

# Global Big Data Management & Governance in Health Care Information Systems

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## **Abstract**

In and around the healthcare industry there has been a lot of talk about "Big Data" as very large sets of complex data that became difficult to process using database management tools. Big Data analysis and management is emerging in the industry because hospitals and health care systems are collecting large amounts of data on patients every single day.

The data comes for a variety of settings: clinical, billing, and scheduling, etc.

In the past, a lot of the data was not leveraged to make patient care and hospital operations better.

There has been a shift to change that. So the analysis, management and governance of big data became a crucial task in nowadays hospitals which led to the realization that data is an asset by itself especially in health care since information is everything. So this new perspective on big data and its analysis will change how physicians take care of patients at an individual level, fostering more personalized support right at a patient's bedside, also the ability to mine and integrate data, extracting new knowledge from it to inform and change the way providers, even patients, think about healthcare. Also creating predictive models based on historical data to be able to identify and predict possible breakthroughs or patterns.

This paper examines the different topics that should be talked about when discussing the management and governance of Big Data in hospitals especially with anticipated changes and developments in technologies and the amount of data stored in the future.

## **Introduction**

Everybody seems to agree, saying that without movement to aggregate, manage and analyze big data, the healthcare industry would be in information overload. Also the federal push for electronic health records has increased the number of hospitals and providers who use them, subsequently increasing the amount of electronic data generated. Given the importance of data governance has risen in other words the necessity of having a department or a committee responsible for the

processes and policies that govern the data in the hospital to insure quality and better outcome for data analysis. Companies like Health Catalyst is already in research of better data governance models and better ways to analyze hospital data which will definitely have an impact on other parts of the world leading to a global improvement in health care data governance and analysis. Breaking down hospital Big Data management to the following topics will make it easier to discuss all the details, approaches and efforts made to manage and govern health care information systems.

## **Hardware**

Enormous investment has gone into computerized hospital information systems worldwide, mostly in hardware and machinery however the overall benefits and costs of hospital information systems have rarely been assessed. When systems are evaluated for example in South Africa, about three quarters are considered to have failed, and there is no evidence that they improve the productivity of health professionals.

To generate information that is useful to decision makers, evaluations of hospital information systems hardware and machinery need to be multidimensional, covering many aspects beyond technical functionality. Major initiatives in South Africa for example gave us the opportunity to evaluate the introduction of computerization into a new environment. We describe how the project and its evaluation were set up and examine where the project went wrong. The lessons learnt are applicable to the installation of all hospital information systems in the world.

## **Security**

Security and privacy issues in healthcare data management play a fundamental role in the widespread adoption of medical information systems. As a consequence, it is very important to know the right means for expressing and managing security policies in order to comply with privacy-related standards and regulations.

Usually, healthcare-related data of patients are stored in a digital version of medical/health records, called Electronic Medical/Health Records and managed by corresponding medical information systems that enable communication of patient's data among healthcare professionals.

As a consequence, it is widely recognized that security and privacy concerns are the main obstacles to the deployment of medical information systems.

In the US, the Health Insurance Portability and Accountability Act established standards for the security of digital healthcare information, while in the European Union, the Directive for personal data acts similarly.

In order to comply with such standards and regulations, healthcare organizations have to define suitable management processes, which often entail the publication of privacy policies intended to

inform patients about the management of their data.

At the moment there seems to be a gap between the functionalities offered by standards, off-the-shelf healthcare information systems and the requirements regarding health-related data privacy, as stated by regulatory bodies.

But privacy is just part of the security of information, also securing the servers and hardware is as equally important to securing data itself.

## **Data Quality**

During the last decade, there has been a transition from viewing the hospital as a number of functional departments, to a business structure focusing more on the business processes being performed. In the hospital world, new strategies are needed for intelligent automation in healthcare organizations to save time and resources, accelerate throughput, enhance patient safety, and improve outcomes.

Hospital information systems were conceived to centralize data, make automatic charging and billings and use data for analysis and predictions. Therefore, the control check is essential to ensure that the information gap does not exist between Hospital Information Systems and manual business process. Identifying these gaps will definitely increase data quality and accordingly make it easier to govern the data. Suggested steps to reduce this gap are: automatically identify the clinical flow, automatically identify the information flow, and automatically compare the therapeutic pathway with the information flow to detect any differences between these two flows.

Data quality is also so important in hospital process management because they ought to deliver better value in terms of end-to-end services.

Some research has been done that aims to develop a control model, namely the Information Gap Checking Mechanism, to automatically check the information gap between computerized process flows and workflow.

## **Data Governance**

Data governance is an executive level concern in many hospitals today. It is an approach that addresses not only the establishment of business rules but more importantly how those rules are integrated into sensible organizational structures, embedded into the day-to-day business processes of the hospital. The successful application of Data governance principles can provide a mechanism to increase the effectiveness of data and, in turn, meet the increasingly high demands from business for IT. There hasn't been so much development and research in the field of data governance in hospitals. Some effort has been made to reach members of the IT management for surveys to

determine their sense of priority and actions taken relative to data governance, as well as their need for tools and services to help ensure effective data governance. These surveys aims to give an overview of the common data governance models already used in the healthcare sector and attempts to answer the question if they really meet the requirements of the healthcare sector as a complex and heterogeneous economic sector. To accomplish these aims, a maturity model has been developed to measure the extent to which the different governance, risk management and compliance focus areas based on the Control Objectives for Information and related Technology (COBIT) Maturity Model have been selected and how they have been perceived.

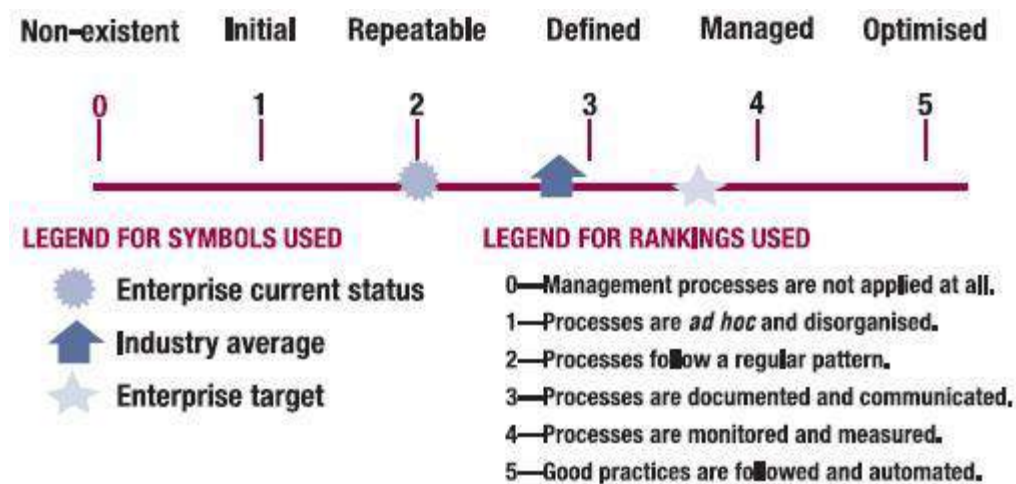


Figure: COBIT Maturity Model

Source: [http://guru-indonesia.net/admin/file/f\\_10942\\_cobit-maturity-model.JPG](http://guru-indonesia.net/admin/file/f_10942_cobit-maturity-model.JPG)

The issues, opportunities and challenges of effectively governing hospital's data demands have become a major concern of the Board and executive management on a global basis. Germany and other European countries have already challenged the introduction of data governance models. The Swiss healthcare sector is currently searching for methods and practices for the solution of operational planning and optimization of IT and data processes. Organizational structures, legal restraints and over the years increased heterogeneous IT systems are just a few aspects which make the healthcare sector a sensible field for the implementation of data governance. Therefore, an integrated and comprehensive approach to the governance of data and its resources is becoming critical to more effectively align, invest, measure, deploy and sustain the strategic and tactical direction and value proposition of data in support of the business. In this context IT as a business enabler can play an important role in hospitals, but it also has the potential for many risks, which may disrupt operations and have unintended consequences.

A very recent study conducted by Health Catalyst Corporation suggested a data governance model based on the awareness that it's necessary for health systems that are entering the world of analytics

because the governance structure will enable the organizations to drive higher-quality, low cost care.

In order for healthcare data governance to be most effective however, it needs to be adaptive because real healthcare data governance is much more fluid than any plan laid out on paper.

Typically there are three phases that characterize successful analytics implementations: the early stage, the mid-term stage, and the steady state.

As health systems begin to determine the effectiveness of their data governance strategy, it's important to look at key metrics from their analytics implementations that will either trend up, remain solid, or trend down.

## Six Phases of Data Governance

You need to move through these phases in no more than two years

- Phase 6: Acquisition of Data
- Phase 5: Utilization of Data
- Phase 4: Quality of Data
- Phase 3: Stewardship of Data
- Phase 2: Access to Data
- Phase 1: Cultural Tone of "Data Driven"



Figure: Health Catalyst Data Governance Model

Source: <https://www.healthcatalyst.com/demystifying-healthcare-data-governance/5/>

## Data Analysis

It has passed about twenty years since clinical information are stored electronically as a hospital information system since 1980's. Stored data include from accounting information to laboratory data and even patient records are now started to be accumulated: in other words, a hospital cannot function without the information system, where almost all the pieces of medical information are stored as multimedia databases.

Several approaches for healthcare data analysis has been adopted by industry and health care information systems vendors like Health Catalyst. One way is first unlocking the data, putting it in a healthcare enterprise data warehouse, which enables an organization to eliminate the manual gathering process and automate data distribution. Then analysts can devote the vast majority of their time to discovering patterns in the data that can be used to understand where changes need to be made. This kind of systematic approach to measurement can ignite changes in how clinicians practice.

## **Data Integrity**

There are no organizations in U.S. healthcare that have a perfect adherence to local, regional, national, or international master reference standards throughout the organization.

Master data management is a long-term journey in healthcare, with no end. Establishment of master patient identifiers and master physician identifiers are the two most critical forms of master data management. The data governance committee's role in master data management is, once again, at the executive level.

While standard codes and vocabularies are critical to a master data management strategy, they also might be the easiest to manage. The more complicated aspect of master data management is related to the standardization and management of the algorithms and rules that bind data together. Adopting a real master data management approach will lead to higher data integrity in hospitals which will lead to better services and higher quality.

## **Future Endeavors**

With the development of Internet, the World Wide Web, Social Media, intelligent agents, mobile technology, sensors and pieces of clothing containing them a new generation of devices have been created offering new possibilities for improvements particularly in areas such assist of living and homecare in general. The use of wearable computing in general and the use of augmented reality in the developed countries in particular offer some unique opportunities to improve outcomes. In the 21st Century and as health care and public health infrastructure intersect deeper into the many Information Technology subfields, abundant and formidable changes can occur that will allow society to shift current systems into some where wellness and disease prevention will be the focus. Many changes can affect positively medical and cost effective outcomes as well as the elimination of medical errors and patient safety. in these areas, with the convergence of science, technology and with Information Technology acting as a catalyst for change, health care systems around the world are slowly shifting form "hospital based" ones into distributed systems that include: hospitals,

clinics, homecare systems with treatment and management of chronic diseases for the elderly via the internet. Just imagine how the public could also be better protected not only against environmental threats, water contamination, food borne diseases through the use of remote sensing data and a worldwide food enterprise architecture, but through alerts that could flow into a person through Wearable Computing. Data, Information, Knowledge and Wisdom could flow into an individual alerting him that they need to immediately visit their doctor or stop consuming certain food.

All this will require a new perspective on data: its management and its governance, through investigating new data governance models that can fit health care systems in the future.

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