MEDINFO 2019: Health and Wellbeing e-Networks for All
L. Ohno-Machado and B. Séroussi (Eds.)

doi:10.3233/SHTI190522

eHOP Clinical Data Warehouse: From a Prototype to the Creation of an Inter-Regional Clinical Data Centers Network

Julia Madec, Guillaume Bouzillé, Christine Riou, Pascal Van Hille, Christian Merour, Marie-Lisen Artigny, Denis Delamarre, Veronique Raimbert, Pierre Lemordant , Marc Cuggia

Univ Rennes, CHU Rennes, Inserm, LTSI – UMR 1099, F-35000 Rennes, France

Abstract

Creation of networks such as clinical data centers within the hospital enables efficient exploitation of clinical data from a local to an inter-regional scope. This work present the structuration of the French Western Clinical Data Center Network (FWCDCN) conducted between 2016 and 2018. As of November 2018, FWCDCD is compounded with 7 institutions. CDW of the combinded Clinical Data Centers (CDC) contains the data of over 4 million patients followed since 2000.

Keywords:
Clinical Data Warehouse, Health Information System, Health Big Data

Introduction

Among strategic data sets, those produced at the hospital during patient care are already bringing new knowledge and technological innovations, from whom society and patients will benefit [1].

A CDC is an organization dedicated to exploit health bigdata for the hospital. The main IT infrastructure of a CDC relies on a cutting edge Clinical Data Warehouse technology called eHOP, developed by the academic hospital of Rennes.

The deployment of a such system in hospital institutions supposes to set up 3 main works: technical, functional and organizational.

Methods

Technical work

eHOP is an indoor development of Rennes University Hospital, using up-to-date technologies and compatible to the open-source platforms such as i2b2 and SHRINE

The system encompasses:

- Libraries : R
- Database management system : Oracle & MySQL
- Web servers used : Apache PHP (application server) and Java (database server)
- ETL : ENOVACOM Suite V2
- Interoperability standards : HL7, HPRIM, PN13, RSS
- Reference terminologies and mapping managed from UMLS

Functional work

Data flows have been chosen by each institution among all the data sources provided by the hospital (biology, drugs…). Data flows regarding the patient master index and hospital structures were mandatory to enable any clinical data flows .

Data integration procedures were the following :

- Real-time data integration : batches of dataset
- Takeover of the existing system

Every center has set up the request circuit with user and profile management. eHOP is only accessible on the center internal network from a web browser. Access is secured using the HTTPS protocol and traceability of requests and studies is ensured.

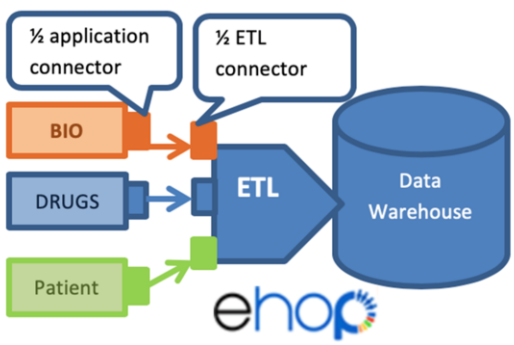

Figure 1 - eHOP data integration process

Organizational work

This work contents :

- CNIL (the French supervisory authority) formalities
- Reglementary procedure : patient information, patient opposition, user charters…
- Human resources assignation for project
- Creation of the corresponding structures :
- An administrative structure to set up strategic orientations of the CDC

- A regulatory structure to validate the access and exploitation policy of the CDW
- An operational structure for data processing. It undertakes to respect the following principles:
- Neutrality: No particular interest in the exploitation of data
- Confidentiality - Security: Exclusive and secure access to all (sensitive) data entrusted to it.
- Transparency: Carries out processing operations only if they are subject to agreement with the organizations and actors providing the data.
- Multidisciplinary medical (Methodological, IT and statistical), regulatory (Data Protection) and technical expertise.

eHOP CDW projects typologies

- **Non-interventional data research**: ex : epidemiological studies
- **Vigilance studies:** ex: therapeutic follow-up in real life
- **Support to health professionals**: ex: assistance in signal interpretation
- **Evaluation of practices**: ex: analysis of health trajectories

Results

The FWCDCN is now compounded with the following institutions : Angers University Hospital, Brest Regional University Hospital, West Cancerology Institute, Nantes University Hospital, Poitiers University Hospital, Rennes University Hospital, Tours University Hospital.

These institutions represent almost 4 million hospitalizations and consultations per year, with a total of 13 000 beds and a budget of almost 4 m€.

Table 1– eHOP documents by flows (mn) with historical depth-example of Rennes University Hospital (as of November 14, 2018)

Type of data flow	2010	2015	2018
medical surveys	-	1.1	3.5
PMSI	2.7	6.3	7.1
emergency report	0.3	0.7	1.8
medical report & doc	0.6	2.6	6.1
biology	0.4	4.9	8.3
anapath	0.1	0.2	0.3
drugs	-	1.2	22.1
Total	4.1	17	49.2

Conclusions

The FWCDCN structuring network makes it possible to share both an organizational model and good practices for the exploitation of data, and innovative tools designed to accelerate research. It creates the conditions to integrate and securely exploit other data sources such as registers epidemiological, administrative database data, and connected objects.

The main objective for the network for 2019 will be to position itself as a local node for the French national Health Data Hub.

Table 2– aggregated content of FWCDCN (as of November 14, 2018)

Historical Depth	Number of patients (mn)	Number of documents (mn)	Number of structured data (mn)
2000	0.1	-	-
2006	0.7	3	16
2009	1.4	12	109
2015	3.1	57	610
2018	4.3	102	1067

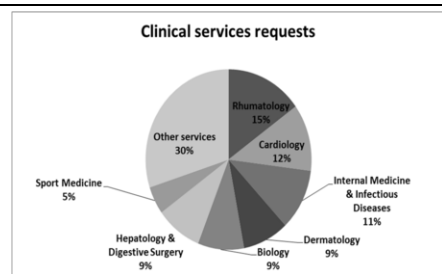

Figure 2– Clinical services requesting by number of studies- Rennes University Hospital CDC (From January 2014 to July 2017)

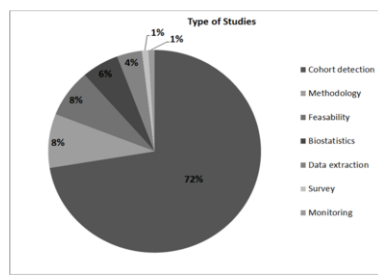

Figure 3– Type of studies at Rennes University Hospital CDC (From January 2014 to July 2017)

Acknowledgements

The authors would like to thank all the members of the French West Clinical Data Centers network for the conduction of the organizational work inside their institution during the deployment of eHOP clinical data warehouse.

References

[1] Andreu-Perez, C. C. Poon, R. D. Merrifield, S. T. Wong, et G.-Z. Yang, « Big data for health », IEEE J Biomed Health Inf., vol. 19, no 4, p. 1193–1208, 2015.

Address for correspondence

France - julia.madec@chu-rennes.fr