

Electronic Medical Records in Latin America and the Caribbean

An Analysis of the current situation
and recommendations
for the Region



Pan American
Health
Organization



World Health
Organization

REGIONAL OFFICE FOR THE Americas

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Summary

At the invitation of the Latin American and Caribbean Network for Strengthening Health Information Systems [Red Latinoamericana y del Caribe para el Fortalecimiento de los Sistemas de Información de Salud (RELAC SIS)], a group of 200 people registered in a virtual forum and held discussions on the situation of Electronic Medical Records (EMRs) in Latin America and the Caribbean. This report is aimed at documenting the feedback posted by the participants on the network virtual platform. To analyze the content generated by participants, thematic qualitative analysis techniques were used. The importance of having a record on the EMR adoption level in the Region, including accurate and updated data, emerged as an important factor. Participants recommended increased human resource training, with a focus on EMRs' associated benefits and risks to improve health information systems. Topics such as EMR organizational aspects and the importance of strategic planning, engagement of all stakeholders, working with interdisciplinary teams and managing change effectively were also discussed, as well as the relevance of having a regulatory framework to enable or foster EMR adoption. Confidentiality and safety of sensitive information was regarded as another factor to be considered. Topics related to the interaction of end-users with the systems also emerged, namely: interface design, the complexity of introducing diagnoses and the use of classifications lists versus the use of terminologies to better reflect users' needs. Participants also described the use of interoperability standards and the sharing of documents describing successful experiences of EMR implementation worldwide as very significant factors related to EMR success in the Region.

Introduction

The Medical Record

One of the tasks performed in medical care is the recording of events during the patient's consultation with the health professional. Recording medical care is mainly aimed at creating a repository of the encounter with the patient. This medical record usually includes the reason for consultation or hospitalization, depending on the level of care, background of current disease (other relevant symptoms related to the reason for consultation), medical history, description of the patient's social environment, family background or history, and the review of symptoms not related to the current disease by system. Recording patient history and physical examination is usually followed by an assessment that may fall in the problem-oriented approach proposed by Weed [1] where each analyzed problem generates a suggested diagnostic and therapeutic plan. Subsequent records made by the physician are usually in the form of progress or clinical notes which record patient and disease evolution. These notes are made on each encounter with the patient, either daily – when the patient is hospitalized – or intermittently during each outpatient consultation. The records of a family physician are generally accompanied by records from other doctors, including interconsultations covering other medical disciplines, as well as complementary test results such as laboratory tests or imaging study reports [2]

These components of medical records are usually stored in different physical locations. For example, the private office of each physician will probably have its own records, including progress by consultation together with the results of complementary studies. Likewise, a hospital medical record will be probably kept at the hospital where health care was provided. Only large health facilities, which provide both inpatient, emergency, and outpatient health care, may have the complete clinical record of a patient in a single location.

Purpose of the Medical Record

The documents of medical health care have different purposes. For example, they are used to record that a patient has been examined or has undergone a test so that the doctor may get the reimbursement or payment for the service. They are also used as a means of communication between physicians and other health professionals such as nurses and physical therapists who also provide health care to the patient. Besides, clinical documentation is useful as a legal record in case of negligence claims and malpractice lawsuits. Finally, they are also used to get data which will later be used for medical research and clinical management. [3]

During the last years, and mainly assisted by the use of computers, the clinical record has added new functionalities. With the recent concerns about the cost and quality of medical care, which demand scientifically-based and cost-effective clinical decisions, the medical record is used to assist clinical decisions, reminding physicians on the efficacy or the need for screening tests, or warning them on possible drug interactions.[4]

The Electronic Medical Record

Historically, the tasks performed for patients' health care have been recorded on paper. This kind

of record has some implicit disadvantages such as accessibility, legibility, information retrieval and storage. The emergence of computers has led to a new form of recording medical consultations. This new format may potentially prevent or at least reduce the disadvantages of paper records. That is why today more and more health facilities in the world are migrating their medical records to electronic format.

In its most simple form, Electronic Medical Records can be defined as the digital or electronic version of paper charts, although the U.S. Institute of Medicine (IOM) indicates that EMRs are more than the electronic version of paper-based records and that they are aimed at providing assistance to offer more efficient health care processes, using reminders, alerts or other types of help for decision-making. [5] According to the definition of the International Standards Organization (ISO), EMRs are the repository of information regarding the health status of an individual in computer processable format, stored and transmitted securely and accessibly by multiple authorized users, having a standardized format that is independent of the EMR system used and aimed at the support of continuing, efficient and quality integrated health care. [6]

According to the definition of the Healthcare Information and Management Systems Society (HIMSS), EMRs are a longitudinal repository of a patient's health-related information generated in one or more encounters in any care delivery setting. The information of the electronic record includes patient demographics, progress or clinical notes, list of complaints or diagnosis, medication, vital signs, medical history, immunization records, laboratory data and radiology reports, among others. EMRs automate and help to respect the flow of health professionals' work. EMRs have the capacity to generate complete records of the encounter of the health professional and the patient as well as to support other health care activities through interfaces, including assisting evidence-based decision-making, quality management and reporting health care results. [7]

In spite of the increased interest and potential benefits reported, and although some exceptions can be observed, the adoption rate at global level is still low. The analysis of barriers for further EMR implementation showed financial, technical, psychological, social, legal and organizational barriers, as well as the required time and appropriate management of change as the main factors. [8]

Situation of EMRs in Latin America

Although EMRs can bring numerous benefits to Latin America and the Caribbean, there is no data available to know their level of adoption and usage. Within the Region, EMRs are identified with different names according to the country. For instance, in Argentina they are known as Electronic Health Record (Historia Clínica Electrónica) and in Colombia as Electronic Clinical Record (Registro Clínico Electrónico), while some other countries may give them the name of Digital Clinical Record (Registro Clínico Digital) or Electronic File (Ficha Electrónica).

In this report, we decided to use the term Electronic Medical Record (EMR) suggested in the "eHealth Strategy of the Pan American Health Organization (PAHO)". According to the PAHO document, eHealth seeks to improve the access and quality of health services thanks to the use of information and communication technologies (ICTs), which include, among others, EMRs. PAHO defines EMRs as the records of the health information of each patient in electronic format which can help health professionals in decision-making and treatment. [9]

Driven by the Latin American and Caribbean Network for Strengthening Health Information Systems (Red Latinoamericana y del Caribe para el Fortalecimiento de los Sistemas de Información de Salud, RELAC SIS) a virtual discussion forum was created and participants involved in the design, implementation and use of EMRs were invited to provide their viewpoint on the role of EMRs in the Region as well as their recommendation on the steps to encourage EMR adoption in the countries of the Region.



Objective

This report is aimed at disseminating the topics discussed in the forums during the period covered by this project as well as the concerns raised by the participants regarding Electronic Medical Records (EMR).

Methodology

The input of participants was analyzed using of a qualitative methodology, reviewing the discussion of virtual forums. Also, the characteristics of the participants who expressed their interest in the project were analyzed. In order to understand the process for creating this report, the steps taken to achieve participants' subscription to the forums are described, as well as the role of RELACSIS in the project..

About RELACSIS

RELACSIS is an academic and practice community that fosters the development and strengthening of Health Information Systems (HIS) in Latin America and the Caribbean, through 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 the HIS. [10]

Since 2004, PAHO and MEASURE-Evaluation have been working together in the context of the framework agreement between the PAHO and the United States Agency for International Development - Latin America and the Caribbean Office (USAID-LAC) aimed at strengthening the HIS of the countries in the Region of the Americas.

The main objectives of this collaboration have been, 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.

RELACSIS has two spaces: a virtual space and a physical space. In the virtual space, RELACSIS members share announcements, experiences in the implementation and usage of HIS products for evidence-based decision-making, research results, reports, and scientific literature. In addition, it has (public and private) discussion forums on the subject where lessons learned and best practices applied by countries and organizations making up the network are exchanged. In the physical component, RELACSIS holds its own meetings and participates in other meetings of the Region within the framework of an annual plan of work focused on the horizontal exchange of practices, having leader countries and make their practices available as well as receptors who analyze national experiences to give them a Regional format.

The Network is allied, among others, with international organizations (PAHO/WHO, UNICEF, UNFPA, PNUD, CEPAL), governmental organizations (USAID, CIDA-Canada), academic units (MEASURE-Evaluation, National Institute of Public Health, in Mexico) and other networks linked to health information systems (RHINO, RedEncuestas).

The virtual discussion forums of the RELACSIS network were used for this project.

Preparation of the forums and invitation to participants

The first measure, aimed at recruiting participants, was to issue a communication explaining the aim of the project, which was disseminated by the regular PAHO and RELAC SIS channels.

To subscribe, participants were asked to provide demographic data, name and surname, country and place of work. These data were collected in a web form and the information was stored in databases in RELAC SIS servers.

For the analysis and description of participants, data structured on the database was used together with the manual assessment of the information provided by the participants in the introductory forum.

Selection of topics for discussion

Before the virtual discussion was started, a literature search on the topic of EMRs and their adoption was performed. One of the coordinators was responsible of the bibliographic revision. Afterward, three (3) interactive rounds were held with the rest of those involved from the RELAC SIS and PAHO network regarding the inclusion of possible topics to be discussed and the final result was reflected in the generation of nine (9) questions, grouped in three domains.

The forum proposed the following topics for discussion:

1. Adoption of Electronic Medical Records.
 - a. Adoption indicators at country level.
 - b. Latin America and the Caribbean differential factor.
 - c. Incentives for adoption.
2. Advantages and Risks associated to EMRs.
 - a. Advantages or benefits of EMRs.
 - b. Risks associated to EMRs.
 - c. Functionalities and components of EMRs.
3. Enabling factors and challenges for the adoption of EMRs.
 - a. Trained human resources.
 - b. Solutions and certification.
 - c. Digital agenda.

Analysis of data collected

For the quantitative description of demographic data, summary measures as mean and percentages are used to bring participants' information together. Data was processed using Microsoft Excel 2010, which, in turn, was used to generate tables and graphs.

To analyze the content generated by participants in virtual discussions, the Thematic Analysis technique was used. [11] The first step was to generate a shared document with all the inputs from participants in the forum using Google Spreadsheet format so that two of the coordinators could work simultaneously in the codification and validation of the applied codes. The axes of analysis were identified according to their relevant codes, which were later grouped into key concepts. Some codes were spontaneously generated; others were developed specifically based on research questions and the topics suggested for discussion.

In order to guarantee understanding and correct application of codes, before starting the analysis a joint codification exercise was carried out by the two researchers involved in data analysis. Inconsistencies in the codification of certain passages were discussed until consensus was reached. In this way, particular aspects were clarified and a consistent criterion was established. Although there were preset codes, the coordinator was free to generate codes according to the results of the interviews and the relevant axis of analysis.

The third step of the analysis consisted in indexation, or systematic application of interview codes. In order to encode and analyze the information, the same shared document was used. As interviews were being encoded, it was observed that it was necessary to reorder and group them so that the objective of the report had sense.

The final step consisted of mapping and interpretation. One of the coordinators made the first interpretation, which was later validated by the second project coordinator.

A draft with preliminary results was sent to the project coordinators who had initially participated in the generation of topics for discussion, for their revision and comments. In order to give more validity to the interpretations, it was decided to keep certain inputs from participants verbatim in the Results section. They will appear within inverted commas and in italics.

Results

Data from participants

A total of 200 people indicated their interest to participate in virtual discussions. Chart 1 summarizes the countries to which participants in the virtual forum belong.

Chart 1 – Number of participants to the Forum by country

Country	No.
Argentina	21
Bolivia	3
Brasil	4
Chile	12
Colombia	29
Costa Rica	12
Cuba	2
Dominican Republic	3
Ecuador	8
El Salvador	7
Guatemala	9
Honduras	5
México	29
Nicaragua	2
Panamá	7
Paraguay	8
Perú	10
Spain	1
United States	10
Uruguay	6
Venezuela	12

Topics discussed among participants

In general, the topics selected by coordinators were followed in the discussion process, and some others, not identified initially by the coordinators, emerged and were incorporated to the Results section.

Adoption of EMRs in the Region

One of the topics discussed in the forums addressed the subject of the importance of having available information regarding the EMR adoption level in the countries of the Region. Participants highlighted the importance of knowing the local and international situation since this data act as a parameter of the situation status, in order to plan policies for promoting their adoption, and to monitor the result of those policies.

“I think it is very important to know the local and the international situation since this information act as a state-of-the art parameter, and it also serves as evidence to encourage adoption and be able to generate projects with increased validation than at present”...

Some participants provided information on the adoption status in their countries as well as on the availability of regulations, or otherwise, to facilitate their use. For example, it was reported that a Peruvian law on EMRs addresses the subjects of security, data transmission, use of standards, implementation, and confidentiality, among others.

None of the participants provided specific data on the level of adoption, and during the virtual synchronous encounter held on the work period, more than 30 participants highlighted the lack of this information and the importance of its availability for decision-making.

Benefits of EMRs

An additional topic addressed involved the benefits for which a country should support EMR adoption. The participants made a relevant list of benefits and stated that their dissemination in the countries of the Region may contribute to their promotion. The following is a list of the benefits identified by participants:

- The assistance of adequate technology may guarantee accurate identification of patients;
- Safety and confidentiality of the patient’s personal data can be guaranteed;
- They promote integration with administrative systems, which may accelerate medical consultation appointment and scheduling;
- If properly implemented, they can help professionals to save time in administrative tasks;
- They enable health professionals to share clinical information, both within the unit and from different hospitals;
- They improve legal certainty of professionals due to the electronic recording of the patient’s information;
- They increase the quality of health care by having immediate and real-time information of the patient available;
- They improve the efficacy of the healthcare process avoiding the waste of unnecessary drugs and diagnostic studies;
- They improve the decision-making process at all levels;
- Availability of real-time health indicators for decision-making;
- They reduce mistakes derived from illegibility of drug prescriptions;
- Their use reduces paper expenses and helps to preserve the environment;
- They facilitate epidemiological surveillance.

A strength and clear benefit of EMRs identified by participants was the possibility of outlining the access to records of patients so as to control who is authorized to access each clinical record, thus improving confidentiality. In another section of the document, confidentiality was also identified as a factor that may be at risk with EMRs.

...”We can outline accesses and thus improve confidentiality of sensitive data, etc. But this requires a clear understanding of the type of network we want to make up, under what standards, which part of the process will be interoperated with other information systems and when will it happen”...

EMRs having systems that help in decision making were identified as an important factor when quality needs to be improved and they were identified as a clear benefit.

“The real advantage is obtained when going beyond the simple recording of data, in an

unstructured form; medical records should provide real support to health professionals and be focused on the patient”

Risks associated with EMRs

The participants involved in discussions had experience in the use and implementation of EMRs. It was important to know whether their use might be troublesome or whether their implementation involved risks.

One of the risks mentioned by participants refers to the complexity of implementing these type of systems, which are frequently underestimated by the staff of technical areas or systems management of health systems:

...”the great risk is to be short-sighted towards the significance of implementing EMRs for the benefit of public health or the health system as a whole. EMRs are a major project which should be considered systemically and should be aligned to the National Health System”...

Another of the risks mentioned was confidentiality. Although it was also identified as a benefit, confidentiality and violation of privacy rights of patients and their families were clearly visualized during the discussion on risks, particularly because they facilitate access to sensitive information from any location.

An additional risk identified was what usually happens when trying to computerize inefficient processes, or processes which are not working properly: the sense that a system will solve inefficiencies, trying to force their operation through the system.

...”If a paper-based system is not accurately built, there is a risk that it will not work properly after automation”...

A further risk identified was the interference EMRs may cause during medical consultation. Although this comment was made in the context of the use of extremely lengthy lists for disease coding, the participant’s comment may be used for any type of functionality in the system requiring increased attention by electronic system users.

“We have seen a doctor looking at the computer screen most of the time during medical consultation, while the patient was astonished trying to make the doctor look at him”...

Available functionalities and components in EMRs

Discussions also introduced the topic of the required components for the EMRs to be useful. Since the participants had a wide variety of professional instruction and they also had experience with the use of medical records and data provided by them, contributions were widely diverse and interesting. Yet, one of the participants indicated that a basic set of functionalities should be defined to make EMRs work smoothly and only then add a set of complementary functionalities.

One of the highlighted aspects was the relevance of differentiating care levels or the role of users before considering the functionalities EMR should have, since the way of recording diseases for a hospitalized patient is different from that for outpatients.

...”It is not the same to apply EMRs for primary healthcare than for internal medicine, including specialties for specialty care, either in consultation, surgery or hospitalization, than the record for occupational medicine or psychiatric medicine, or with regard to chronic diseases or social security”... “There is common data which is interesting for everyone, but there is data which pertains to the specialty. Each specialty has specific fields of exclusive concern of the specialist. For example, an ophthalmology HR is different from a gynecology HR. I think this is one of the biggest complexities for EMR adoption”...

Participants made comments on the importance of reviewing documents generated by international organizations working on standardization of EMR content to take them into account before the State unilaterally define the components or functionalities EMRs should include.

...”Reading this is fundamental for those of us interested in EMRs, this is the technical report published by the International Standard Organization (ISO) ISOTR20514 from 2005- ...ISO is an international organization highly ranked at global level (particularly LA) for its accreditations and certifications”...

In this Discussion section there was an evident participation of PAHO members who develop their activities in different agencies of the Organization, highlighting, for example, the relevance of having the possibility of recording in EMRs whether a patient is a smoker, as well as chronic diseases or nutritional status of patients. In general, these opinions were highly related with the use of data by participants of specific programs of the Organization.

“All the clinical records of adolescents and adults should have a space to record the smoking status in each visit. In this way, if a patient smokes he or she could be advised to quit, or if the patient does not smoke or has quitted smoking, he or she could be encouraged to keep it up”

“Developing recording systems that enable monitoring individual and population nutritional status, also enable to provide orientation for decision making (counseling, nutritional education, reference to services)”.

Factors that may facilitate EMR adoption and challenges to be overcome

Within this Discussion domain, participants were encouraged to talk about the possibilities of training human resources to work later in EMR development and implementation, as well as the accessibility of open source solutions or the existence of rules and regulations that facilitate EMR adoption.

Specialized human resources

Different discussion topics addressed the importance of having professionals trained in the use of EMRs, but highlighting that both professionals from the health area and from other areas could work in or lead projects related to EMR adoption.

...”Not only clinicians and computer scientists are responsible of an EMR project. There are a large number of people involved in this projects, particularly when we are integrating information on primary care, laboratory, diagnosis, and, perhaps, the key is the patient”...

Connected to the presence of human resources trained for EMR implementation, the importance of providing digital literacy to end-users of these systems was observed.

...”I think that when we undertake the task of implementing ECFs [electronic clinical files] in our hospitals and health facilities we face staff who are mostly not trained in this regard, or even with basic computer skills below desirable levels ”...

Specifically, one of the participants shared the experience being carried out in Mexico where, prior to EMR implementation a diagnostic survey was conducted about digital culture of future users of the system.

Also, participants provided input on universities and training centers available in the countries of the Region.

Open Source Solutions

In general, participants expressed that commercial, open code or Open Source (OS) systems were some of the most widely used solutions in their countries and some States and institutions have

their own developments. Although there are a wide variety of national and international companies in the market offering these services, none of them talked about the existence of registries or catalogues that provide decision-makers with a space to find information. Participants observed that if those records existed, they should be kept by the Ministries of Health.

...”in El Salvador (so far) there is no registry and definitely no certification, whatever the kind of licensing of the EMR solution... if any, it should be promoted by the Ministry of Health (as the governing entity) or, in any event, the Higher Council for Public Health”...

Participants also considered that currently, and due to the characteristics of the health systems in the countries of Latin America where the healthcare sector offered by the State beyond standard commercial or open source solutions, it would also be important to have a domestically generated system observing the processes already implemented in national institutions, especially in the public sector.

...”In my personal opinion, the MINSAL (MoH) should first have an EMR implemented “at home” since this institution offers health services (to approximately 80% of the population), and then, once it has enough knowledge and experience, it could consider the task of registration/certification”...

Regulation, certification and incentives for EMR adoption

Another question proposed for discussion was regarding the strategies that could help to foster EMR adoption. In this topic, participants stressed the importance of introducing health information systems and, particularly, EMRs in the political agendas of governments as a priority policy. Furthermore, emphasis was given to the relevance of enlightening governmental authorities on EMR benefits and how they could be connected to other national priorities by providing or generating evidence showing, for instance, whether EMRs may be used as an equity tool, or to improve health access or resource distribution.

“The main strategy is to introduce health information systems in the political agendas of local, provincial, and national governments in all areas, and to create a communication network among them all”...

In this sense, participants also underlined the importance of having a regulatory framework to facilitate adoption.

“Each country of the Region should legislate on EMRs. In the interim, it should be allowed to supply national systems with data that can be under monitoring and surveillance, guaranteeing patients confidentiality so as to capture information from all health providers”

But, beyond the regulatory framework and the incentives governments can provide, participants also pointed out the importance of complying with healthcare processes for adequate adoption, regardless of the regulatory framework.

“...adoption and use are not exclusively subject to the generation of a regulatory framework. Although it is true that electronic medical practice should be protected and regulated for adoption, we should try to cover users’ needs. Adoption and use of Electronic Clinical Files (ECF) is mainly a question of processes. Main users of these systems are health professionals”...

According to the participants, there is a current need to have regulations addressing the exchange of information between their different Electronic Health Record Systems; therefore, definition of exchange rules and minimal data to be shared with standardized mechanisms adhering to applicable regulations is an important area of opportunity at sectoral level.

Regarding EMR certification, one of the participants talked about the Mexican experience, where a standard informs that all EMR, both public and private, should be certified by a Compliance Assessment Process through the Directorate-General of Health Information.

Participants from Mexico, Venezuela and Argentina pointed out that their countries have a digital agenda at national level which considers the discussion and will issue technical specifications for potential exchange scenarios and for EMR design. These agendas are not necessarily always related with the ministries of health and sometimes, as in Venezuela, the coordination of the national agenda depends of the Ministry of Science and Technology.

One of the questions raised by the participants was the possibility of having regulations at regional level, as in the European Union, where the eSOS project is trying to connect EMRs within the European Union.

Classifications versus Controlled Vocabulary

One of the topics the participants raised spontaneously was the question of using disease classification as ICD family by health professionals or the use of wider vocabularies such as SNOMED-CT and the representations of the health domain.

The responsibility of selecting a classification code was mentioned by the participants as a weakness that health information systems frequently present. Often, this task implies that health professionals carry out tasks not understood by patients, and that may generate resistance in physicians.

Participants indicated the importance of having intelligent systems to provide, at least, the upload of diagnoses by, for instance, the suggestion of code-related terms, especially when doctors start to write a term in the information system.

“Some systems are so intelligent that as soon as doctors begin to type they provide options (usually ordered by frequency of disease or cause of death). We have seen a doctor starting to type “DIA...” and the system immediately offers “DIABETES” because this is the most frequently repeated value; and we have seen that in a hurry, or due to discomfort, the doctor inadvertently clicks “DIABETES” while the patient had died from “DIARRHEA RELATED TO CHOLER”...

Some members explained how their countries or some institutions are starting to use controlled terminologies migrating from the traditional model of secondary coding to the use of interface terminologies.

...”work is being done on a catalogue (thesaurus) to develop an automated codifier in the medium term for this EMR and we expect to collaborate for the improvement of the quality of the record and correct assignation of ICD code”...

It was also mentioned that it would be very useful to use systems to improve disease coding, a task that is often considered an administrative assignment by health professionals.

...”Electronic files should evolve to incorporate automated coding of diagnosis so that doctors do not waste time searching for the code or diagnosis in a catalogue; codes should be assigned by the software application as it is currently done with mortality. Codifiers could solve those diagnoses that have not been included in a dictionary of diagnostic terms and feed it with new input”...

Participants also explained that the use of clinical terminologies will not solve the question of interpreting the reasons and cause of hospitalizations, and although many processes are automated, some of them – such as identification of hospital discharge – would continue depending on professionals trained for that end.

...”The use of vocabulary interfaces is useful at the time of recording information by way of a terminological, and even orthographic, dictionary to guarantee that doctors record their own diagnosis, never one of a list, but using syntactically and orthographically correct terms. The mapping via SNOMED CT to different classification codes does not solve statistical coding of hospital discharge causes since it lacks the stage of applying specific selection and association rules of ICD”...

Discussions regarding the use of structured information or in the form of free text in the EMR were also grouped within this Domain, although participants did not provide their opinion on the preference of availability of more structured information over free format information or vice versa, they do remark the importance of taking this issue into account:

...”There are elements as basic data of the patient, family or patient background, immunizations, coded diagnoses, triage, control of critical path method, among others, which can be structured with standards; but also, in physical clinical history we find that doctors usually make unstructured notes or carry out procedures that are not code-recorded but which are particularly important for them”...

Recommendations given by participants

In general, participants had experience in the use and implementation of EMRs and in different moments of the discussion they provided inputs regarding recommendations to take into account prior to EMR implementation.

Many of these recommendations were related to organizational management or the human aspect of EMR implementation. For instance, participants recommended multisectoral and interinstitutional work, that is, involving all the players in the implementation process, which had also been mentioned as a risk if not carried out. Management of change was also mentioned as well as digital literacy of future users of the system to be used.

Furthermore, they discussed the need of a long-term strategic plan prior to starting operative work, including a detailed analysis of the situation in organizations or units where the electronic system would be implemented.

...”Strategic planning has a full and very interesting methodology to be followed which can help in project definitions. Broadly, this planning includes defining the vision/mission of the project, analyzing the setting, identifying barriers, analyzing risks or potential resistances, identifying communication elements and an implementation, control and evaluation plan of the project”...

Interoperability was also mentioned as a key factor to be taken into account by the authorities.

...”to be functional, an EMR should be unique by country; I do not mean the same software but interoperable web-based software which allows remote access linked to the essential components of complementarity”...

...”nevertheless, clinical records do not speak the same language, nor are they integrated with the health information system, and definitely not with individual reports of healthcare delivery or public health surveillance databases, or in any event, demographic ones”...

Participants requested to take into account and respect the different languages spoken in the Region.

“Adaptation of the language according to indigenous languages, predominating in some sectors of the countries of our Region, should be taken into account”

Another recommendation was the need to share backup documentation regarding legal and regulatory aspects of EMRs, as well as to share the methodologies used with their instruments for diagnosis, planning, implementation, monitoring and evaluation of local, regional or national projects on EMRs. Documented successful experiences should be shared (evaluation reports, studies, etc.)

Topics of concern for participants

Some topics taken from discussions were related to the participants' concerns regarding EMR implementation. Many of these concerns can be regarded as recommendations to take into account when working on EMR adoption.

One of the subjects was confidentiality of clinical information. Participants pointed out the importance of having a law or regulation to protect the confidentiality of the medical act reflected in the EMR.

Another concern was the topic of the resistance to change and all the cultural factors that may induce health professionals to resist the use of EMRs.

... "Resistance to change is the first point to be addressed and one of the most latent risks. Successful implementation EMRs lies in this point; this has been so critical that First World countries have created incentive programs for their use."

Another point of concern was regarding technological aspects, particularly those related to accessibility to technology and communication, such as internet availability.

... "Colombia has areas without internet or communication access to allow integration of records; in fact, there are multiple hospitals with local EMR that does not allow assessing the quality of integration between records"....

Economic factors were mentioned as well.

... "economic factors. Many countries are considered low-income countries, which hampers EMR implementation"...

Failures in the design of systems are also an important topic. Particularly, it is essential to consider usability when implementing clinical systems.

... "Some health information systems are so complicated to operate that physicians end up making their records on paper"...

Participants discussed the problem of implementing the information systems and the leadership by those involved in systems without including professionals who have been working for years in information areas and with diagnosis classifications.

"In general, system areas are being allowed to take the lead with EMRs and they are not necessarily accompanied by the information area and PAHO health classifications"...

Differential factors present in Latin America and the Caribbean for EMR adoption

One of the topics that raised more interest in the forum was the identification of particular situations in the Region which should be considered for EMR adoption.

In general, participants agreed that there are differential factors in the countries of the Region, from the legal and regulatory framework to cultural, social and political patterns. They also mentioned

that differences are not only seen in connection with the health sector but also with the technological framework or technical and semantic interoperability or patient's security and rights, and they agreed that although the countries of the Region have some similar characteristics, the improvements in each of these factors can be considered dissimilar.

Particularly regarding the health sector, participants identified some domains such as the organization of the health sector and the way of service delivery, funding, and the role of social security, as a differential factor in most countries. Also, the way in which health workers are organized - in unions, for instance - and the weight of professional associations in some decision making. The importance of integration in Latin America was also underlined at the level of health information systems as well as the major role PAHO could have as promoter of policies and incentives for EMR adoption in the Region.

Within the same topic, it was also said that in some countries of Latin America decision-makers do not know the real benefits that EMR could produce for the health of the population. This topic could also be related to the need for trained human resources in EMRs.

...”ignoring how much computerization of processes for gathering and keeping medical and health information could contribute to the rationalization of the healthcare process, and how little it may contribute to the generation of indicators of the population health status and the management of resources for the health in the country”...

Another characteristic remarked by participants is how some countries of the Region have incorporated the use of technicians and staff from statistical agencies who need information in the form of classifications, especially the classifications of the WHO family such as ICD-10. It is said that in these countries physicians only write diagnosis of patients' diseases as free text which is later coded by staff trained for this task. Previously, in another section of the results, comments were made on the role of classifications in EMRs.

Within the same topic, some particular difficulties already mentioned in other sections of the report were identified, but here they are specific for the Region, such as the low rate of adoption of interoperability standards which causes, for instance, the fact that closed health systems cannot be consulted or medical information shared between health institutions. Participants also underlined the lack of legislation at country level on the use of EMRs in the Region, the lack of consensus between different state and private players and the limited number of professionals trained to work in this domain of knowledge - Medical Informatics.

Discussion

This report presents the opinion of the participants subscribed in a discussion forum about the situation of EMRs in the Latin America and Caribbean Region. Participation was very active and included the input of 200 participants from 21 countries, with similar realities but, at the same time, some differences in the management of health information systems and electronic records.

During the virtual discussion period approximately 300 contributions were provided by participants, which were analyzed and then included in this report. Within the factors mentioned by participants, we find it essential to be able to know the current situation of the EMR adoption level in the Region with objective and validated data. It was also recommended to encourage the training of human resources in the Region, focusing on the knowledge of EMR-associated benefits and risks. Many of the inputs were related to organizational aspects of EMRs, strategic planning, involving all the players, their multidisciplinary character and the adequate management of change. The importance of having a regulatory framework to facilitate or encourage their adoption was also mentioned. Confidentiality and security in the management of sensitive information was highlighted as an additional factor to be considered. Also, subjects related to the interaction of end-users with systems also emerged, such as the design of interfaces, the complexity of introducing diagnosis and the use of classification lists compared to the use of terminologies that better reflect users' needs. The use of interoperability standards and the review of documents describing successful experiences of EMR implementation in the world were also described by participants as important factors for EMR success.

In a bibliographical review of information systems in developing countries, the authors identified similar factors to those provided by participants in the project. Luna et al. also recommend the development of national agendas including eHealth in their priorities and, as the project participants stated, they also mentioned that the necessary measures should be taken to overcome current worries regarding confidentiality and security of data, as well as having trained human resources and fostering strategies to facilitate regional integration. [12]

One of the topics discussed was the information available on EMR adoption in the Region and, in general, it was agreed that although there are no data in the countries of the Region, having this information is essential to take the necessary steps to promote their use and to monitor the measures taken for this end. In this sense, countries such as the United States, or even regions such as the European Union have data that facilitate this task. [13,14] Overall, participants agreed that having an entity centralizing this information as well as other documents for the whole Region, would be extremely relevant.

Closely related to EMR adoption are the barriers that often hamper their use. Participants described some of them, many of which are also documented in international literature. The financial barrier is one, since a high initial investment is required, and technical barriers (such as lack of infrastructure, lack of trained human resources and interoperability problems of EMRs). Time is also described in literature, not only for implementation but also in terms of users' resistance, since the use of EMRs frequently prolongs the duration of medical consultations. Psychological factors, such as negative perceptions, a sense of loss of autonomy by professionals, also play a key role in adoption resistance. Social barriers, especially the fear of interference in the doctor-patient relationship are also significant. And, lastly, difficulties for managing change and effective leadership strategies are barriers commonly mentioned in literature. [8]

Participants identified an important list of benefits, highlighting the role of EMRs when they are integrated to expert systems for decision making. Literature presents evidence of the clear benefit of this association [15]. Moreover, participants identified confidentiality as one of the benefits although in other passages of the discussion they also found that EMRs can make sensitive data confidentiality more vulnerable.

Regarding functionalities, participants particularly place emphasis on the identification and use of documents in this topic in international organizations, adapting them to the Region if necessary, on functional models or necessary requirements of EMRs, for instance, the suggestions of the United States Institution of Medicine or the HL7 functional model. [16, 17]

Resistance to change and other organizational aspects were mentioned by participants; for instance, the risk of not identifying failures in existing processes, or the importance of having facilitators among the people working in the implementation of these systems. This issue is widely described in health informatics, for instance. Ash et al. identified specific roles they called “bridgers” or facilitators for the people interacting among those in charge of implementing the systems and health professionals. [18] In this regard, participants also recommended interdisciplinary work, involving all the members of organizations, identifying key people to work in project teams. Management of change is described in literature as a key factor; in fact, in the medical information area, the organizational factor is described as responsible of 80% of successful implementation.

There is evidence that forcing already established processes in health organization, through the implementation of systems that do not respect them, may bring more complications than benefits, even increasing mortality, as was demonstrated in a very well-known study carried out in the United States. [19] Participants identified this as a risk and a factor to be taken into account. [20] Literature also suggests that system design should involve health professionals, and recommends training users before implementation. [21]

The use of controlled vocabularies integrated to EMRs was a topic spontaneously identified by participants. Literature offers recommendations on how to facilitate their implementation as well as on which is the right balance between entering free text, usually preferred by health professionals, and entirely structured data, generally easier to interpret by information systems. [22] During the discussions, beyond the role of entering information in EMRs, participants underlined the importance of workers who are currently performing coding tasks using classifications widely accepted in the Region, such as the ICD family.

Participants identified some of the factors that hamper adoption in the Region, with special emphasis on the lack of human resources trained in medical informatics. Having trained human resources has already been described in literature as a facilitating factor and participants also identified this as a key factor. In this regard, participants provided available training programs and also emphasized the importance of training human resources who will later work in EMR implementation.

Failures in usability and the complex design of systems were already mentioned by participants as a risk to consider. Literature has also addressed this matter; in fact, a report from the US Institute of Medicine (IOM) considers usability as one of the key points to take into account before selecting an information system for the health system. [23]

Regarding the regulatory framework, participants stated that although countries like Colombia, Peru, Uruguay, México and Chile, among others, are working on this topic, the importance of replicating successful experiences and having a certain level of integration in the countries of the Region regarding EMR regulation was also mentioned.

Limitations

The report has some limitations that deserve to be described. Firstly, participation was voluntary and only members of the RELACSYS and PAHO networks were contacted, which could have limited the diversity of opinions. Additionally, as invited participants were already members of networks of health information systems, many of them may have a favorable vision towards EMRs, which could bias the opinions provided in the forums and summarized in this report. Also, when undertaking a qualitative analysis, there are some limitations distinctive of the methodology which should be taken into account. An attempt was made to reduce them by triangulation of researchers in the analysis and later validation of the content generated in the report.

Conclusion

Although the implementation of EMRs is a complex process, this report documents a series of recommendations that can be used by the countries of the Region to facilitate and encourage their use by health institutions. There is still a long way to go and many topics to discuss, but this initial document specifies some relevant questions to be taken into account, many of them have been described in the international literature as important steps prior to the correct adoption of EMRs in the Region.

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