Integration of specialist and ancillary services system into HIS: Development and implementation of a Generic Report System

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Introduction

- Complementary studies are
  - →carried out by providers or other professionals of the healthcare team
  - →performed by complex equipment, with or without human intervention
  - →these ancillary services or medical specialties are so called Effectors Services
- This services shape the obtained results of the test that generates the reports
  - →each effector has its own way to do this
  - →and each one can make several tests, each requiring different reports.
- We can find long narrative texts without structure, tables with measurements, graphics, waves, images, etc.; and all the possible combinations.
- In a hospital information system (HIS) setting, involving every patient's healthcare aspect, the primary capture of data in the instances created is a key issue.

Introduction (cont.)

- Systematic incorporation of reports with such dissimilar characteristics raises a considerable challenge.
  - →A possible alternative is to generate computerized reports, each one dedicated to the particularities of each specialty
    - SPIS (Specialties Information systems), which includes the LIS (Laboratory Information Systems), RIS (Radiology Information Systems), CIS (Cardiology Information Systems), etc.
  - →Another possible option is a more simple approach, a single reports system
    - Allowing the creation of different reports in free text
    - Disadvantage: impossibility of terminological control, analysis, or systematic use of this information.
  - →Any modification, adaptation to new necessities, or incorporation of new technologies, in both, requires modifications on the software that supports them.
- Our true solution was to create an integrated and unique system, adaptable to each effectors service's needs.

Scenario

- Hospital Italiano de Buenos Aires (HIBA)
  - →Tertiary care, teaching and research hospital with a 150 year old history.
- Since 1998 a full scale HIS has been gradually implemented
  - →Including ambulatory Electronic Health Record (EHR), inpatient discharge summary, administrative systems, scheduling systems, inpatient tracking systems, pharmacy systems and complementary studies report and visualization.
  - →Several health informatics standards had been implemented, including HL7, CDA Version 2, ICD-9CM, DRG, ICD10, and ICPC.

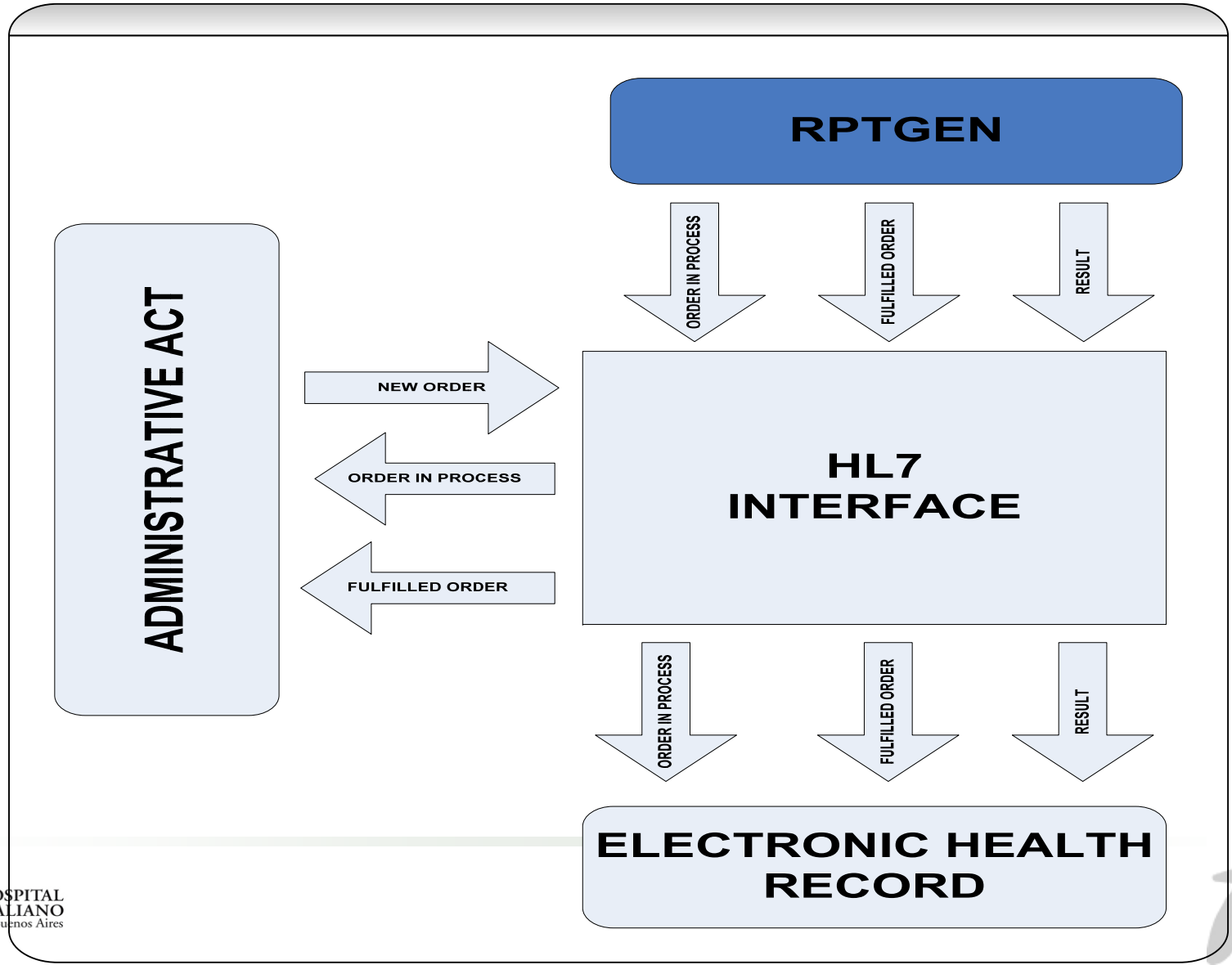
Operational Model – *Creation of the report*

- RptGen system allows to:
  - → define groups for input forms and visualization of generated information
  - → storage and data recovery of these groups
  - → tabular representation for queries
  - → accessibility according to different roles for security purposes
  - → generation of printable reports, export of queries, use of Web Services, etc;
  - → use of different APIs (Application Programming Interface) to interface with hardware devices or integrate with other applications
- Diverse types of fields can be included
  - → simple data type: text, numerical, dates, etc. (for which validation ranks can be defined)
  - → to complex data type: multiple lists (for which its domain of origin can be defined)
  - → images, with DICOM format
  - → electronic documents
- The amount and combination of these fields are defined according to the needs

Operation

- It can work like an independent application
  - →offering all the functionality that is defined
  - →offering presentation services
- Be functional to other applications through Web
- In our case it is fully integrated with the EHR in every scope
  - →allowing physicians to access the information in real time.

Data flow



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Architecture and Technological Model

- The RptGen was developed in
  - →Web architecture
  - →Java (IAS - Oracle)
  - →Oracle database
  - →MQSeries (IBM) as messaging engine
  - →HL7 V2.X standard for transactions
  - →CDA for the clinical document exchange

Implementation

- In July of 2004 the first implementation of RptGen began for Gastroenterology
- Few months later it was implemented in the Audiology area
  - →A great challenge aroused that had not specifically been planned when designing the system: the upload of the test had to display a previsualization of audiometric graphics as data was loaded.
  - →The printed report had to contain graphics with the curves and symbols (in colors) of the study, preserving the corresponding standards.
- It was also implemented giving workflow support to the test processing in Cardiology, Pathology and Radiology.

Visualization from the Web Based EHR

Paciente P.Salud: Id. H.I.: Turnos Integrados / Volver a Citar

Resumen | Problemas | Evolución | Interconsultas | Estudios / Prácticas | Resultados | Indicaciones Médicas | Eventos | Fichas | Internaciones | Salir

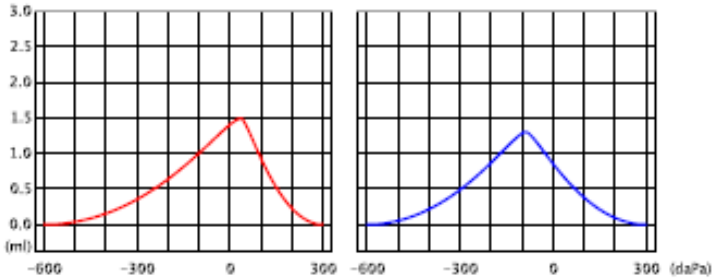
Tabla | Resultados por Fecha | Resultados por Protocolo | Carga Manual | Graficador - Opciones

Estudios por Fecha

- **04/12/2006**
  - 695492 - AUDIOLOGIA ADULTOS
- **25/08/2006**
  - 538639 - ECOGRAFIA
  - 538633 - MAMOGRAFIA
- **17/07/2006**
  - 483279 - ECOCARDIOGRAFIA
- **06/06/2006**
  - 417171 - ECOGRAFIA
- **24/05/2006**
  - 10076/06 - ANATOMIA PATOLOGICA
- **05/05/2006**
  - 378074 - LABORATORIO DE ESTUDIOS ENDOCRINOLOGICOS IN VITRO
  - N 420077 - LABORATORIO CENTRAL
- **25/04/2006**
  - 361180 - ECOGRAFIA
- **23/01/2006**
  - 1281/06 - ANATOMIA PATOLOGICA
- **17/01/2006**
  - 120080784 - RADIOLOGIA INTERVENCIONISTA
- **28/12/2005**
  - 237536 - ECOGRAFIA
  - 237534 - MAMOGRAFIA

Pages | Attachments | Comments

Timpanometría



Oído Derecho
Presion: 36 daPa
Complacencia: 1.49 ml

Oído Izquierdo
Presion: -88 daPa
Complacencia: 1.3 ml

Impedanciómetro: IMPE AZ26

Reflejos Estapediales

Contralaterales

Oído Derecho					Oído Izquierdo			
+/-	dB	Inv.	OnOff	Frecuencia	+/-	dB	Inv.	OnOff
+	100			500 Hz	+	105		
+	100			1000 Hz	+	100		
+	100			2000 Hz	+	95		
+	105			4000 Hz	+	105		

Ipsilaterales

Oído Derecho					Oído Izquierdo			
+/-	dB	Inv.	OnOff	Frecuencia	+/-	dB	Inv.	OnOff
+	95			500 Hz	+	105		
+	95			1000 Hz	+	100		
+	100			2000 Hz	+	95		

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Conclusion

- This system allowed us to create an application able to adapt to the needs of the Effectors and each professional
  - →according to the way in which they prefer to upload data
    - it is possible to choose a completely structured interface, as it is the case of audiometry
    - an intermediate model with structuration of diagnosis and tests, like in G.I. Endoscopy
    - or free text, as in radiology reports.
- Data-driven design
  - →This, as many other applications, can be supported with no need for internal modifications to the system
- Within a more ambitious project, it will be integrated with the PACS that will be implemented during 2007.

References

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- [2] González Bernaldo de Quirós F, Soriano E, Luna D, Gómez A, Martínez M, Schpilberg M, et al. Desarrollo e implementación de una Historia Clínica Electrónica de Internación en un Hospital de alta complejidad. 32 JAIIO; 2003; Buenos Aires, Argentina.

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