



# Digital Hospital

Pilot implementation  
of interoperability systems  
at the National Cancer  
Institute (INCAN)



SPECIAL EDITION - INNOVATIONS

DIGITAL HEALTH CASE STUDIES

EDITION 10

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**Author:** Marcelo Céspedes.

**Technical editing:** Fernando Portilla, Luis Antonio Morales, Ian MacArthur and Jennifer Nelson.

**Design:** [www.souvenirme.com](http://www.souvenirme.com)

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# ABBREVIATIONS AND ACRONYMS



<b>IDB</b>	Inter-American Development Bank
<b>INCAN</b>	National Cancer Institute (Instituto Nacional del Cáncer)
<b>EMR</b>	Electronic Medical Records
<b>HIS</b>	Hospital Information System
<b>MSPB</b>	Paraguayan Ministry of Public Health and Social Welfare
<b>SAA</b>	Sub-System of Information of Health Services Ambulatory Area

# REPORT OUTLINE



## INTRODUCTION

Presentation of the health information systems interoperability project implemented at the National Cancer Institute (INCAN) of Paraguay.



## CHALLENGES

Specific challenges encountered during the initial survey at the National Cancer Institute.



## EXPECTED BENEFITS

Description of the benefits expected to be obtained by the medical and technical team after implementation of the system.

## CONTEXT

Description of the current context of the Paraguayan health system.



## IMPLEMENTED SOLUTION

Description of the implemented solution, which consisted of the creation of a health information systems interoperability platform.



## LESSONS LEARNED

Identification of lessons learned during the project implementation process and recommendations for future implementations in other hospitals.





# INTRODUCTION

- » **Beneficiary:** National Cancer Institute (Instituto Nacional de Cáncer, INCAN)
- » **Executor:** Genexus Consulting
- » **Funder:** Inter-American Development Bank (IDB), IDB Lab
- » **Project delivery:** April 2023

This report focuses on the implementation of a health information exchange platform at the National Cancer Institute (INCAN) of Paraguay, in order to improve patient care through interoperability between the different information systems used in the hospital.

The project presented by Genexus Consulting, called **Digital Hospital**, was the winner of a call for proposals made by the IDB Lab in 2020 during the COVID-19 pandemic. The purpose of this call was to promote innovative and technological solutions in the health field to address the challenges posed by the health crisis.

The Digital Hospital project is integrally aligned with **Paraguay's Digital Health Roadmap**, which seeks to improve the efficiency of healthcare services through digitalization and the secure exchange of health information.

Thus, this project puts this vision into practice by creating an interoperability platform for the exchange of health information between health service units in Paraguay. The initial implementation of the platform is focused on the National Cancer Institute (INCAN) as a pilot institution.

**The Digital Hospital was selected among approximately 500 proposals, standing out for its innovative approach and its potential to improve the quality of healthcare services.** In the future, it is expected that this interoperability platform can be replicated in other health institutions in Paraguay, as well as in other countries in the region, in line with the IDB's objectives of improving access to quality health services and reducing inequalities in health care. The pilot project carried out at INCAN, after 18 months of development, facilitates access to clinical information in real time, with **8752 documents shared in three months**. Increased use is anticipated after full implementation in the hospital.





## Interoperability and Soccer

**Just as a soccer team can improve its tactics by analyzing its matches, interoperability is like a soccer team where all the players, even if they are from different countries and speak different languages, can understand each other on the field. Imagine that each player is a different system in a hospital computer.** Just as soccer players use the language of the game to communicate, these computer systems use a common language, referred to as standards, to share information and understand each other. This is what we call interoperability.

### Now, why is interoperability so important?

#### 1. Improve patient care

A soccer team plays better when all the players understand each other. Similarly, hospitals can provide better care when their systems can share information. For example, if a player is injured in a match and then visits a hospital, doctors can access their medical records and see if they have suffered similar injuries in the past. This allows them to make informed decisions about the player's treatment and recovery. Similarly, if health systems can share information, physicians can make informed decisions about patient treatment and improve the quality of care.

#### 2. Save time and money

Just as a soccer team saves time when players understand each other quickly, hospitals can save time and money when their systems share information efficiently. They do not need to repeat tests or treatments because they already have all the information they need.

#### 3. Improve medical research

Just as a soccer team can improve its tactics by analyzing its matches, medical practitioners can improve treatments and cures by analyzing information shared by hospital systems. For example, they can see which treatments have worked best for players with a similar knee injury and use this information to improve future care.

#### 4. Reduce errors

In a soccer team, effective communication between players results in fewer errors. When a coach has information about how opposing players make passes, it is shared with the team so that players can anticipate and be more effective. Similarly, in healthcare, collaboration and information sharing are key to providing quality care and reducing medical errors. For example, if a child is allergic to a medication, authorized hospital physicians can access this information in their systems, avoiding reliance on parental memory alone, which can often lead to errors in medication administration. In this way, the interoperability of healthcare systems can improve patient safety and reduce medical errors, in turn improving the quality of medical care.

The soccer analogy simplifies the understanding of interoperability, which is often a complex concept. Just as soccer is universally understood, we strive for health systems to communicate and share information effectively, regardless of technological or linguistic differences. **This analogy facilitates the understanding of interoperability, promoting better communication between experts and the general public.**







**1.**

# **CURRENT CONTEXT**



# 1. CURRENT CONTEXT

## 1.1. The Paraguayan Health System

**The Paraguayan health system faces great challenges to achieve universal health coverage.**

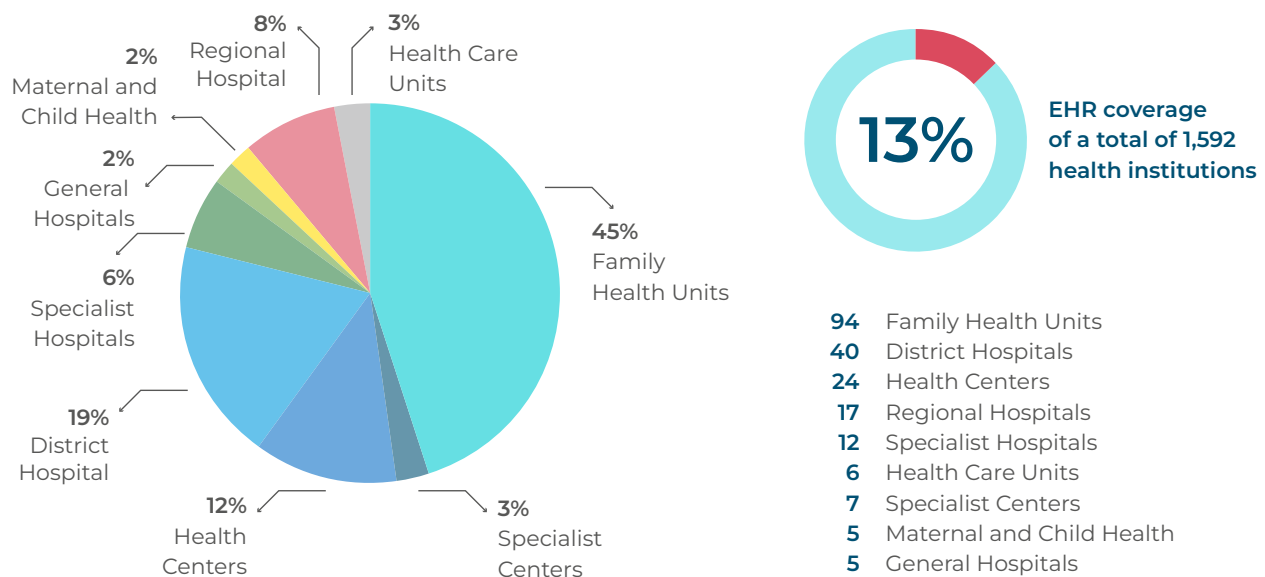
Currently, the health system is highly fragmented and its capacity is insufficient to address the disease burden of the population.<sup>1</sup> In addition, the decentralization of health services has been one of the main challenges in the health system, which has led to a lack of coordination and coherence in the planning and provision of health services.<sup>2</sup> Although the Ministry of Public Health and Social Welfare (MSPBS) has developed an Integrated Health Care Model, which is the basis of the health system and combines a series of strategies to guarantee comprehensive health care,

the lack of human and financial resources, deficient infrastructure and lack of coordination among the different actors in the health system continue to be significant barriers to achieving universal health coverage.

The implementation of the Electronic Health Record (EHR) in Paraguay has been a complex process and is currently in an initial implementation phase covering **79 hospitals and 131 primary health care facilities**.

**In recent years, significant progress has been made in the digitalization of health information.** However, there are still significant challenges in terms of interoperability between the different health center information systems.

**FIGURE 1:  
210 HEALTH INSTITUTIONS WITH ELECTRONIC HEALTH RECORD (EHR) SYSTEMS**



<sup>1</sup> <https://www.oecd-ilibrary.org/sites/504e4366-es/index.html?itemId=/content/component/504e4366-es>.

<sup>2</sup> <https://docs.bvsalud.org/biblioref/2018/11/965939/13-25.pdf>





**2.**

## **CHALLENGES**



## 2. CHALLENGES

Paraguay's National Cancer Institute (INCAN) faces several challenges in the medical care of cancer patients. These include delay in medical care, loss of medical information and medical studies, as well as lack of coordination between different health care providers. These challenges can affect the quality of care and continuity of care for patients, underscoring the need for innovative solutions to improve efficiency and quality of care at INCAN.

- » Over 100,000 registered medical consultations per year
- » 1 million printed patient records stored in the Archives Department

### 2.1. Identified Challenges

#### Difficulty generating statistics

Collecting statistics and metrics in digital health projects can be challenging due to the complexity of the data and the need to integrate information from different information systems. In addition, generating statistics and metrics can be time-consuming and require additional resources to process and analyze the data. In some cases, generating statistics and metrics may require manual transcription of data from printed medical reports, which increases the risk of human error and may delay the generation of accurate statistics and metrics.

#### Loss of documents

Patients may occasionally lose their medical results or face difficulties in accessing them due to the large volume of patient records in the Archives area. With approximately one million records, the hospital's filing system lacks sufficient resources to handle this demand, which can result in lost or misplaced records.

#### Damaged records

The deterioration of paper medical records at INCAN causes setbacks in the management of medical information, as it can make it difficult to read and interpret the information. A notable example of this problem occurred when a storm caused the loss of thousands of tokens, underscoring the vulnerability of paper records and the need for more resilient and durable solutions.

- » "We moved into this archive in 1986 with 15,000 patients, today we have almost 1 million patients using almost the same infrastructure."

Source: Interview with the head of the Archives Department of the National Cancer Institute



### Difficulty sharing information

INCAN faces challenges in sharing medical information among different health care services and providers, which makes it difficult to coordinate medical care and manage patients' medical information. In addition, the lack of a centralized medical information management system and the reliance on paper medical records hinder the accessibility and updating of patients' medical information.

### Disconnected systems

More than 7 information systems operating at INCAN were identified, but unfortunately, they are not interconnected. This lack of integration often leads to unnecessary duplication of effort and limited availability of critical information, which is especially problematic in emergency medical situations.

### Delays in care

Delays in care may be caused by the need to physically fetch the documents from the file folder and take them to the physician. This is aggravated at certain times during the night, because if a patient comes to the emergency room at night, there is no availability of the patient's medical results because the archives area is closed.





**3.**

## **IMPLEMENTED SOLUTION**

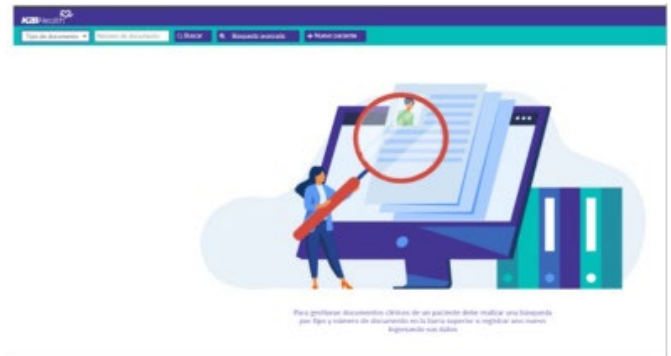


## 3. IMPLEMENTED SOLUTION

- » **Duration:** 18 months
- » **Investment:** Total budget US\$187,500
- » **80% IDB Lab 20% Counterpart**
- » **Identified Systems:** 7 (seven)
- » **Interoperated systems:** 2 (two)

**Digital Hospital is a platform that enables the interoperability of health information systems,** facilitating the consolidation of information from different systems that currently operate independently, as “*islands of knowledge*”. Although in the future it may evolve into an inter-institutional information exchange, at present, its main focus is the interoperability of medical information between information systems within the National Cancer Institute (INCAN).

**FIGURE 2:**  
**Digital Hospital Platform**



### 3.1. Project Stages

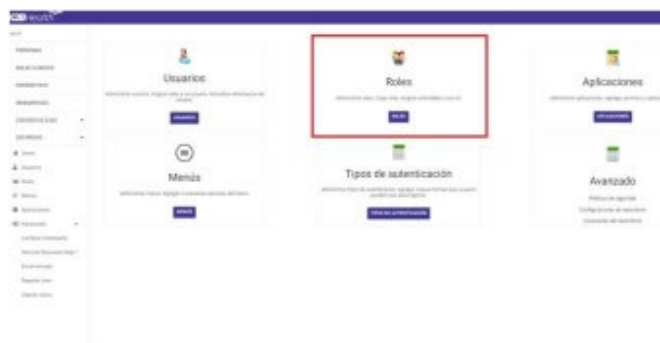
#### STAGE 1 - Analysis

During this stage, a comprehensive analysis was made of the systems used in the various INCAN sectors that generate clinical information, in order to learn about the technologies in which they were developed, their interoperability possibilities and the experience that the suppliers had in projects of this type. A strategy was also established to implement interoperability between the systems and the platform. This platform will allow the integration of INCAN's existing systems and the efficient management of patients' medical information. By consolidating information from these systems, clinical decision-making will be improved and medical errors will be reduced. The interoperability achieved will also lead to more efficient management of resources and improve the quality of medical care, not to mention reducing costs for the healthcare system.

#### STAGE 2 - Implementation

During this stage, we worked on the adaptations that had to be made to the platform according to the information gathered in stage 1, so that it would be ready to comply with the established strategies. A document manager was also created, whose main objective was to include the solution in all those clinical sectors of INCAN that did not use any computer system to date.

**FIGURE 3:**  
Document Manager –  
Digital Hospital Platform



#### STAGE 3 - Evaluation

During this stage, the use of the platform, the documents sent, and access to the viewer were evaluated. Interviews were also conducted with the different areas affected by the system, including administrative, technical, operational and medical personnel. It should be noted that the platform is still undergoing adjustments to ensure optimal use of the services.





## 3.2. Interoperated Systems

Seven computer systems capable of interoperating with the platform were identified:

1. **HIS:** Mainly outpatient area system to be expanded nationwide.
2. **SAA:** Outpatient Area System, predecessor of the HIS system, which has historical information that was not migrated to the HIS system.
3. **SAM:** Endoscopy area.
4. **ARIA:** Radiotherapy area.
5. **GESLAB:** Laboratory area.
6. **SISSAN:** Blood bank area.
7. **DATA SCAN:** System for digitizing paper files.
8. **PAPER:** Printed reports from the areas of anatomic pathology, tomography, mammography and ultrasound.

The systems used in the INCAN project are provided by different vendors, use different technologies and have different levels of technological maturity. Due to these differences, directly connecting these systems to each other would be impractical. This is because it would require a compatibility analysis for each case, which would be costly and probably not feasible. Therefore, a solution was sought that would allow an independent dialogue between the systems, so that the clinical information generated by each of them could be accessed from anywhere and at any time by the healthcare professional, without losing the specialization for which each system was acquired or developed. **In the first stage, the first two systems, HIS and SAA, were connected.**

### HIS System

The *Hospital Information System* (HIS) generates reports and reports depending on the hospital area for which it is required, providing feedback on the quality of health care services. This system mainly covers the outpatient area. However, only a limited number of hospitals have expanded the service to other areas such as the emergency room or the inpatient ward. At present, it is partially present in 210 hospitals and is expected to be expanded throughout the country.

### SAA System

The SAA system, Outpatient Area Subsystem, is a program implemented in the hospital that is dedicated to the conservation of information on patients treated in the outpatient area. The methodology consists of the physicians writing down the relevant data on paper, which is then updated in the system by the administrative staff. This system is the predecessor of the HIS, which is projected to be replaced by the HIS. However, the SAA stores a vast amount of historical and patient-by-patient information, which is invaluable from a historical data perspective.





**4.**

## **EXPECTED BENEFITS**



## 4. EXPECTED BENEFITS

Although adjustments are currently being made to the integration of health information systems at INCAN, interviews have been conducted with different areas of the hospital, including the Director's Office, Emergency Department, IT and Archives. During these interviews, the people in charge of these areas expressed great expectation for the potential benefits of the interoperability system. Although the numbers and statistics are not yet available to assess the impact of the system on improving patient care and the efficiency of the healthcare system, the interviews conducted suggest that medical staff and other hospital users are enthusiastic about the possibilities offered by the health information exchange platform. Overall, the integration of health information systems at INCAN is expected to have a positive impact on medical care and medical information management at the institution.

### 4.1. Agility in Care

During the interviews conducted with different areas of the hospital, both the general director and the medical director agreed on the potential improvements related to the agility of patient care. Furthermore, the person in charge of the Emergency Department emphasized the benefit of being able to access the patient's medical studies even at night. In general, the integration of health information systems would allow quick and easy access to patients' medical information, which would improve efficiency in medical care

and reduce waiting times for patients. In addition, access to patient medical records at any time, even when the Archives Department is closed, would improve continuity of care and clinical decision making.

### 4.2. Hospital Management Efficiency

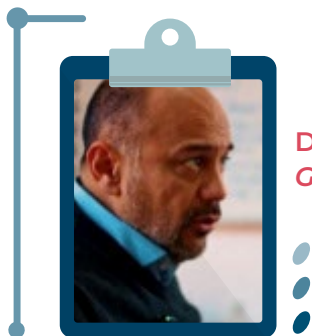
During the interviews conducted in different areas of the hospital, the head of the Archives Department was interviewed, who expressed the need to digitize patient records because they no longer have sufficient physical space or personnel to manage each of the files. Currently, 14 people work in the archive and are responsible for managing the individual records, which represents a significant workload. In addition, many of the statistics they must report to the Ministry currently require the review of paper-based patient exams, which is a slow and tedious process.

The head of the archives department believes that the Archives area will work more efficiently, and the statistical calculations will be more agile. Digitization of medical records would allow the elimination of the need for physical space to store paper medical records, allowing for better utilization of space in the hospital. In addition, the digitization of medical records would allow the creation of backup copies and the implementation of additional security measures to protect patients' medical information.

### 4.3. Efficient Centralization of Health Information

A recurring expression in virtually all interviewees was that digitization of medical information improves the quality of medical care, reduces the loss of information, the time and cost of re-doing studies, and allows for more efficient information management. Physicians can access patient information in real time, make informed decisions and share information between different specialists and services. In short, digitalization improves medical care and reduces the workload for physicians and hospital staff.

### 4.4. Medical Staff Interviews

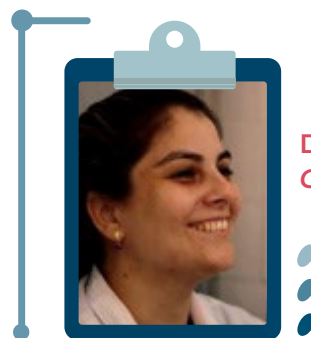


**Dr. Julio Rolón**  
*General Director*

**Investment in technology for digitalization in the healthcare sector is a necessity to improve the health of patients and the performance of medical professionals.**

In the interview, Dr. Julio Rolón, Director of INCAN, discussed the critical importance of digitization in the healthcare sector. He emphasized that the process of adapting to technology can be difficult due to resistance to change, but it is fundamental to improve the efficiency and quality of medical care. Dr. Rolón sees the future of hospitals as an integrated, digitized network where vital information can be shared quickly and effectively, which can be crucial in emergency situations.

Dr. Rolón detailed the specific benefits of digitization in hospitals, which include faster access to information, improvements in efficiency and management, and a better experience for patients. He also mentioned how digitization enables physicians and other healthcare professionals to instantly access a patient's complete medical records, including historical records, which can help improve diagnosis and treatment. The INCAN director concluded with a clear statement about the indisputable benefits of digitalization in healthcare. He emphasized that investment in technology for digitization in the healthcare sector is a necessity to improve the health of patients and the performance of medical professionals. According to Dr. Rolón, digitization not only improves the quality and quantity of care, but also streamlines care, which can enable patients to receive diagnoses and treatment plans more quickly.



**Dr. Andrea Quiñónez**  
*Chief of Emergencies*

**Fast, easy and complete access to patient information, avoiding data loss, improving medical decision-making and facilitating administrative management.**

Dr. Quiñónez stressed that having quick and easy access to patient information is crucial in her area, where urgency involves adverse reactions to treatments or complications of diseases. Prior to the implementation of the computer system, the process was paper-based, which limited access to documents and made it difficult to track information. Schedules were also a constraint, as there was no access to patient records during the night. With the new system, patient information can be accessed more quickly, as records are requested from the admission desk and brought to the

office. This prevents the loss of documents and facilitates 24-hour service continuity. The digitization of medical records also provides additional benefits. On the one hand, updated patient information can be accessed quickly, which avoids the loss of records or studies that could be deteriorated. On the other hand, having all the information in one place allows for more efficient data management and avoids the loss of important information. Dr. Quiñónez mentioned that the centralization of information in a computerized system facilitates patient follow-up, avoids misunderstandings between physicians and ensures adequate continuity of treatment. She also stressed the importance of having digital records for administrative purposes, such as statistics and service evaluations.



**Dr. Marcelo Galli**  
*Medical Director*

### **Not only as a desirable goal, but as an imminent need in the field of medicine.**

In this interview, Dr. Marcelo Galli, medical director of INCAN, highlighted the urgent need to advance digitalization in healthcare. He underlined how physical records are no longer practical given the increasing volume of patients and decreasing number of physicians. He argued that digitalization, while requiring a period of adaptation, can significantly streamline consultations and improve overall efficiency in patient care. Dr. Galli also emphasized that while hospital technology has advanced in many aspects, such as radiotherapy and tomography, the digitization of patient records has not kept pace. This has resulted in a duplicated workload for physicians, who often have to record the same information on both computer and paper. In addition, current systems often do not cover all the tasks performed during a consultation, such as dressings and other procedures, so any tool that streamlines a medical practice is welcome. Finally, Dr. Galli noted that the patient population at his institution, which focuses on cancer treatment, is particularly sensitive. Therefore, the implementation of efficient digital systems can be of great benefit to these patients. In addition, digitalization will facilitate access to and interpretation of imaging studies, which is crucial in the field of oncology. In general, Dr. Galli sees digitalization not only as a desirable goal, but as an imminent need in the field of medicine.



**5.**

## **LESSONS LEARNED**



## 5. LESSONS LEARNED

» **The hospital's information management integration project has had some challenges, but significant progress has been made in digitizing information and improving the quality of medical care.**

It is true that the change management process and organizational culture needs to be addressed strategically, and the implementation of the system has required additional effort on the part of hospital staff. However, it is important to recognize that these challenges are common in projects of this nature and have been successfully overcome. In addition, its implementation has allowed for a scalable transition as well as detecting and resolving challenges as they arose. Overall, the project has demonstrated that digitization of information is critical to more efficient management and higher quality care, and that the long-term benefits far outweigh the short-term challenges.

### 5.1. Change Management

**Although it is recognized that change management was beyond the scope of the project, the importance of communicating the project adequately and involving hospital staff from the beginning of the project to ensure the adoption of the platform is emphasized.** In some cases, the clinical staff perceived the use of the system as additional work, since, in addition to making the paper records required by the Ministry, they

also had to upload the information into the implemented system. It is critical to ensure that clinical staff see a tangible benefit in using the platform to increase the likelihood that they will adopt it. Although there was resistance to change on the part of the clinical staff, it is recognized that technical training was provided on the use of the system, which demonstrates the commitment of the project team.

### 5.2. Interoperation Costs

**Two systems were successfully integrated into the platform and documents were sent from the HIS to the platform, achieving interoperability.**

In addition, all historical documents were transmitted from the SAA system, allowing professionals to access information generated in the past through the document viewer of the interoperability platform. Training meetings were held with all participants, with special emphasis on system providers and INCAN staff, and technical guides were developed for system providers. However, it is important to note that defining standards from the beginning of the procurement process could mitigate many of the challenges encountered. Therefore, establishing clear agreements with external suppliers on technical requirements and considering the costs associated with integrating their information systems with the platform will ensure interoperability with as many systems as possible in future projects. Including the definition of standards as an integral part of the supplier, contracting process is an alternative that could facilitate this objective.

### 5.3. Full Integration

The interview with Dr. Rolón suggests that a complete digital system be implemented in all hospital services at once, instead of doing it piecemeal. It is important to note that the scope of this project allowed for the interoperability of a limited number of systems, which means that not all the hospital's services could be digitalized in this first stage. However, in future implementations in other hospitals, the design could include the implementation of all areas so that they have the benefit of the Digital Hospital. Dr. Rolón argues that if implemented in steps, the complementarity of the work and the implementation of actions at a global level is lost, which can generate a delay in the total flow. Some services already have the agility and advantages of digitalization, while others do not, which can lead to inequalities in access to information. For example, if the X-ray area is digitized and the report is already in the patient's electronic record, but the ER area is not digitized, when the patient arrives at the ER, the medical staff will not be able to view the X-ray information in the system. Therefore, on average, it ends up being the same as not having a system that streamlines. The implementation of a complete digital system would allow a more efficient management and an improvement in the quality of medical care, since all the information would be available in a single channel and the waiting time of patients would be reduced.

### 5.4. Conclusion

After 18 intense months of work, the final result of the pilot project at INCAN was the achievement of the main objective of the interoperability platform, which was to allow an independent dialogue between the information systems, so that the clinical information generated by each of them could be accessed from any place and at any time by the healthcare professional, without losing the specificity for which each system was acquired or developed. During the 3-month evaluation period established in the project, the use of the platform was reviewed, and positive results were obtained. During this period, a total of 8752 documents were made available on the platform. The visualization of the results in the viewer is still in process, so as of the date of this report, there are no statistics on its use. It is expected that once the system is available in all hospital services, an increase in the level of use will quickly become evident. Therefore, it is recommended that a second impact measurement be carried out once the system is operational throughout the hospital.

**The project was carried out during the pandemic period**, which posed an additional challenge and required the full commitment of the actors involved. Thus, the team was able to maintain focus on the project objective and work collaboratively to overcome obstacles. This challenge also allowed the team to develop skills and strategies for working remotely and adapting to changing circumstances. In addition to the positive results, some challenges and opportunities for improvement were identified regarding the integration of new systems, such as the lack of standardization in health information systems and the need to establish common protocols for interoperability.

**It is common for effective communication to be a key factor** in the success of interoperability and other healthcare IT projects, and this is not limited to technical training on the use of the tool. In this regard, it is key to clearly communicate the objectives and benefits of the project, involve relevant stakeholders in the planning and development process, and address the concerns and needs of end users, including healthcare professionals



and patients. In addition, effective communication can also include promoting the project and its benefits through appropriate communication channels, such as newsletters, social networks and other media.

**During the project, we were able to take the first steps towards organizational change, accompanying end users towards digital transformation in order to mitigate their resistance to change.**

» **Given the scope of the project, it is considered that the Digital Hospital project, using an interoperability platform at INCAN, was a success and laid the groundwork for future interoperability projects in healthcare.**



