


Big Data and Health “Clinical Records”

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Abstract. The health sector every day requires and implements technological tools in support prevention, prediction and treatment of diseases, as well as the capacity of the high volume of data in storage and processing of the same, that allow the health professional to give better attention and diagnose their patients. The health area integrates large amounts of data, which must be stored, classified, analyzed and consulted, all of them (with systematized and structured processes) generate useful information for the achievement of advances in health discoveries and in the administration of medical resources. BigData in medicine can have many uses and applications in areas such as epidemiology, clinical records, clinical operation, administrative management, among others.

Keywords: BigData · HealthCare · TICs

1 Introduction

The use of information and communication technologies have changed the way we do things, from an internet consultation to using technologies as work tools, are a necessity in the world in which we live. In the health area the changes that have been presented are many, to mention some from the storage of the information in medical records that allow the consultation of the information at all times until the accomplishment of surgical operations guided by technological devices. This article presents an analysis of the characteristics of technological applications in the health area, namely the use of Big Data and the implementation of clinical records. It presents the basis of BigData, its features, its functions, and existing applications, as well as the creation of a BigData model the health sector in Mexico.

2 Background

For years at a global level in the health sector, they have concentrated on curing diseases, but scientific studies have shown that most of the diseases that are currently affecting humanity are likely to be avoided, modified or controlled [1]. Hence the importance of having information of the individual from his birth and during his life, with the aim of

preventing those diseases (for their food, for their way of life, for genetic issues, or for their culture etc.).

The WHO World Health Organization says in one of its principles: “The enjoyment of the highest level of health that can be achieved is one of the fundamental rights of every human being without distinction of race, religion, political ideology or economic or social condition” [2].

Having all this information in a clinical file is a difficult task and more so, in Mexico. This is because it was not until the National Development Plan of 1995–2000, which emphasized the importance of systematizing, homogenizing and updating the management of the clinical file (which contains the records of the essential technical elements for the rational study and solution of the user’s health problems, involving preventive, curative and rehabilitative actions and which is constituted as a mandatory tool for the public, social and private sectors of the System National Health [3]). This Official Standard is for the Mexican national territory and its provisions are mandatory for providers of medical care services in the public, social and private sectors. Having all the information of the individual in a computer greatly benefits the doctor and the user.

2.1 TICs in Medicine

Information and communication technologies have revolutionized the way we do things without leaving out the health area. The contributions of TICs is essential in all areas but in medicine, it becomes essential because of the progress that it has. The main benefits that are obtained are better quality of care, efficiency and the reduction of costs.

The use of different devices helps in the consultation and the updating of the medical record from anywhere, having access to the information for a prompt response or making decision as the case may be, to mention an example. Other applications TICs are: clinical laboratories, hospital management software, medical records, surgeries, image files, computed tomography, nuclear magnetic resonance, medical research, to name a few.

The majority of the medical population incorporates information and communication technologies as an essential resource in their professional activities, as they offer new methods and innovations thus improving the quality of their service.

Another important factor in the health sector and ICTs are global statistics on health. The World Health Observatory (GHO) is the one that provides this information from its databases of the World Health Organization [4]. The objective is:

- Provide country data and statistics with comparable estimates
- Analysis to monitor the global, regional and national situation and trends

3 BigData

The study published by The McKinsey Global Institute (MGI) in June 2011: Define BigData as “datasets whose size goes beyond the ability to capture, store, manage and analyze database” [5].

In 2012 Gartner defined BigData as “information assets characterized by their high volume, high velocity and high variety, which demand innovative and efficient

processing solutions for the improvement of knowledge and decision making in organizations.” This definition makes mention of the 3 famous “V” of the BigData: Volume, Variety, and Velocity [6].

- Volume: The main benefit is the ability to process large amounts of information in large analytical data. Many companies already have large amounts of data stored, perhaps in the form of records, but do not have the ability to process them.
- Velocity: Increasing rate at which data flows into an organization has followed a similar pattern to that of volume.
- Variety: Very few times the data does itself present itself in a perfectly ordered and ready for processing. In the large information systems the data of origin are very diverse and doesn’t fall into neat relational structures. It could be text from social networks, image data, a raw feed directly from a sensor source. None of these things come ready for integration into an application [7].

3.1 Project Focused on BigData

Every project that is structured in BigData focuses on the phases:

- The storage of data generated by transactional systems, external sources, integrated documents and basic information to perform information analysis.
- Processing. Technological bases to operate with large volumes of information and data flow.
- Analysis. Algorithms and methods allow to generate information from the data records and the availability of them.

3.2 Big Data and Health

BigData in medicine can have many uses and applications, in areas such as epidemiology, clinical records, clinical operation, administrative management, among others. The health area integrates large amounts of data, which must be stored, classified, analyzed and consulted, all of them with systematized and structured processes generate useful information for the achievement of advances in health discoveries and in the administration of medical resources.

In the health sector, the data on which BigData’s analysis techniques can be applied are as diverse as they can be (Personal data, clinical data, administrative data). The information obtained once processed analyzed and classified the data allow the obtaining of a preventive, predictive, personalized and effective medicine.

3.3 Big Data in Preventive Medicine

Prevention is one of the relevant objectives of any health sector in any nation, prevention consists in identifying and anticipating the needs of patients, health centers or clinical laboratories, means taking steps to prevent physical, mental and sensory deficiencies (Primary prevention) or to prevent deficiencies, when they occur, have negative physical, psychological and social consequences [2].

BigData in medicine allows analyzing the data, conduct historical data studies to define specific preventive policies such as:

- Prevention health campaigns (vaccination), environmental and labor health campaigns.
- Public policies for the development of health education.
- Follow-up on epidemic outbreaks and health emergency situations.
- Development of public health research programs.

Preventive medicine is part of the data analysis to increase the social welfare of a community.

3.4 Personalized Medicine with Big Data

BigData's techniques support the health sector by offering personalized treatment to patients by providing analytical tools and techniques for creating decision-making solutions based on real data [8].

- Encourage joint planning of patient care.
- Take advantage of information received from eSalud social networks and apps.
- Provide useful information on public health, nutritional plans, information on physical activity, etc.

The analysis of data based on BigData allows modeling the patient and provide each individual with the information and resources necessary to improve their health conditions. Therefore an effective and efficient health system.

3.5 Medical History

A tool based on the health sector, which can be identified as a set of documents generated from the relationship between the doctor and the patient, is conformed by the clinical and legal points of view of all levels of health care. The data that make up clinical history are:

- Patient filing data
- Patient medical information

According to trends, the impact of BigData on the health sector is becoming more and more important, it is becoming a growing force in the health landscape. The possibility of combining traditional data with other new forms of data both at the individual and the population level, i.e., the integration of structured and unstructured data. The health sector generates a large amount of variety of data, both structured and semi-structured. It is important to consider that structured data is data that can be stored, queried, analyzed and manipulated by computers, usually in a data table format, e.g.: The classic patient data (name, age, sex...) Structured are paper recipes, medical records, doctors 'and nurses' notes, voice recordings, X-rays, MRIs, CT scans and other medical images.

Also, electronic records of accounting and administrative management can be considered, clinical data.

The BigData, allows us to perform the transformation of data into information, support for self-care of people, support for health care providers, grouping of data.

The trend over data usage is to work with limited datasets, combine a wide variety of data, or pooling.

Medical research can make great strides with the proper management of unstructured data and organize them to define causes of illness and offer solutions (Monitoring, histories, medical treatments)

The use of BigData can be used to predict, prevent and personalize diseases, it is possible to identify its usefulness in genomic investigations, clinical administration, personalized attention to patients, patient monitoring,

3.6 Algorithmic Models for BigData in Health

Once a knowledge base of the experts and the integrated historical data have been formed, it is possible to create algorithmic models in health, that allow the treatment of information, predict the evolution of patients and their needs, and serve as Support in the practice of health professionals.

- Disease detection systems.
- Prediction of diseases and hospital readmissions.
- Early diagnosis of diseases.
- Prognosis of disease evolution and patient follow-up.
- Control of epidemics.

4 Methodology

The methodology is important for any type of process that meets the specific requirements of science [9]. A BigData is designed for the health sector which can be used as support in areas of disease prevention and detection, as well as in the follow-up of a clinical history. The phases of the methodology implemented in the construction of the BigData for health are mentioned below in Table 1 and Fig. 1.

I. Types of Users in Database

- End User: the person who uses the data, this person sees data converted into information:
- Application Developer: is the person who develops the systems that interact with the Database.
- DBA: is the person who ensures integrity, consistency, redundancy, security this is the Database Administrator who is responsible for performing daily or periodic maintenance of the data.

II. People have DBMS access are categorized as follows:

- Engineer users: they are those that interact with the system through permanent applications.

- Sophisticated users: are those with the ability to access information by means of query languages.
- Application programmers: are those with a broad domain of DML capable of generating new modules or utilities capable of handling new data in the system.
- Specialized users: are those who develop modules that do not refer to data management, but to advanced applications such as expert systems, image recognition, audio processing and so on.

Table 1. Phases in BigData design methodology in health

Storage	In this phase, the information required by the system will be integrated to identify relevant data on patients, their illnesses, treatments and physicians
Prosecution	Design of the database, determination of tables, constraints and defined data model
Analysis	This phase will allow the implementation of search algorithms and determination of patterns, for the detection of health problems

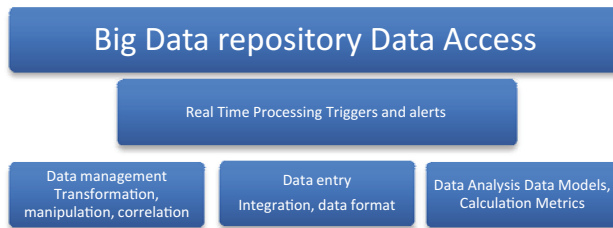


Fig. 1. Phases in BigData design methodology in health

In a BigData system, it is very important to consider the type of users involved in a system of this type, for the correct design of the system [10].

- System Users

The End User. Responsible for the health sector, and specific areas that require information and are the basis for the development of the system.

Specialized User. A user who clearly identifies the required modules and the handling of data and advanced applications such as expert systems, image recognition, audio processing, among others.

Sophisticated users. Users with the ability to access information through query tools.

- BigData design team. Team formed by experts in the design of systems, the database administrator.
- Application Developers
- BigData analytics experts.

5 Conclusions

The use of technological tools in health is becoming more useful and necessary, they offer storage and processing capabilities that allow the health professional to give better care and diagnosis to their patients. BigData implemented for the analysis and prediction of diseases are very useful, allowing advance in areas so relevant to the health sector.

These new techniques lead us to hyper personalization, which is the amount of medical data that is collected in the medical history of a person can increase exponentially and this allows us to advance in the era of knowledge where it is possible to make decisions on the basis Of the characteristics of each patient.

Likewise, thanks to the large amount of information available, it will be possible to apply artificial intelligence techniques to carry out advanced analyzes and make real-time decisions in the medical field.

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