



HL7 LATAM NEWS
2017, MARCH

**MIRTH CONNECT
ONLINE COURSE**

Introduction to standards-based
interoperability engines.



Dr. Humberto F. Mandirola & Ing. Cesar Moreno



Integrating medical applications with HL7: Lessons learned

Mandirola Brieux H. F., Guillen S., La Rosa F., Moreno C.



Information Security in Health Environments.

Dr. Ricardo Herrero - Lic. Jorge A. Guerra

EDITORIAL

HL7 LATAM News is now in its sixth year, having launched in October 2011, and in our issues we have shared notes and items of interest by leading international experts from Latin America and around the world relating to health information and technology standards, especially involving experiences and initiatives for practical and effective application of different information standards regionally and globally. This new edition is presented as an online e-book, with versions available for mobile devices and Macs. It contains different perspectives and key topics for implementing information and communication technologies (ICTs) in the health sector, such as the various standards and initiatives currently in use at the national and regional levels, including HL7, SNOMED, IHE, DICOM, LOINC and GS1.

The first of many joint initiatives involving the Latin American chapters of HL7 is the dissemination of the standards in Latin America and the strengthening of the regional HL7 chapters.

We invite you to join us and continue growing together on what we consider the right track for the progress of health care. In this day and age, health care cannot exist without information, information cannot exist without systems, and systems cannot work and interoperate properly without standards.

Focusing on HL7 itself, this has been a year of great news that has pleased us immensely. The new HL7 standard, FHIR*, is growing by leaps and bounds. Although it had been a DSTU, this was clearly a needed change.

Some 20 connectathons have been held, and the result is evident not only in the Working Groups meeting, where the FHIR tutorials are at full capacity, but also in actual implementations being carried out.

In the most recent MEDINFO, HL7 LatAm was an active participant, drawing more Latin American attendees to its health informatics conference than any other worldwide. Participants offered and attended tutorials, presented papers and posters, conducted workshops and took part in panel discussions.

Tutorials and panels were held in Spanish and Portuguese. The high note was a remarkable talk by keynote speaker Dr. Fernán Quirós (Argentina - Hospital Italiano de Buenos Aires), who spoke in Spanish, but displayed his presentation on two different screens, one in Portuguese and the other in English, and included simultaneous translation in both languages for those who wanted it. The convention also brought the HL7 community together thanks to the sponsor, HL7 International, with the participation of affiliate representatives worldwide.

Over time, we will continue working together in the expectation that more and more of our electronic medical records will be interoperable, thus providing quality, security-conscious care for every patient in Latin America and the world.



Presidente de HL7 Argentina
Magister MSC Fernando Campos.



Miembro de la CD de HL7 Argentina
Dr. H.F. Mandirola Brieux.



HL7 LATAM NEWS

2017, MARCH

TABLE OF CONTENTS

Integrating medical applications with HL7: Lessons learned, *By Mandirola Brieux H. F., Guillen S., La Rosa F., Moreno C.*

HL7 chapters in the region

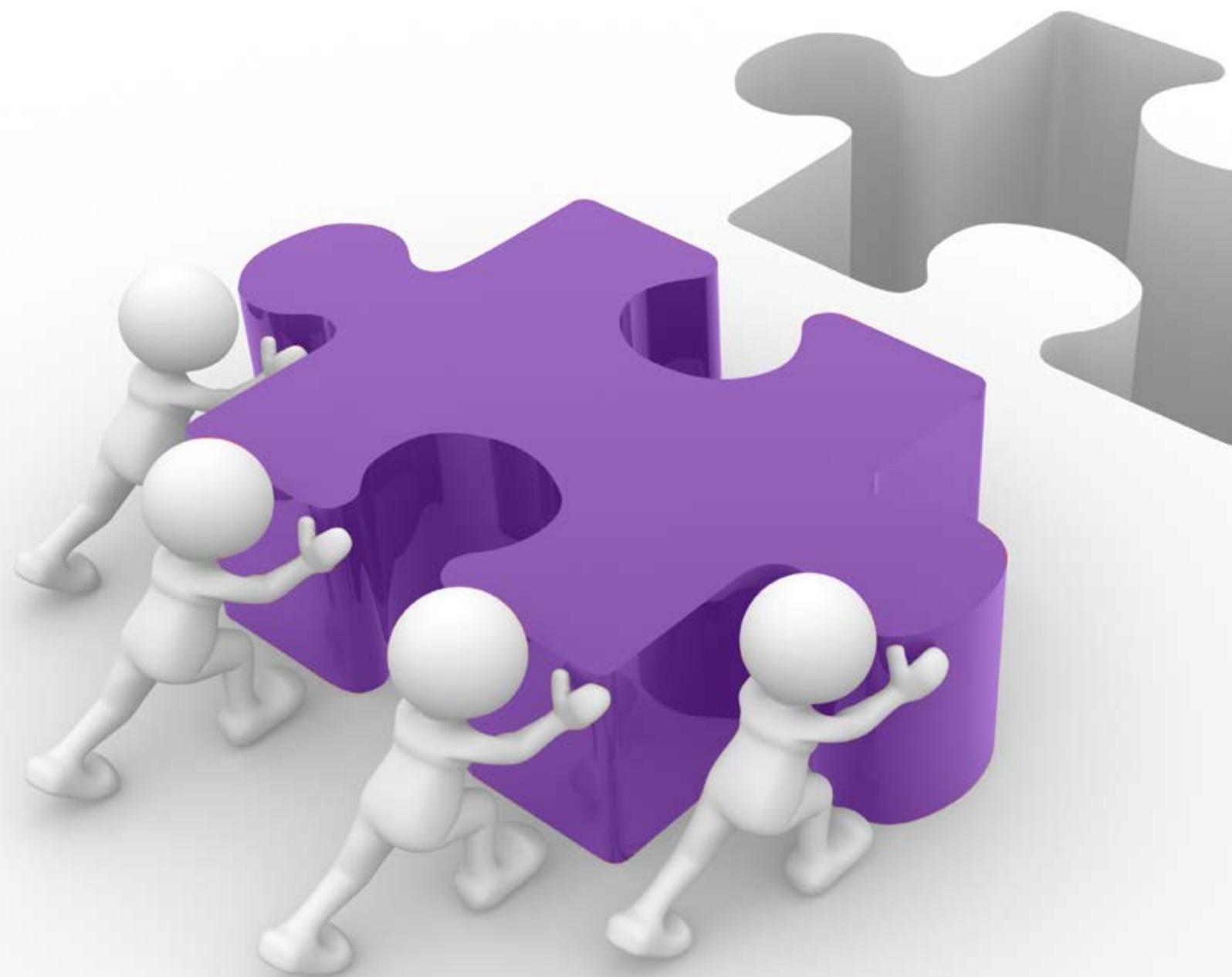
Discussion forums on social networks

MIRTH CONNECT ONLINE COURSE, *By Dr. Humberto F. Mandirola & Ing. Cesar Moreno*

Information security in the healthcare setting, *By Dr. Ricardo Herrero - Lic. Jorge A. Guerra*

The Use of Medical Informatics Standards in the 2016 Salud.uy Connectathon, *By Fernando Portilla*

HL7 LATAM Social Network



Integrating medical applications with HL7: Lessons learned

Mandirola Brioux H. F., Guillen S., La Rosa F., Moreno C.

a BIOCUM, Buenos Aires, Argentina; *b* Unitechblue S.A., Buenos Aires, Argentina; *c* GRIENSU S.A., Buenos Aires, Argentina; *d* HL7 Argentina, Buenos Aires, Argentina; *e* Hospital Italiano, Buenos Aires, Argentina

There are a number of things we must take into account to create interoperability between systems. HL7 (Health Level Seven) is a set of standards for the electronic exchange of medical information. While messaging is important, we also have to work on terminology standards, normalization of databases, unambiguous identifiers, integration engines and on the most basic level, a workflow plan for the integration that we want to achieve.

We need to keep in mind that a single software solutions provider cannot meet all the requirements of a healthcare institution; so it is important that every application developer be conscious of standards in order to make their applications more useful.

Recent decades have witnessed major progress in the development of applied health informatics. The distinctive characteristics of a "medical business," where most of the strategic decisions are based on the information provided by the professionals themselves, who are also responsible for carrying out most of the decisions on the use of diagnostic and therapeutic resources, require that any added clinical management instrument must be recognized and accepted by them in order to be added. (1)

Unique object identifiers (OID) have a fundamental purpose: to allow tracking of an identifier used in a cross-system communication. The OID is assigned via a methodology that ensures uniqueness. If an OID is assigned to an object, no other object can be associated with that same OID. This arrangement is not without its downsides, including problems with using the present OID registration system as a reliable source for the identifier, the confusion that the use of an OID introduces in messages, and the redundancy that the OID introduces at the expense of increased message size and no new content. In promoting clearly defined cross-system communication identifiers, HL7 developed a standard that requires the use of OID outside of network addressing. This norm and its propagation by others may have paradoxically added more confusion than clarity. (2)

Related terms must be handled in the context of the International Health Terminology Standards Development Organization (IHTSDO). Terminology standards represent a fundamental link necessary to achieve interoperability. (3)

Among terminology standards most used in medicine are the World Health Organization's International Classification of Diseases ICD-9 and ICD-10; other terminologies are SNOMED and LOINC. The acronym LOINC stands for Logical Observation Identifiers Names and Codes, and as the name implies, it is an observation-oriented coding. If we consider the diagnosis as a result and the test as a question, terminologies like LOINC are on the question side while other encodings such as ICD-10 and SNOMED are on the answer side. LOINC is the terminology standard initially developed for laboratories performing clinical analyses and other tests and today also includes clinical terms. It is the standard that best satisfies the terminology and coding needs of laboratory tests and is coming into wider and wider use. The purpose of LOINC is to assist in the electronic exchange and collection of clinical outcomes (e.g. laboratory tests, clinical observations, outcomes management and research). LOINC has two main parts: laboratory LOINC and clinical LOINC. Clinical LOINC contains a subdomain of Document Ontology that captures types of clinical reports and documents. (4)

HL7 attaches great importance to these kinds of issues and has created standards such as FHIR (Fast Healthcare Interoperability Resources). FHIR is oriented to developers with practical criteria and includes almost all the tools that we need to interoperate (5).

FHIR is strongly influenced by the philosophy of REST (Representational State Transfer), a web development architecture that is based completely on the HTTP standard, making it perfect for mobile communication scenarios. REST is much simpler than other alternatives used in recent years, like SOAP, and it is estimated that approximately three-quarters of web services worldwide are already REST. FHIR also marks a change in the way standards are defined. It is completely framed

within the strategy change announced by HL7 on open standards, with an open license. This, plus the number of existing sample implementations, makes starting to use it much easier.

Integration engines such as Mirth Connect enable cross-platform HL7 interfaces that allow bi-directional sending of HL7 messages between systems and applications through multiple available means of transport. (6)

Conclusion:

The lack of policies on standards increases costs and error in system interoperability processes. Therefore, before defining the systems to be used, it is necessary to define the frameworks and policies that will allow interoperation of the systems that are implemented. This includes messaging standards, terminology, identifiers, master tables and integration engines.

References

1. Barrios-Blasco L, Pérez-Torres F, Nicolás García-Rodríguez J. Historia de salud del ciudadano: evolución y retos del futuro. *Rev Calid Asist.* 2002 May 1;17(03):143–8.
2. Steindel SJ. *OIDs: how can I express you? Let me count the ways.* *J Am Med Inform Assoc.* 2010 Mar 1;17(2):144–7.
3. Fernández-López JA, Fernández-Fidalgo M, Geoffrey R, Stucki G, Cieza A. *Funcionamiento y discapacidad: la clasificación internacional del funcionamiento (CIF).* *Rev Esp Salud Pública.* 2009 Dec;83(6):775–83.
4. Dr. Humberto Mandirola. *LOINC Estándar terminológico desarrollado inicialmente para laboratorios de análisis clínicos y otros test y que hoy también contempla términos clínicos.* *HL7 LATAM NEWS [Internet].* 2014 Sep;VOL 5. Available from: <http://www.hl7latam.org/HL7LATAM-News/N5/N5.pdf>
5. *201205WGMIntroductiontoFHIR.pptx [Internet].* Google Docs. [cited 2015 Jul 15]. Available from: https://docs.google.com/presentation/d/1kdmgNcSXHRKghs-f72H0d0sq5p-DK-J34PeqpgQndmsk/embed?start=false&loop=false&delayms=3000&usp=embed_facebook
6. Mirth Connect [Internet]. Mirth Corporation. [cited 2015 Jul 15]. Available from: https://www.mirth.com/Products-and-Services/Mirth-Connect?utm_source=google&utm_medium=cpc&utm_term=Download&utm_content=Mirth-Connect&utm_campaign=ADW_15_Mirth_Connect&gclid=CjwKEAjwiZitBRCy0pb3rIb-G9XwSJACmuvvzKc1-jKCMUqkvO1akrKzm4X-TuR8j-_I3IWMwIcdEFqhoCHIXw_wcB

By Mandirola Brieux H. F. ace, Guillen S. a, La Rosa F. bd, Moreno C. cd



HL7 chapters in the region

Some Latin American chapters, that in the past were very active have lost their affiliation, and we in the Latin American community hope to provide all the support we can to bring them back into the fold. Among the chapters with the most ties to the region we must mention HL7 Spain, which not only is linked to us by our shared language, but with which we maintain constant contact and collaboration.

Argentina	www.hl7.org.ar
Brasil	www.hl7brazil.org
Uruguay	http://www.sueiidiss.org/

Discussion Forums on social networks

Social networks are undeniably playing a fundamental role in the communication and development of activities of all kinds, including healthcare, technological and academic; therefore we are providing a list and invite everyone to join and participate.



MIRTH CONNECT ONLINE COURSE: Introduction to standards-based interoperability engines.

In 2016, HL7 Argentina added to its training courses the online course on middleware based on Mirth Connect. Middleware is software that acts as a bridge between operating systems or databases and applications, especially in a network, allowing them to interoperate.

Due to the growing demand for Spanish-language training on interoperability engines, HL7 Argentina this past year decided to launch a course on the fundamentals of Mirth Connect, a multi-platform engine specially designed to work with several of the protocols of the HL7 family, such as V2.x, V3.x, JSON (FHIR), etc., and other healthcare application protocols such as DICOM. This engine is currently one of the most used in healthcare interoperability projects.

When dealing with interoperable healthcare structures of medium to high complexity, point-to-point connections and the HL7, CDA and/or FHIR standards oriented to the exchange of information between healthcare systems are only part of the solution. In order to establish a reliable interoperability scenario, it is best to use specialized tools to manage message queues and monitor and apply business and data transformation rules so that the appropriate information is transmitted to the parties concerned and arrives at the right place in a timely manner.

This introductory course covers the Mirth Connect Integration Engine, its internal components, configuration and operation modes and various interoperability use cases, and most importantly, includes a large amount of laboratory practice intended to guide participants in addressing



Dr. Humberto F. Mandirola &
Ing. Cesar Moreno

standards-based interoperability cases similar to those they are likely to encounter in real life.

Prerequisites for taking the course

Knowledge of medical informatics, healthcare interoperability, networks, XML, HTML

Knowledge of HL7 (we suggest having taken the HL7 online course), HL7 v2.x messaging and CDA.

Basic knowledge of databases, Java, operating systems and programming languages.

The [Mirth Connect introductory course](#) is basically an online workshop for immersion in the universe of interoperability and its application to HL7 protocols.

With the help of some web resources, we developed a series of guided exercises that demonstra-

te, through multiple examples, a model of good practice in the use of these standards. Access to the material is available for one year after completion of the course. It requires 5 hours a week on average, and there is no fixed schedule; participants work on it when they can.

Upon completion of the course, participants will: Know how to carry out a project that requires implementing an interoperability scheme between different health information systems.

General objectives: Familiarization with healthcare interoperability engines, their uses, the elements they use, standards and basic operation. Evolution of Mirth Connect and its ranking among users, familiarization with other MC tools, types of MC licenses, technical support available and accessing the user community. Where to download MC, installation prerequisites, installation and start-up. Creating an Admin user and



adding other users, recognizing dashboard elements, when to use the most appropriate interoperability artifact (messages and/or documents), configuring channels, ports, connectors, routing, alerts, FHIR connector, and connecting with RIS, LIS, HIS, PACS applications.

Dr. Humberto F. Mandirola &
Ing. Cesar Moreno

COURSE CONFIGURATION AND RESOURCES

Course in distance learning mode with Web tutoring; tutors certified by HL7. Material in Spanish developed by the tutor team. Documentation in Spanish and English. Glossary of HL7 terminology in Spanish and English. Discussion forums.

Two thematic units are given per week, with an exam at the end of the second one.

Self-assessment questionnaires in each module. Activities coordinated and evaluated by the team of tutors.

A minimum enrollment of 10 students is required to begin the course.

COURSE WITH EXAMS

CERTIFICATES ARE AWARDED TO PARTICIPANTS SCORING 80% ON TESTS AND ATTENDANCE

SYLLABUS - 4 WEEKS

INTRODUCTION TO INTEROPERABILITY

- Evolution of health information systems
- Interoperability concepts
- Identifying OID objects
- Concepts of HL7 V2.X messaging
- Modeling RIM data
- ICD-9, ICD-10, LOINC, SNOMED terminologies
- XML CDA documents
- FHIR
- Interoperability engines
- IHE
- Connectathon
- Exercises
- Exam

INSTALLATION AND START-UP

- What are HIT integration engines?
- What Is Mirth Connect?
- Other Mirth tools
- Types of Mirth Connect user licenses
- Technical support available
- Surveys and status of other interoperability and messaging engines on the market.
- Installation procedure
- Mirth Connect versions available
- Software and hardware requirements
- How to install Mirth Connect
- Exercises
- Exam

CONFIGURATION OF CONNECTORS

- Protocols used
- Connections to databases
- Connections to the file system
- LLP (Lower Layer Protocol)
- TCP/IP
- HTTP
- XML
- JSON
- Web services with SOAP
- JMS (Java Message Service)
- Connector configuration

- Types of connectors
- Exercises
- Exam

CONFIGURATION OF CHANNELS

- Introduction to the concept of channels
- Data source connector, to read or write data
- Filter accepts or rejects message based on rules
- Transformers manipulate and extract data from a message
- Target connectors transform messages to the target system format
- Exercises
- Exam

ROUTING

- Concept of routing
- Broadcasting
- Integrating applications
- Exercises
- Exam

ALERTS

- Concept of alerts
- Configuring alerts
- Exercises
- Exam

FHIR IN MC

- Where to get the FHIR connector for MC
- FHIR installation guide
- Testing the FHIR connector
- Exercises
- Exam

INTEROPERABILITY WITH PACS, RIS systems and modalities with MC, Laboratory and MC EHR and MC

- Examples
- Exercises
- Exam

Improving the quality of health care:

Methodology:

The methodology for improving the quality of health care has evolved rapidly over the past decade.

This has been the result of several factors: The large amount of practical experience that has been gained in numerous countries worldwide and in a range of areas and specialties in the field of health care delivery,

The increasing complexity of health care delivery and the resultant new needs for efficient and cost-effective care,

Higher expectations among clients, and Advances in our knowledge of improvement, management, and clinical practice

The four principles of quality improvement:

Focus on the client:

Services should be designed to meet the needs and expectations of clients and the community.

Understanding of work as processes and systems:

Providers must understand the service delivery system and its key processes in order to improve them.

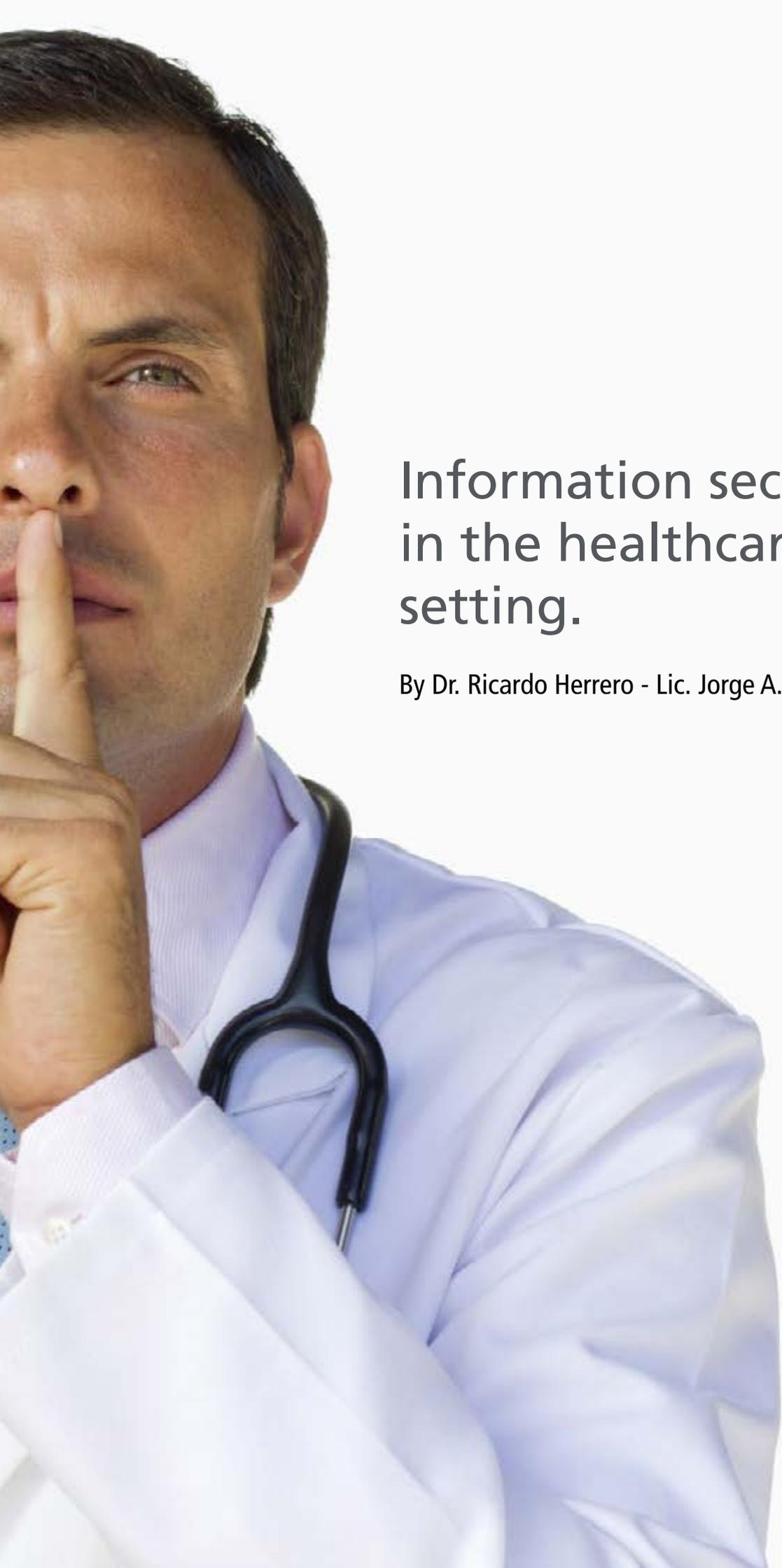
Teamwork:

Improvement is achieved through the team's approach to solving problems and improving quality.

Testing changes in processes and systems through the use of data:

Changes are tested to determine whether or not they produce the required improvement. The data is used to analyze the processes, identify the problems and determine whether or not the changes have produced improvements





Information security in the healthcare setting.

By Dr. Ricardo Herrero - Lic. Jorge A. Guerra

Management of information in health care.

Data related to individuals' health has always been of a **strictly confidential nature**, since during care processes patients may share with their doctor details of their personal lives that they do not reveal to anyone else, with confidence that/trusting that the doctor will maintain absolute secrecy.

Therefore, **clinical information must be both protected and available**, and this is reflected in current law in Argentina (Law 26.529), which is based on the rights of citizens.

The social and technological development of the past few decades has made it possible to generate, utilize, replicate and share large amounts of data in a short amount of time, meaning that **information is exposed to new and numerous risks** that can affect the organization's fulfillment of its objectives.

Information has become a **key strategic asset** and therefore requires **proper management in terms of security**.

Information security.

Information security is often defined as the sum of three basic concepts:

Availability:

The information must be available when and where it is needed, regardless of when and where it was generated.

Integrity:

The information recorded must be accurate and complete, and accordingly must be protected against accidents and attacks. If the data is unreliable or incomplete, it is of no use.

Confidentiality:

Access to information should be restricted

based on the person trying to access it and the relevance of such access.

That is, rules must spell out who can access what data, when and how.

Of these requirements, two are in conflict with each other: availability and confidentiality.

Any measure to facilitate the availability of data detracts from its confidentiality, and vice versa. A reasonable balance between the two extremes must be ensured.

In the health sector, the two requirements clearly converge, since professionals caring for a patient need access to the data in the patient's medical record in order to be able to provide the best care possible, but at the same time this information is confidential, **and viewing and modifying it requires authorization by the patient**.

This is reflected in Argentina's laws (26.529 and 25.326) protecting the rights of citizens to health and privacy and obligating health institutions to take the necessary measures guaranteeing them.

It is **clear to all** that advances in information and communication technologies (ICT) have greatly enhanced the availability of information, especially with the creation of communications networks and above all the Internet.

However, they have also allowed the creation of very effective mechanisms to safeguard confidentiality, such as access controls, activity logs and automatic alarm systems.

We have the technological means necessary to implement any reasonable solution designed from an organizational point of view, which is where **the true heart of the problem lies** and which must form the foundations of an information security plan.

These foundations include:

Defining a corporate security strategy.

Compromise between availability and confidentiality of data.

Use of ICT as a tool for implementing the measures designed.

Training and awareness efforts for the people involved, both professionals and patients

Principal characteristics of health services:

The first noteworthy characteristic is **the large scale of health services**, which need to be prepared to respond to a wide demand for care.

The second is **the complexity of healthcare activity**. Any clinical act, however minor, may involve a large number of professionals from different disciplines who must also work in coordination with each other.

The medical record and other sources of information for health services

Each patient's information is stored in their medical record, which is a complete and structured repository of their clinical data. This makes it the basic information element for the professional and, by extension, the fundamental instrument of the care process.

The medical record is the most important source of information for health services.

In order to guarantee the security of the information contained in the medical record, both electronic and paper, several requirements must be met:

One of the most important is the **principle of quality of information** based on the uniqueness of the data.

This means that each piece of data is recorded only once and a single version of it is maintained, thus avoiding the risk of duplication or contradiction.

Equally relevant is the **authorization and authentication** of professionals who seek to access information contained in the medical record, both to create a record of access events that is available for later audit and to ensure that clinicians' actions are not deniable.

It is important to keep in mind that health services manage other sources of information in addition to medical records and these should also be safeguarded. For example, administrative departments may handle demographic and financial data from patients, professionals, and providers.

This information generally is less sensitive than that contained in the medical record, but some administrative data may have clinical value. For example, a patient's room number can indicate the floor and medical unit where the room is located, thereby providing clues as to the condition for which he or she is being treated.

Legal Framework and Best Practices:

Law 25.326 on Protection of Personal Data.

The National Directorate for the Protection of Personal Data (<http://www.jus.gov.ar/datos-personales.aspx/>) under the national Ministry of Justice is in charge of implementing the law. Its director is Dr. Juan Antonio Travieso. directordnnpdp@jus.gov.ar.

To register databases and identify those responsible for their administration

To provide the Personal Data Security Document, which specifies, among other things, the procedures and security measures to be observed regarding files, records, databases and data banks containing personal data.

Law 26529/2009 Rights of Patients in

Their Relationship with Health Professionals and Institutions.

Article 2 subsection d) **Confidentiality**

The patient has the right to expect privacy from anyone who creates, manipulates or merely has access to his or her medical record, unless permission to divulge its contents is expressly granted by the competent judicial authority or by the patient himself or herself;

ARTICLE 14 **Ownership**

The medical record is the property of the patient, who must be given a copy of it upon request, authenticated by competent authority of the care institution. Delivery must be made within forty-eight (48) hours of the request, except in case of emergency.

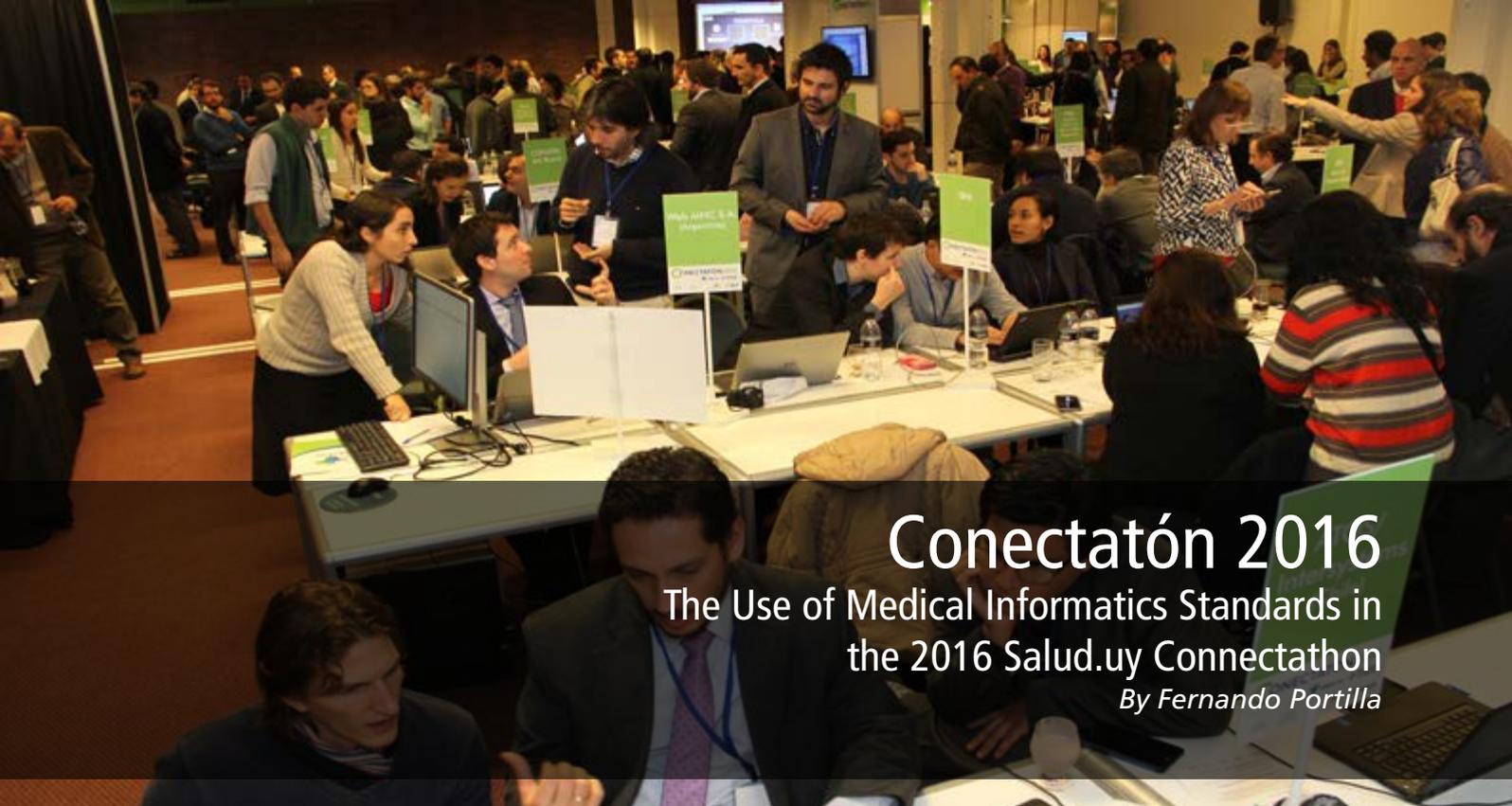
ISO 27799 information security applied to healthcare institution.

This standard (IRAM-ISO 27799) is based on the experience gained in these national efforts to address the problem of the security of personal medical information and is conceived as a complementary document to IRAM-ISO/IEC 27002. It is not intended to replace IRAM-ISO/IEC 27002 or IRAM-ISO IEC 27001. On the contrary, it is a complement to these more generic standards.

Current situation.

Despite the international consensus on the importance of citizens' right to privacy, studies have identified significant deficiencies in compliance by healthcare organizations.

In addition, it is apparent that in some cases information security is not among the organization's priorities and there is insufficient awareness among professionals.



Conectatón 2016

The Use of Medical Informatics Standards in the 2016 Salud.uy Connectathon

By Fernando Portilla

Specialist, International Health Informatics Standards

During the first half of last year, Connectathon 2016 was held at the Technological Laboratory of Uruguay (LATU), with participation by 41 organizations, including providers of integral, partial, public and private health services, IT providers, government agencies and representatives from four other Latin countries. The event demonstrated in action the components of the Salud.uy platform of Uruguay's National Electronic Clinical Record (HCEN), in a context of hands-on experience and active learning, allowing the healthcare system's different actors to increase their familiarity with it.

Purpose and test cycles:

Connectathon 2016 was sponsored by Salud.uy, Uruguay's e-health program, and the Ministry of Public Health (MSP) to advance the adoption of standards for clinical interoperability within the framework of the HCEN adoption plan.

The test laid out four cycles, which the organizations developed as part of the activities designed for participants of Connectathon 2016.

Cycle 1 Connection This cycle was designed for institutions to connect via hardware and software with the Connectathon platform, Salud.uy. This cycle was a necessary prerequisite for exploring the use cases of the subsequent cycles.

Cycle 2 Interoperability This was Connectathon's main cycle, where use cases were raised so that organizations could have their own information systems interact with the main components of the health platform (EMPI, XDS, data bus); using standard messaging, transactions involving the storage, registration, query and visualization of standardized clinical documents were carried out under a federated repositories scheme.

Cycle 3 Electronic Clinical Document - CDA This cycle was set up so that organizations could validate and generate clinical documents based on the recommendations and technical guides using the HL7 V3 CDA-R2 standard that were produced by the Salud.uy program.

Cycle 4. Platform Services This cycle was designed for organizations to identify and use access to other services available on the health platform, including listings of professionals, providers and terminology services.

Following is a synopsis of the 2016 Connectathon standards, profiles and terminologies and how they were used in the test.

IHE: An initiative of health professionals and industry aimed at improving the sector's information systems for data-sharing needs. IHE promotes the harmonized use of standards such as DICOM and HL7 by documenting compliance profiles that are useful in facilitating the implementation of use cases involving actors, transactions, diagrams, messages and technical specifications. These profiles serve as a frame of reference in the design of interoperability components for anyone involved in developing medical applications. IHE periodically holds compliance tests called Connectathon.

IHE PIX/PDQ: This IHE profile defines the actors and transactions (HL7 messages in this case) necessary to maintain a master record of the different patient identifiers and provide the information to other applications. Its implementation is especially useful since it proposes the use of an EMPI (Enterprise Management Patient Index), a fundamental component in establishing the necessary unique patient identification for an EHR.

IHE XDS.b: (Cross Data Sharing) This profile defines the actors and transactions for the storage, registration, query and deployment of clinical documents in a shared EHR affinity domain. The messaging is based on eb-RIM; in the case of Uruguay's HCEN, the exchange documents correspond to documents standardized under HL7 V3 CDA r2. These documents are generated and stored in each organization of origin, while the metadata of each document is sent to a single registry that is indexed with the generated document. When providers need a patient's information, they go to the single registry to obtain the information necessary to access and deploy the

document. In the case of Uruguay's HCEN, the repository model is federated.

HL7 V3 CDA r2: The standard used for the standardization of electronic clinical documents. CDA standardizes the structure and semantic elements necessary for the specification of clinical documents; the content of a CDA document is defined in implementation guides for specific use cases. The CDA documents are divided into a HEADER and a BODY. The standard specifies that the HEADER registers the context information of the document, which must always be coded, thus establishing Level 1 interoperability. The BODY of the CDA contains the clinical document's information, which can be structured and divided into sections. When there are coded sections, this corresponds to Level 2 interoperability. The content of the sections, which corresponds to the actual clinical information, can also be coded under the concept of "statements" or entries; when these entries are coded in at least one section of the CDA, the interoperability is Level 3. When the BODY of the CDA document is not structured, information can be included in HTML, PDF or text format and Level 1 interoperability is preserved.

HL7 V2.XML: IHE recommends the use of HL7 messages for the implementation of the PIX profile. Similarly, it references the possibility of implementing this messaging in version 2.x as well as in version 3.0. Within version 2.x the profile uses ADT V2.3.1 messages. The HL7 V3.0 messaging that conforms to PIX and is referenced by IHE is not being used for Uruguay's HCEN definitions. Instead, Uruguay is using HL7 version 2.XML, which is based on the structure of version 2.x of the standard, but adjusted to the XML format.

The message is generated from the source application, from which the patient's identification information is registered; this can be a national ID or any other identifier, such as the MRN (medical record number). The actor that generates this identification is known within the semantics of the messages as the AA (Assigned Authority). In this way, the demographic information of the

patient, accompanied by the different identifiers, is part of the message sent to the EMPI identification manager. This information is sent when a patient is admitted, pre-admitted, registered or has any demographic data updated.

LOINC Logical Observation Identifiers Names and Codes: LOINC encoding is used as HL7 CDA recommends for encoding of document types within the HEADER code element. Within the HCEN implementation definitions, there is a need to identify and standardize the types of clinical exchange documents. Salud.uy found it necessary to specify three axes to characterize a document type. The first axis classifies the document type at a high or general level and refers to a subset of 14 LOINC codes as document types.

SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms): This has been the reference terminology that the Salud.uy program has chosen to specify the semantic definitions within the HCEN, taking into account that it has a high level of granularity, is broad in scope and can be extended. In the 2016 Connectathon it was used as a complement to the classification of document types, according to the definitions of the program. A document has three axes of classification: general, detailed and specialty. For the first level LOINC codes are used, and for the second and third level SNOMED CT codes were identified and extended. This information is mapped to the CDA HEADER and metadata level of the XDS record. About 150 SNOMED CT concept terms are used in this definition.

OID Object Identifier: These are object identifiers, defined by the ISO standard. In interoperability they play a fundamental role in the semantic definition of the elements of interchange. HL7 documents and messages make use of OIDs to uniquely identify specific instance terminologies and identifiers. An OID is defined according to a hierarchical assignment, established by the International Organization for Standardization (ISO). It is based on ISO/IEC 8824-1 Information Technology - Abstract Syntax Notation One (ASN.1) - Specification of basic notation. Each country defines an OID assignment entity.



Uruguay manages the root 2.16.858, via the national OID entity; in the context of Uruguay's HCEN, the OID definitions used in the Connectathon were established at the level of controlled vocabularies or identifiers, such as: patients, professionals, providers, repositories, applications, Assigned Authority, document identifiers, etc.

Summary:

The 2016 Connectathon demonstrated the utility of informatics standards in health care; standards-based interoperability scenarios employ well-evolved definitions that permit advancement from bases of solid experience. Additionally, it was interesting to see how teams from four other countries were able to interoperate, a task made more feasible by the existence of shared standards definitions.

The goals of Connectathon in the use of standards were achieved; now we continue with the challenges of using them in real life. We expect that organizations will gradually adopt their use, adapt their applications and infrastructure and use the resulting experience to make the HCEN of Uruguay a reality.

