incorporate the technologies in a single file that will provide health staff with medical information in digital form on the various users in whatever facility they visit across the country.

The creation of EMR represents a quantum leap in quality for the Salvadoran health system, as it provides the means to record the conditions suffered by each citizen, how they were treated and even any diagnostic imaging tests they may have taken. This improves the capacity of each health center to provide assistance once coverage for an entire population has been accomplished.

Hence, this availability of information on each patient becomes an essential asset for medical staff’s efforts to save lives or take prompt action. This is particularly so inasmuch as medical facilities may access their medical record and act accordingly. To that end, health centers need to be interconnected.
HONDURAS MAKES PROGRESS IN IMPLEMENTING ELECTRONIC MEDICAL RECORDS

The “Mario Catarino Rivas” Hospital in Honduras has introduced a project to implement EMR. The purpose is to improve care conditions for the more than 700 patients visiting that health center on a daily basis, particularly by expediting assistance for citizens, who will have an electronic card containing their most important details.

The project’s aspiration is for medical data currently recorded in paper files to be replaced with an electronic version. This file will contain essential details such as their date of birth, residence, telephone number and designated caregiver. Through this initiative, clerical assistance for each patient will be expedited.

The work conducted by the hospital's admissions department has resulted in the depuration of over one million files with sequential numbering that had been manually filled in until then. This change enhances not only speed but also accuracy of the information doctors get when they meet patients.

The project is initially concerned with the area of outpatient care for specialties provided at the assistance center in all five emergency areas: labor and delivery, orthopedics, surgery, pediatrics and internal medicine. Thus, in having their electronic card, patients can speed up their involvement and requests for in-hospital assistance.

EMR is a very interesting initiative in any health system. Its materialization in the form of patients’ personal details, which is currently underway in Honduras, constitutes a first step that may move forward towards more interesting uses. Among other things, it provides the means to record the conditions suffered by each citizen, how they were treated and even any diagnostic imaging tests they may have taken.

In addition, it is important for this kind of actions to complete the incorporation of other hospitals and health centers in the country so as to create an EMR network encompassing the entire sector. Information is an essential asset for medical staff’s efforts to save lives or take prompt action. The proliferation of residents with an electronic health card allows medical centers to access their medical records and act accordingly.

Being interconnected, hospitals can access patients’ information in the event of an emergency, and can also identify the most helpful procedures for a particular condition. In other words, the ability to share information among the various health facilities makes it possible to improve medical decisions, which provides more opportunities to enhance conditions in the sector.
Wireless broadband provides an ideal opportunity to bring connectivity to all health centers. This is particularly true in light of strong technologies such as LTE, which enable the transmission of large volumes of data at high speed and low latency. And, moreover, with conditions that make it possible to achieve wide coverage in a faster manner than with wired technologies.

**PARAGUAY IMPLEMENTS ONLINE VACCINATION SYSTEM**

The Ministry of Public Health and Social Welfare and the Office of the National Secretary of Information and Communications Technologies (SENATIC) of Paraguay have unveiled the Nominal Vaccination System as part of the Expanded Immunization Program (PAI). This is an online register that reveals the number of vaccinated individuals among that country’s population.

Among other benefits, this register provides the means to find out in a simple, rapid manner the level of compliance with the vaccination schedule of each individual, even where they have missed their print card. Moreover, health professionals will be able to access information on the vaccination status of each of their patients.

Additionally, authorities in the sector will have access to nationwide vaccination statistics, since every citizen who gets vaccinated will be recorded with the following details: dose, type of vaccine, date and place of administration. This initiative has been underway for over four years now, the last two of which saw the involvement of SENATIC. It is already available for gradual implementation in the public and private sectors entering into agreements with the Ministry of Public Health and Social Welfare.

Furthermore, the register’s online nominal system makes it possible to find out the population’s vaccination status. This tool also allows authorities to give rise to logistic and operational actions relating to vaccination throughout the country.

For the conduct of this initiative, the following stages have been developed: the first one was aimed at the modeling, technical analysis and design of an information system in line with new technologies, so that over time it may adapt to the constant changes in the area and be functional, active, useful and transparent. The second stage involved its actual building, and the third one, which has already been gradually introduced into the various health services registered with the Central Department, is concerned with its controlled implementation and activation.

Thanks to this initiative, Paraguayan authorities will have a reliable tool for their statistics and future plans relating to health policies. Moreover, it serves as a significant aid to health professionals, increasing the amount of information available at the time of assisting citizens and, consequently, creating better opportunities at the time of engaging with patients.
In order for this project to reach all health centers in Paraguay and enable a universal register of vaccinated individuals, each of them needs to have connectivity. In other words, bringing wireless broadband access to each health facility is part of a necessary work to accomplish the implementation of this initiative.

In this sense, wireless broadband technologies enable coverage in large territories providing strong, high-speed connectivity, particularly through LTE. For this reason, local authorities need to be able to stimulate investment in the implementation of connectivity for this kind of technology throughout the country.

URUGUAY MAKES PROGRESS IN THE CREATION OF ELECTRONIC MEDICAL RECORD

The Uruguayan government is working towards the creation of advanced networks for the health sector and the development of a nationwide Electronic Medical Record. These two goals had been established in Uruguay's 2011-2015 Digital Electronic Agenda with a view to modernizing and advancing the National Integrated Health System.

This project was implemented by Executive Order No. 405/011 of November 23, 2011. This law emphasizes how Information and Communications Technologies (ICT) have a great potential to enhance the management of health services. This program makes use of the web portal “Salud.uy”, which has been created under an agreement entered into between the Office of the President of Uruguay, the Agency for Electronic Governance and Information and Knowledge Society (AGESIC), the Ministry of Health (MSP) and the Ministry of Economy and Finance (MEF).

AGESIC is the agency charged with leading the Electronic Governance implementation strategy in Uruguay. Its premises consist of giving rise to an efficient State centered on citizens, and advancing the Information and Knowledge Society by promoting inclusiveness, appropriation and good use of ICT. This Agency coordinates, manages and promotes an engaged citizenship and an open government; a modern, efficient and effective management of public affairs; a good use of ICT and Trust and confidence.

AGESIC’s performance in the health sector had among its main objectives the creation of a nationwide integrated Electronic Medical Record. The purpose of this initiative is to allow institutions to enhance the procedures to assist users, contribute to a safer, more comprehensive care for patients, and facilitate the continuance of assistance procedures.

The guidelines for development of the health system have been included by Law No. 19,355 of December 30, 2015. Section 466 of this Law authorizes the Executive to set the mechanisms for sharing medical records for assistance purposes through the National Electronic Medical Record System, so as to ensure citizens' right to have their health protected and access to integrated health services networks, pursuant to Law No. 18,211.
of December 5, 2007. In exchanging medical information, data confidentiality will be ensured pursuant to Law No. 18,331 of August 11, 2008 (Personal Data Protection Act).

This law enables health agents to access details of each of their patients in order to be able to provide them with proper assistance. Therefore, it becomes an essential element for the functioning of the National Electronic Medical Record project. It is important to emphasize that any prior information on each patient held by the health system becomes a key asset to health professionals at the time of providing assistance.

Another benefit brought by this law is the equivalent status afforded to print medical records and its electronic counterparts. The law emphasizes that Rx’s in electronic form must meet the minimum required contents: dosage form, dosage, administration and concentration of the drug concerned, identification of the prescriber, and effective period based on its date of issuance. Similarly, the Executive has been vested with authority to regulate the electronic procedures for prescription, issuance and control of electronic Rx’s for narcotics and psychoactive drugs, before application.

The electronic prescription and Rx system, in turn, constitutes a great contribution to society and to the sector given the benefits it brings. This is because it facilitates control on the part of pharmacies, laboratories and drugstores of any medications delivered. Moreover, it creates safer conditions in the event of attempted forgery of the document and electronic signature, as it enables a more direct contact between doctors and pharmacies. In addition, the law provides for the use of automatic mechanisms to follow up any prescribed treatment and reduces the number of errors in the identification and dosage of any medication.

These types of initiatives are feasible in Uruguay thanks to the extensive connectivity available in the country. The ability to interconnect the various health centers across the country is essential to conduct this kind of programs in an efficient manner. In other words, a program that seeks to bring ICT to the health sector will invariably need strong connectivity among the various health centers.

Moreover, it is important for these plans to include mobile services, as they provide a great opportunity to mainstream this kind of benefits. Another interesting aspect is the promotion of the creation of mobile apps in order not just to promote preventive health among residents, but also to stimulate growth in sectors aimed at the development of this kind of products.

In order for this ecosystem to be able to develop in an efficient manner, it is important not only for the government to support the public health system through connectivity, but also to increase the potential of high-speed mobile broadband access. In this sense, the availability of a wide range of smartphones and LTE access is necessary to stimulate the creation of apps aimed at preventive health.
Furthermore, Uruguayan authorities have implemented the Oral Health Program for Schools and “Salud.uy” has introduced the Dental Electronic Medical Record, a computerized system created for the primary care of schoolchildren throughout the country. It seeks to make theoretical and practical progress in the creation of a National Oral Health Subsystem for schoolchildren throughout the country.

There are 70,000 children currently receiving assistance under this program, mainly in schools located in rural areas and critical contexts. Thanks to the test activities, training and exchanges with dentists and hygienists, a computerized system has been developed by the “Salud.uy” Program in coordination with PSBE and the GURI system, in order to contribute to the National Electronic Medical Record.

In the case of dental-based EMR, the benefits of information-sharing among professionals and care facilities are also manifest. This is because citizens’ records may be accessed in a simple, rapid manner by each dentist, hence improving care conditions.

In Uruguay, this tool optimizes the continued assistance of children in a friendly, simple manner. With it, health teams can access medical information regardless of the geographical location and the institution or school where it originates. This is intended to reduce inequalities in oral health in the country.

Thus, dental electronic medical records emerge as a supplement to the National Integrated Health Information system. In this sense, over two years ago Uruguay had already set in motion the National Electronic Medical Record, a program relying on the web portal “Salud.uy” that had been created under an agreement entered into by the Office of the President of Uruguay, the Agency for Electronic Governance and Information and Knowledge Society (AGESIC), the Ministry of Health (MSP) and the Ministry of Economy and Finance (MEF).
MOVING FORWARD...

There are various ongoing efforts by supranational agencies and by different governments in Latin America to incorporate Electronic Medical Record (EMR) into the health system. While the degree of development differs among the various markets, there is consensus that this sort of implementations are necessary to improve health conditions and that Information and Communication Technologies (ICT) may play a chief role in pursuing that goal.

ICT are an important tool towards the optimization of the health sector in Latin America. This becomes particularly true through the use of wireless and mobile broadband, as it makes it possible to bring coverage in a more efficient manner to rural areas or places far away from major cities, which serves as an opportunity to redress one of the main deficiencies of the health sector in the region.

In other words, technologies such as LTE, LTE-A or 5G can offer the means to provide strong, high-speed wireless broadband services to the health centers of a given country, including those in rural areas. This leads to the creation of the conditions needed to share patients’ information, an essential condition for EMR to be able to achieve optimum results.

One of the strategies that government authorities in the region need to pursue in order to increase connectivity in the market and stimulate the adoption of mobile broadband is the availability of radio spectrum. Greater spectrum portions and a larger number of bands are needed in order for new technologies to be able to develop efficiently.

Likewise, the authorities of the countries in the region need to agree on which bands will be available for 5G, so as to harmonize this matter regionwide. Drawing up agendas for bands to be offered for tender is also necessary so that providers may efficiently plan the development of new technologies.

Another measure that authorities should consider is reducing the existing bureaucratic barriers against the development of telecommunication networks. It is important that there is consistency between the demands of the various municipalities towards providers, and it would be ideal to have a national framework law that allows providers to correctly plan the installation of their networks.

In order for coverage to be accomplished rapidly and efficiently, authorities should also ease the tax burden on network components. And the same holds true for access devices. This measure would make them more affordable and enable greater adoption of EMR services.
Another benefit of making smartphones more affordable to the population in connection with EMR is the opportunity to create an app market relating to this initiative. Having a population with greater access to these devices would provide start-ups wishing to implement apps derived from EMR with a specific market, hence stimulating a digital economy.

Therefore, a market with greater connectivity in conjunction with a larger number of individuals with access to mobile broadband constitutes a positive tool for countries wishing to put EMR into practice. For this reason, in addition to having a public health strategy and making efforts with the private sector to set these initiatives in motion, it is important for authorities to focus on the implementation of mobile broadband.
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