

# The Medical Project: Implementing an Open Source HIS in Rural Argentina

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**Abstract:** We chose a Primary Care center in the north of Argentina as a pilot project to implement *Medical* [1], an Open Source Hospital Information System. The project required the analysis of village socio-economics, center infrastructure, and regional technological and economical resources. Once implemented, the center will have a centralised, standard based Hospital Information System, enhancing the team work. *Medical* will be a valuable tool to keep track of the condition of families and their members, as well as to provide the health ministry with solid epidemiological data, so they can optimize the health campaigns in the region.

**Keywords:** Hospital Information System, Health Information Systems, e-Health, Open Source, Primary Care, Family Medicine

## 1. Introduction

The north of Argentina faces many challenges of emerging economies, with many families living in poverty, poor housing and malnutrition. San Vicente public primary care health center in La Rioja was established in 1999. With over 5900 clinical records, the clinic currently assists 2200 families, and a temporary / seasonal population of 1200 people.



San Vicente Center	
Type	Primary Care
Coverage (habitants)	8900
Number of families	2200
Patients per day (approx)	80
Number of rooms	4
Number of doctors	6
Number of health promotion agents	6
Number of administrative workers	1
Number of nurses	4
Coordinates[2]	29°24'47.66"S, 66°51'59.91"O
Distance from Buenos Aires City	1010 Km

### *1.1 San Vicente Primary Care Center Logistics*

The center has an admirable way of working with the community. They have six health promotion agents, which routinely go house-by-house, assisting their members and the community in the following way:

- Take note of their living and sanitary conditions
- Advise their members on reproductive health
- Check their children vaccination status
- Encourage their members and ultimately make an appointment to visit the health center.
- Alert about family violence or other social events that require immediate action

Once they get to the center, that information is passed to the administration department, where they take note and write down the appointment.

The patient can also call and make an appointment over the phone. Once the patient gets to the center, they are checked by the nurse that takes the vital signs of the patient. Finally, the nurse derives the patient to the doctor, who ultimately makes the evaluation.

There are several federal and NGOs programs that make financial contributions both to the primary care center and to the family upon completion of some requirements, such as timely pediatric visits, or enrolment in reproductive health programs by the patients.

### *1.2 Current Problems*

The lack of a computerized Hospital Information System (HIS) has many drawbacks that hinder the center's efficiency, health promotion and prevention of illnesses. The following list summarises the main problem that faces the center in terms of data management:

- Data isolation: The information seldom leaves the center in a structured way, so is not shared among other centers. This reduces the amount of epidemiological information.
- The information often arrives to the ministry of health not in time and without the accuracy needed to make effective health campaigns. Similarly, the lack of information leads to errors in the amount of money assigned to such campaigns and to medicaments.
- They risk losing clinical records data. La Rioja is located on the side of the Andes mountains, an active seismic area. Common risks as fire, floods or theft are also present.
- Lack of a centralised calendar, where doctors could see which patients they will assist.
- It's hard to track which patients have insurance, so the center can invoice the company.
- The health promotion agents have difficulty to track the status of the families they visit. It's hard for them to know which family assisted to the center after their advice, which children have been vaccinated, what reproductive health measures have been taken etc.
- Difficulty to measure performance of center personnel (assistance, prescriptions, derivations, ...)
- The information storage on paper is very hard to analyse. There are just too many indicators, patients, families over the years.
- Lack of stock control. Medicines and other medical goods are many times overstocked or, on the contrary, they may lack, since there is not statistical data to rely on.
- Difficulty to know how successful are being the funds given by the federal government or NGOs to specific health programs.

## **2. Objectives**

We have observed that the human side of the center is excellent. The center counts with highly skilled doctors and nurses, and a very committed team of health promotion agents. The main problem relies on how the information gathered is processed.

Our goal is to implement during 2009 *Medical*, the Open Source Hospital Information System, to better serve the community of La Rioja. The next step will be a regional implementation, where all primary care centers will share a centralised HIS and database.

In the implementation of *Medical*, we will cover the following functionality:

- Patient information : Family members, clinical history, socio-economics, lifestyle
- Laboratory management : Hematology, Radiology
- Human Resources : Assistance, Roles, departments and hierarchies
- Accounting : Covering both financial and analytical accounting, it will allow identification of money flows, and the performance of different departments
- Vademécum : *Medical* provides a vademécum with all the available drugs provided by the *Remediar* [3] federal project
- Stock and Supply Chain Management: *Medical* will be able to automatically order necessary medication or medical goods based on amount of stock remaining.
- Dashboards: We can create multi-dimensional infocubes with different indicators that will show in real-time epidemiological trends, as well as the performance on different prevention programs.

All the information gathered by the system relies on industry standards. For example, all the pathologies are encoding using WHO ICD-10 [4] notation. The professional doesn't have to input in a "free text" field, so there will not be coding errors. Moreover, the information gathered can be used by international organizations for further studies.

The system will include specific, local information that is used daily by the health promotion agents and the doctors. For example, *vinchucas* infestation levels in the houses and Chagas disease relation [5] or amount of dog bites per neighbourhood.

### 3. Methodology

The implementation of *Medical* in La Rioja began in January of 2009 and it has a go-live date in January 2010. It is a multi-disciplinary effort, involving doctors, sociologists, NGOs, health ministry, faculty of medicine researchers, computer scientists, Enterprise Resource Planning (ERP) and Data Warehouse consultants.

Barceló University in La Rioja (Instituto Universitario de Ciencias de la Salud, H.A. Barceló, IUCS) has been working in the region since 1994 [6]. The center counts with doctors graduated from the IUCS. The university actively collaborates with the community in terms of promotion of health and prevention of diseases. They have a medicine informatics department (CIACS) that is actively collaborating with the project.

The first step was getting to know the village socio-economics. We needed to get involved with health promotion agents to focus on their needs. *Medical* is focused on Primary Care and family medicine, so the health promotion figure is key.

The second stage was to meet the doctors, nurses and administrative personnel. They told us how they interact with each other and the patients, as well as the information gathering process. We also had interviews with the health ministry staff. They gave us their point of view on what do they need to improve their health campaigns, as well as to how to make use of their budgets in an optimal way.

The next step consists of installation of necessary hardware and software components (see technology section). There will be one development instance and one Quality Assurance instance (sharing same physical server), and one production server that will be in a separate server. The quality assurance server will also be used for personnel training.

The following project stage will focus on localisation. Components, including the *Vademécum*, Chart of accounts, doctors, programmatic areas and sectors, family codes, will be installed and customized. At this stage the center departments, user security profiles and

access controls will be also implemented. For security and integrity reasons, the data will be replicated in real-time on a contingency server located at a different location. Additionally to the replication process, there will be daily local and off-site backups.

Once the system is customized and adapted to the local needs, the users will be trained. The training will be for technical users (system administrators and programmers) and for end-users that will be in charge of the administration and finally, training for the health professionals (doctors, nurses and health promotion agents).

Finally, there is a period of uploading all paper clinical records. Once this process is over, there will be the official go-live, and the system is ready for production use.

## 4. Technology

When designing *Medical*, one of the most important requirements was that all the components had to be OSI [7] compliant. The system has to be free and remain free.

The main software components of the *Medical* project are:

- Ubuntu [8] GNU/Linux (operating system and firewall).
- Postgresql [9] (Database)
- OpenERP [10] ( ERP / CRM / Dashboards / Hospital Information System )
- GNU Privacy Guard[11] ( Data Encryption)

Hardware:

- One server to hold the Development and Quality Assurance Instances
- One Server to hold the Production instance
- One Server (off-site) as the replication / standby instance
- Four laptops that will be used at the doctors offices
- One laptop that will be used by the health promotion agent

An Internet connection must be established to link the main and the contingency servers, as well as for professionals outside the main facility.

## 5. Conclusion

The implementation of *Medical*, an Open Source Hospital Information System (HIS), in San Vicente will greatly enhance the work among health professionals, reduce the costs in medicaments and other supplies and optimize the health promotion campaigns and programs. At the same time, patient critical data will be securely stored, minimizing the risk of data loss. Patients will be easily located, among their family members, current living conditions, socio-economics status and clinical history. We are confident that this pilot project will serve as the foundation to implement a Health Information System at a regional level, where a single database will hold all the institutions in La Rioja.

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