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A countrywide clinical informatics project in Uruguay

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Abstract

FEMI is a federation of 23 private not-for-profit health care organizations across Uruguay. It covers approximately 700 thousand people (20 percent of the Uruguayan population) and owns a tertiary center in Montevideo. Pressure from ongoing national changes in health funding and regulation have pushed FEMI to develop a project, in order to improve efficiency in health care through the use of information and communications technologies. In particular, a federal electronic health record and a strategic management system are pursued. This project is supported by the Inter American Development Bank. The project has four lines of action: Specification, construction and implementation of the systems; Alignment through the use of standards; Cultural change through training and prototype systems; and Infrastructure. Short term results include a federal balanced scorecard, federal identification and authorization services, a terminology service, telemedicine applications and massive training of interdisciplinary teams at the local level. The importance of collaboration at the regional level and the advantages of having a multi-institutional commitment are stressed.

Keywords:

Uruguay, South America, Information systems, Computerized medical record systems, Inservice training

Introduction

Uruguay is a small country located in the southern cone of South America, with 3.4 million people, half of them living in Montevideo. Its health indicators (e.g., life expectancy of 76.6 years, infant mortality rate of 11.9 deaths / thousand) are close to those of developed economies. The health care system is comprised of public and private not-for-profit organizations. The latter cover approximately 60% of the population and are HMO-type organizations, providing both insurance and health care. There is an on-going health care reform, designed to increase coverage and improve management of the first level of health care.

FEMI (www.femi.com.uy) is a federation of 23 private not-for-profit organizations across Uruguay. It covers approximately 700 thousand people, owns a tertiary referral center in Montevideo, over 30 hospitals with 1500 beds and 100 outpatient clinics across the country, and 2800 physicians work there. Three-quarters of its budget comes from the National Health Fund, administered by the Social Security.

Pressure from ongoing national changes in health funding and regulation have pushed FEMI to develop a project, in order to improve efficiency in health care through the use of information and communications technologies (ICT). This project is supported by the Inter American Development Bank through the MIF Fund, and by the Secretary of Health. It aims at the exchange and analysis of administrative and particularly clinical information at a federal level, taking into account the different levels of information system development of each individual institution of FEMI. The project was officially launched in March 2008 and has a four-year duration.

A previous publication [1] has shown the massive training strategy across the country during 2008, in agreement with a more general conception for developing countries [2]. In this paper, a description of the main lines of action and short-term results, and an update of the training efforts are shown.

The project

The project needed to consider the different levels of information system development across the Federation, as shown in the survey performed across it: While all of the institutions have the administrative systems necessary for the day-to-day operations, and the majority have some kind of departmental clinical system in place, most of them don't have comprehensive electronic health records. There currently are about 2500 PCs and 100 servers across the Federation.

Furthermore, each Institution within the Federation was free to choose the information technology vendors, so there are a variety of systems in place, although two vendors cover half of the institutions. The project also intended to provide federal functionalities while accepting autonomy, and legacy administrative and departmental systems of each institution. A general diagram of the proposed system architecture is shown in Figure 1. The main lines of action in order to achieve the above results are shown in Figure 2.

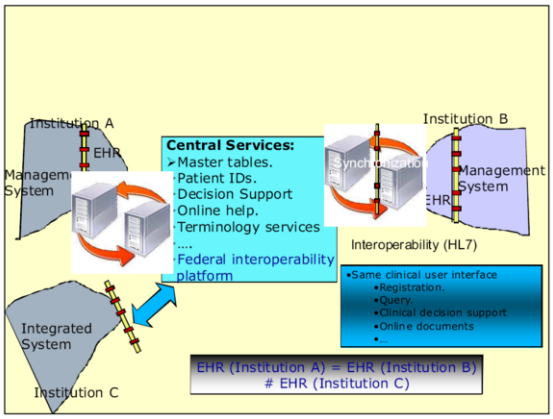

Figure 1- Model of the federal electronic health record.

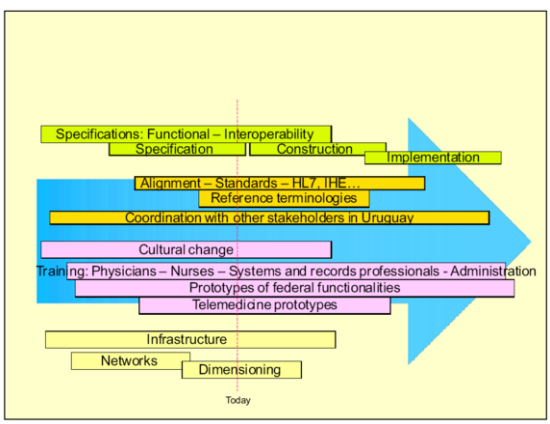

Figure 2- Main lines of action at the FEMI Project.

The first line of action, *Specifications*, includes the Specification itself, Construction and Implementation of the Federal Electronic Health Record (EHR). The EHR will be implemented in the Emergency rooms and later in the outpatient settings in five pilot institutions during a first phase, and in the rest of the institutions in a second phase. Most other components involve all of the FEMI institutions from the beginning. This line of action also includes the design and construction of a balanced scorecard (a strategic performance management tool).

The second line of action, *Alignment*, includes the 1) use of standards for information exchange and representation (for example: messaging standards, standard terminologies, federal identification services), and 2) coordination with other stakeholders in Uruguay (Secretary of Health, Social Security, HL7 Uruguay, other health care organizations).

The third line of action, *Cultural Change*, includes 1) Training, 2) Prototypes of federal functionalities, such as the Federal Authorization Services, and 3) Telemedicine, where Telemedicine applications are used as a rather quick way to bring health care professionals into the use of information technology and into the Project.

The fourth line of action, *Infrastructure*, includes Computer and Videoconferencing Hardware, Software and Networks.

Results

In this section, the short term goals and achievements already realized or expected before March 2010 are discussed, in the context of the overall project.

There is a crossover among the lines of action. For example, the federal identification service is related to *Cultural Change* and to *Alignment* and is a requirement for the federal electronic record explained in line 1; and the telemedicine applications needed the Intranet – *Infrastructure* - to be updated.

Specification, Construction and Implementation

Regarding this line of action, a **federal balanced scorecard** will be implemented before the end of 2009, after having finished the selection process of the consulting firm. Each institution will have available their indicators from the National Indicators System SINADI and other clinical performance data, compared historically to themselves and to the rest of FEMI Institutions.

Regarding the specifications of the **Federal Electronic Health Record System**, KPMG Consulting firm has just finished the Specification, and next steps (construction/adaptation and implementation) are to begin.

In parallel, there is a **process redesign in clinical areas** where the electronic health record will be implemented (particularly Emergency room and ambulatory settings), with the help of Hospital Italiano de Buenos Aires.

Alignment

In this chapter, the advancements in identification and terminology services are shown. There also is a national consensus to use HL7 CDA as a messaging standard. These and other topics are being discussed in periodic meetings with the other main stakeholders in Uruguay (Secretary of Health, Social Security, HL7 Uruguay, and other health care organizations), since the alignment includes organizations external to FEMI.

Identification services

The provision of identification services in order to identify a person unequivocally is a foundation for the federal record system and other federal applications, as disparate electronic systems need to link personal information across institutions with the lowest chance of error. This service also needs to take into account the legislation regarding personal data, which has

recently been passed and applies to every health care organization and to the federation as a whole.

In Uruguay, there is a national identity number that exists from birth. Nevertheless, a series of patient data needs to be taken into account to ensure that a proper match among existing records within the federation is being done, because no single patient identification number is considered to be sufficiently reliable or universal [3]. That is why the goal is to implement an identification service instead of trying to look for the best unique identification number [4].

This service cannot be successfully implemented unless the different processes involved in identifying patients are carefully reviewed. The main processes involved are: Registration, accreditation and audit. *Registration* is the process through which each Institution assigns a personal identifier and registers it along with his/her personal data, in order to be able to carry out a correct accreditation at a later moment. *Accreditation* is the process through which each person is verified to be the person who claims to be, and consists in taking the personal data given by a person and then compare them with the data registered in the previous process. These processes depend on the quality of the information registered in the organizational systems. For example, if the registration process has an error, the accreditation process will be affected. For this reason, there is an *auditing* process, where the registered data are verified for completion and accuracy. If all the information registered is verified, then the accreditation process could be performed in an optimal way. To help in the auditing process, the records could be marked in different states, such as: temporal, permanent or validated. The "temporal" state means that the record was not verified as complete or correct. The "permanent" state means that the record is complete but was not validated as correct. The "validated" state indicates that the record is complete and correct.

The process followed to obtain the identification service at FEMI was developed in several stages. First, there was a survey to understand what data were registered for FEMI patients and to detect problems in registration and also possible incompatibilities among different institutions which could lead to problems in the future, when attempting to share clinical information. The main problems detected were under-registration (to register less data than necessary for a correct identification), and the formats of some fields, such as date and codes for gender. This survey was carried out in 13 of the 23 institutions, and the rest of the institutions will be surveyed before the end of 2009. In a parallel work, there is coordination with the Social Security and the Public Health Services, to use similar identification data sets and algorithms.

The federal identification service is currently being implemented, with the goal of not only identifying persons, but also to offer related services, such as coverage for each patient, and geo-referenciation of patients' homes and workplaces, as well as physicians' offices.

The federal identification service is a key element to implement other federal services, such as sharing of clinical documents among institutions.

Terminology services

The use of natural language simplifies the registration requirements in the EHR for health care providers, but limits the reusability of the data, except for patient care. If, at the same time, specific fields are coded automatically from natural language strings, the best breed is achieved. This is one of the main reasons for using a Terminology Service. Through this service, a terminology is used as a reference (for example, SNOMED CT) and then it is related to the natural language used in the country or region. Classifications are used as output vocabularies (such as ICD-10, CPT, DRG) for reports and analysis [5].

To obtain this product, an adaptation of the medical terminology service developed at Hospital Italiano de Buenos Aires [6] was decided. This service uses international standards, and will take into consideration the needs of FEMI and other Uruguayan institutions. A match of over 80% is expected from Argentinean to Uruguayan natural medical language as a starting point for the service, considering the experience between Argentina and Chile [7].

The use of standards is a fundamental component of the Project. The Terminology Service will allow to represent clinical data mapped to different standard classifications, increase the analytical capabilities of data registered in FEMI systems, allow the exchange of information across institutions within and outside FEMI, and eventually implement decision support systems.

At this time, an agreement with Hospital Italiano de Buenos Aires has been reached, and the first trials are being made. A note should be made that current FEMI systems could use the Terminology Services, without the need to wait until the Federal Health Record is in place.

Cultural Change

Cultural change is a main line of action of the Project, as success largely depends on it. It involves hundreds of professionals at local governing boards and technical coordinating teams across 23 institutions, as well as eventually 2800 physicians and more than ten thousand health and administrative personnel. A more professional strategy is being finalized with the help of communication and organizational change specialists, but – in the meanwhile – the project coordinating team has devised several change management strategies, including training, implementation of system prototypes and telemedicine applications, described below.

Training

A great effort has been made to train local interdisciplinary units, as shown in [1]. An update of these results shows that:

- The 10 x 10 introductory online course on health information systems (approximately 150 hours of coursework), developed by AMIA and adapted for

the region, was taken by 72 professionals in its 2008 and 2009 editions.

- The face-to-face introductory course developed in conjunction with the Uruguayan Health Informatics Society SUIS was taken by 85 professionals in its 2008 and 2009 editions.
- The HL7 online course was taken by 40 informatics professionals in its 2008 edition.
- Sixty-seven nurses in coordination roles from across the country participated in the Nursing Informatics and Quality Conference in March 2009.

Now an end-user training strategy is being designed and implemented, considering the massive training needed and that the deployment times will differ across institutions. First, a *survey* to understand end-user basic and health-related informatics literacy has been designed and is being implemented in pilot institutions. Then, three levels of training will occur: 1) *Basic informatics training* for those who need it (which will rely on local organizations). 2) *Concepts about the Electronic Health Record*. This is intended as a change management tool for health care providers, designed to change attitudes and provide basic knowledge about the topic. The methodology is train-the-trainers, where the ones providing the actual training will be the local coordinating units, because they will then become the local experts for the end-users regarding the new system being implemented. The first courses on Concepts about the EHR will be at the beginning of 2010. 3) A more *skills- and processes-oriented training* just before the implementation of each module will be provided as needed, blending professionals from the consulting firm in charge of the EHR, the central unit and the local units.

Authorization service

A by-product of the federal identification service, which has been needed for a long time in FEMI, is the authorization service. This service will allow a patient from one FEMI institution to go to another institution and be authorized though a semi-automatic and documented process. It is a change management strategy at the management level, because a short term result is shown while waiting for longer term goals.

Telemedicine applications

At the other end of the spectrum, telemedicine applications are viewed as a way of integrating technology for the end user. A plan has been designed, including continuing health education, then tele-rounds and finally tele-consultations (without and with the EHR). The first continuing education events are being carried out. As an example, in September 2009, about 700 health care professionals in 20 sites participated in an educational event about type 2 diabetes, with the use of tele-confererencing technology. Small-group discussion was included in the methodology (78 small groups reported back), and the final plenary with the experts took into account the small group reports, integrated automatically via Google forms.

Infrastructure

FEMI has a national intranet that has been expanded to take into account the new requirements, including high quality live videoconferencing.

Discussion

There are some topics that come across the different lines of action of the project. One of them is the **added value of having a federal project**: 1) there are functionalities that involve the whole federation and not each one of the institutions (for example, the authorization service, and distance continuing health education events or tele-consultations); 2) there is an economy of scale in working together in a project (for example, in change management and training, or in having some services at the federal level, such as the terminology services); 3) it is possible to do things that otherwise would not be possible, such as negotiating with the other main stakeholders, having the advise of recognized international academic institutions, or having a centralized highly specialized coordinating unit.

The other topic is **international south-south collaboration**, particularly with Hospital Italiano de Buenos Aires, in distance health informatics training, terminology services, and consulting. But other organizations or experts from abroad have also helped in nursing informatics training (Brazil and Argentina), Telemedicine applications (Switzerland and Argentina), and HL7 (HL7 Argentina), as well as in the overall project strategy (Chile, Argentina and others).

Conclusion

This ambitious project intends to integrate 23 institutions across Uruguay, using the electronic health record and management tools. The first stages of change management and alignment have been successful, but there still is a long way to go in order to achieve the main results.

Acknowledgments

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