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e-Health: A framework proposal for interoperability and health data sharing. A Brazilian Case.

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Abstract. Interoperability among systems is a challenge that requires several regards and infrastructure often complex. The best worldwide reports and frameworks say that this can also improve health care and bring the best outcomes for stakeholders. Implementing Interoperability in developing countries is less affordable even it can also promote quality care and save lives. The best models and guidelines could offer protocols for sharing health data allowing to build a system that can deliver at the same time quality, transparency, and social value. This paper addresses an interoperability problem providing the steps built in a pilot to enable a conceptual framework for exchange healthcare data through EHR, and presents the first step and overview of a platform build using rules of PDCA. The experiment was built in a small Brazilian town intends to be a standard for deliver interaction between local government and citizens and also to offer to patients to control own medical data records through a mobile application.

Keywords: Health Interoperability, Health Exchange Data, Quality of Care, Action Research

1 Introduction

The interoperability at the Health Sector is considerate a very complex task, but according to the American Hospital Association (AHA) can provide advances and better health care outcomes that saving lives and involving key stakeholders [1,2].

Recent studies from The European Commission (EC) says that yet today many countries like France, Germany, and Italy are still struggling with several challenges to exchange their health data. Developing countries suffering also with a lack of infrastructure and financial resources, presenting a systematic deficit in the quality of care, costs, transparency, and deficient management [2, 3].

The Commission on Health System Quality (HQSS) and World Health Organization (WHO) offer some frameworks and guidelines to produce well-functioning and performance health system in order to ensure the use of reliable and timely information regarding also to protecting privacy and security patient data [4,5].

Brazil has 5,500 municipalities where the major part of the population suffers from a lack of resources and it is dependent on a public single and universal health care system (SUS). A partnership between UNIP researchers and a small town in the Paraíba Valley to develop a pilot platform, aiming to promote interoperability that intends to become a standard and scalable solution that could be implemented at other cities that faces the same problem, enabled the development of this research [6, 7].

This paper is the first one of an Action Research Cycle that describes the experience and proposal to design a framework based on PDCA to implement interoperability at public Brazilian health systems. Following the best practices is possible to design a strategy to be followed, based on the premise that is possible to build a cost-effective platform to reach data integration between entities using patients record as key data. The work is competing for an international award as a solution for this Brazilian quest [8, 9, 10,11].

2 Methodology

Action Research is a qualitative method that has been used in Production Engineering researches, and also a step-by-step method that helps to conduct interventions in improving a business situation. The term "Research" refers to the production of knowledge, and the term "Action" to an intentional modification of a given reality. The method was chosen to drive this project because leads to collaboration and involves stakeholders in a diagnostic and active-learning [8].

This work has begun with diagnosing that lead to an action plan. Action Research is a tool whose cycles aiming to affect and change the social reality using observations, explanations, and understandings. Table 1 shows the summarized steps used to fulfill the objectives of this research providing a structure for replication [8].

Table 1. Applied Cycles of this Action Research

Step	Main Objective	Expected Outcome
Identify the problem and theories	Research literature and cases and concepts	Set goal and target audience
Develop a plan	Envision Success	Invites to participate, Techniques and Analysis Units
Collect Data	Describe actual situation	Register Data
Analyze Data	Develop a plan for improvement	Compare Theories and Practices
Adjust the Theory and Plan	Implement the plan	Actions Plan Improvements
Reports and Results	Framework Guidelines	Provide structure for replication

The theoretical background was chosen after a detailed analysis of frameworks, interoperability ontologies, best practices and policies documents regarding the exchange of patient data health. The main concepts were pointed out by the AHA originated in countries like the USA, and by the European Commission (EC) at countries like Croatia, France, Germany, Italy, The Netherlands, and Sweden [1, 3, 5].

The final work will join the best practices and ontologies for interoperability suggested by the American Hospital Association (AHA) and Quality impacts offered by The Lancet, as shown at figure 1 indicating the guidelines for the relationship between citizens and governs referring to health data [1, 3, 5].

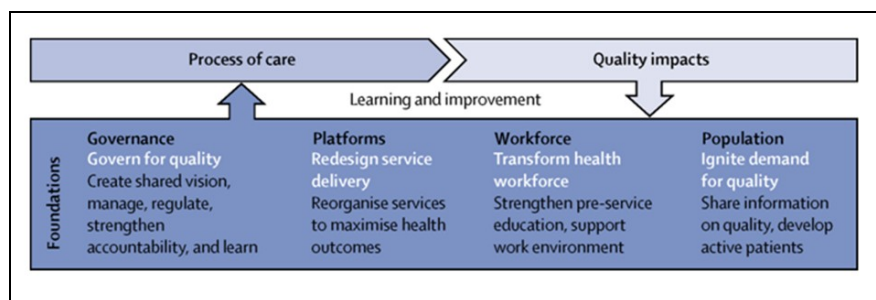


Fig. 1. Foundations for High-Quality Health Systems Commission [3].

Figure 2 shows the suggested rules for decision makings, to access quality, transparency, use, share and support information for health professionals, and patients that encouraging government-citizen relationship and also will be used to measure the impact of the pilot project [1, 3, 5].

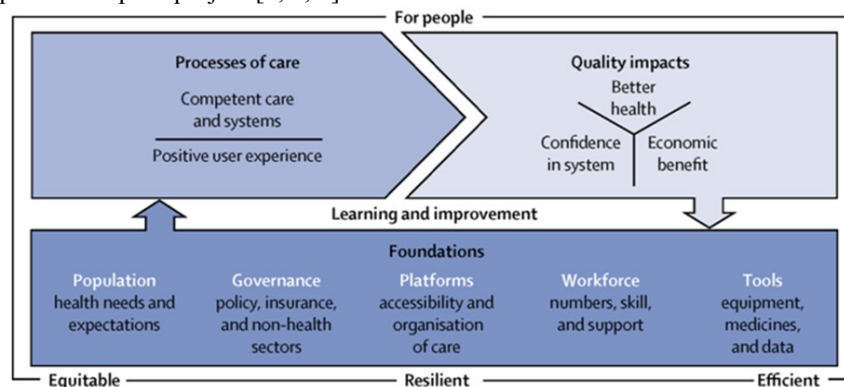


Fig. 2. Suggested Framework for High-Quality Health Systems Commission [3].

Thus, we will introduce a summary of the pilot that is being developed that intends to become a standard to fulfill this gap. The chosen Brazilian city to applying the pilot project was due to their number of inhabitants, relationship and proximity with health managers that facilitated the diagnoses of their health infrastructure for the first step to collect data to test the platform with patients regarding health data exchange. [1, 9].

3 Results

The public health system (SUS) offered in Brazil was designed to fulfill all kind of health care whose Information Policy offers a lot of stand-alone software free supplied to manage data in order to provide information for the government. New society goals and health systems need to produce better health outcomes, including greater social value suggesting that citizens are able to collaborate at the government-citizen relationship, improving quality of access, transparency, the security of the information and also support for decision making that is stickle by this disconnected technologies. [5, 7, 10].

3.1 A Brazilian Case

According to data of the Brazilian Statistic Institute (IBGE), Bananal is a little town in the state of São Paulo at the Metropolitan Region of Vale do Paraíba that has 10,775 inhabitants. The city presenting a health infrastructure with a single Joint Health Unit, four offices for developing family health strategy, and one basic care unit that not exchange information among themselves causing many duplicates records and unnecessary costs without any participation of their citizens [6, 7].

Figure 3 shows the first process and their 3 steps that enable the platform to be implemented at the city allowing a standardized method. After this, the platform will use a single key of patient data from an Electronic Medical Record to track and exchange data through entities that also establishes a channel between the local municipality and population and given to patients the control of carrying on their medical history on palm through their own mobile [9, 10].

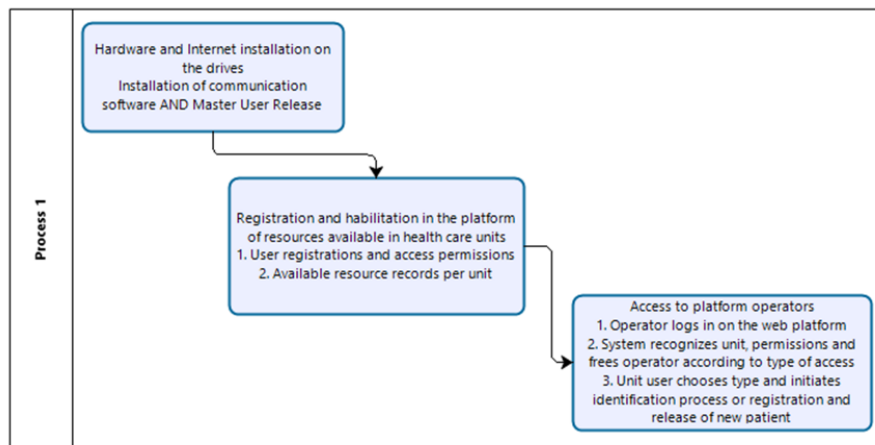


Fig. 3. Diagnose and a process of identification and patient authentication data.

The platform also offers an interface to establish a communication process between the local government with citizens through an ordinary mobile application (APP). The final procedure is consolidated sending all medical historic data to patients that used

the health services provided by the city allowing transparency. The applied model at the city will be extended to other cities reaching a population of more than 2 million inhabitants within 39 municipalities [9, 10, 11].

However, health data are also highly privacy-sensitive, and even if more users are complaining by not obtain control over their personal health data, governs are compelling to face regulations generating several challenges. At the platform, we are concerned to safeguarding all steps of security and authentication, in a similar model done by the Blockchain platform allowing tracking and reliability of the data. [10].

A summary of the workflow is shown in figure 4 that illustrates since the first identification of each patient at any health facility at the city. It is required to validate data before the first use of the mobile application. [10].

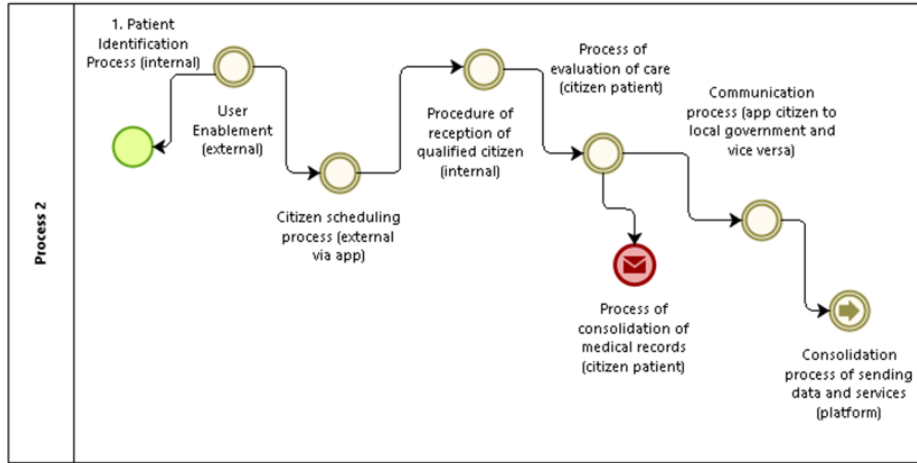


Fig. 4. Summarized workflow process.

4 Conclusions

A new society demand is affecting the Health Sector ending up in regulations. Electronic Medical Records (EHR) and patient data are usually retained by health institutions and very critical information to be safeguarded with systems that were not designed to offer patients own data. The best practices in healthcare and patient expectations include trusting that shared data is accurate. Health systems need to be designed to produce better outcomes including greater social value [1, 2, 5, 10]

The American Hospital Association (AHA) suggests an interoperability ontology through Electronic Health Records to build an efficient solution with a cost-effective platform for improving health care and sharing best practices with stakeholders. The Lancet Global Health Commission allows to understanding a framework to reach transparency implementing high-quality health systems that could save 8 million lives. These frameworks were chosen at this research by offering models and guidelines to create a reliable Health Systems including delivering data on the palm of patients at their mobile phones [1, 2, 4, 5].

This work presented a proposal of interoperability that reveals possibilities of sharing data between entities through a single key acquired through Electronic Medical Record. The pilot intends to be a model to be implemented at the suggested platform allowing major safety, tracking, and reliability of data at systems. The project is competing for an international award between 1,294 practices which can generate significant savings and better health outcomes for the Brazilian population [9, 10, 11].

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References

1. AHA- American Hospital Association - Sharing Data, Saving Lives: The Hospital Agenda for Interoperability - January (2019)
2. Spyrou, S., Berler, A. A., Bamidis, P.D.: Information System Interoperability in a Regional Health Care System Infrastructure: a pilot study using Health Care Information Standards. *Studies in health technology and informatics*, 95, pp. 364-9 (2003)
3. Greer, S. L., Hervey T. K., Mackenbach, J. P, McKee, M.: Health law and policy in the European Union. Doi: [http://dx.doi.org/10.1016/S0140-6736\(12\)62083-2](http://dx.doi.org/10.1016/S0140-6736(12)62083-2) (2013).
4. Kruk, M. E. et al.: High-quality health systems in the Sustainable Development Goals era: time for a revolution. The Lancet Global Health Commission. *Lancet Glob Health* 2018; 6: pp. 1196–252. Published Online September 5. Doi: [http://dx.doi.org/10.1016/S2214-109X\(18\)30386-3](http://dx.doi.org/10.1016/S2214-109X(18)30386-3) (2018).
5. WHO Library Cataloguing-in-Publication Data. Everybody business: strengthening health systems to improve health outcomes: WHO's the framework for action. ISBN 978 92 4 159607 7. Geneva 27, Switzerland (2007).
6. IBGE, Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde 2013. Rio de Janeiro: IBGE. Available at https://ww2.ibge.gov.br/english/geociencias/geografia/geografia_urbana/arranjos_populacionais/default.shtm?c=9 (2013).
7. BRASIL: Ministério da Saúde. Available at <http://portalms.saude.gov.br>, last accessed 2019/02/25
8. Mello, C. H. P., Turrioni, J. B., Xavier, A. F., Campos, D. F.: Pesquisa-ação na engenharia de produção: proposta de estruturação para sua condução. *Production*, 22(1), pp. 1-13. November 08. Doi: <https://dx.doi.org/10.1590/S0103-65132011005000056> (2012).
9. González, C., Blobel, B.G., López, D.M.: Ontology-based framework for electronic health records interoperability. *Stud Health Technol Inform*. Vol. 169, pp. 694-698 (2011).
10. Liang, X., Zhao, J., Shetty, S., Liu, J., Li, D.: Integrating blockchain for data sharing and collaboration in mobile healthcare applications. *IEEE 28th Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*, Montreal, pp. 1-5 (2017).
11. BRASIL, Prêmio APS Forte para o SUS: Acesso Universal - Available at <https://apsredes.org/premio-aps-forte/> last accessed 2019/05/15