

## Healthcare Industry Improvement with Business Intelligence

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*The current paper highlights the advantages of big data analytics and business intelligence in the healthcare industry. In the paper are reviewed the Real-Time Healthcare Analytics Solutions for Preventative Medicine provided by SAP and the different ideas realized by possible customers for new applications in Healthcare industry in order to demonstrate that the healthcare system can and should benefit from the new opportunities provided by ITC in general and big data analytics in particular.*

**Keywords:** *Business Intelligence, Healthcare Analytics, Use-Cases, Real-Time Processing*

### 1 Introduction

The concepts used and presented in this paper are Big Data, which is a challenge nowadays, In-Memory, which is a new Business Intelligence technology and Analytics, which is a use case [1] [2]. Nowadays, it is very important to present the role of Business Intelligence technology in the healthcare sector.

Global data production is expected to increase at an astonishing 4,300 per cent by 2020 from 2.52 zettabytes in 2010 to 73.5 zettabytes in 2020 [3]. Big data refers to the vast amount of data that is now being generated and captured in a variety of formats and from a number of disparate sources. Big data analytics is the intersection of two technical entities that have come together. First, there's big data for massive amounts of detailed information. Second, there's advanced analytics, which can include predictive analytics, data mining, statistics, artificial intelligence, natural language processing, and so on. Put them together and you get big data analytics.

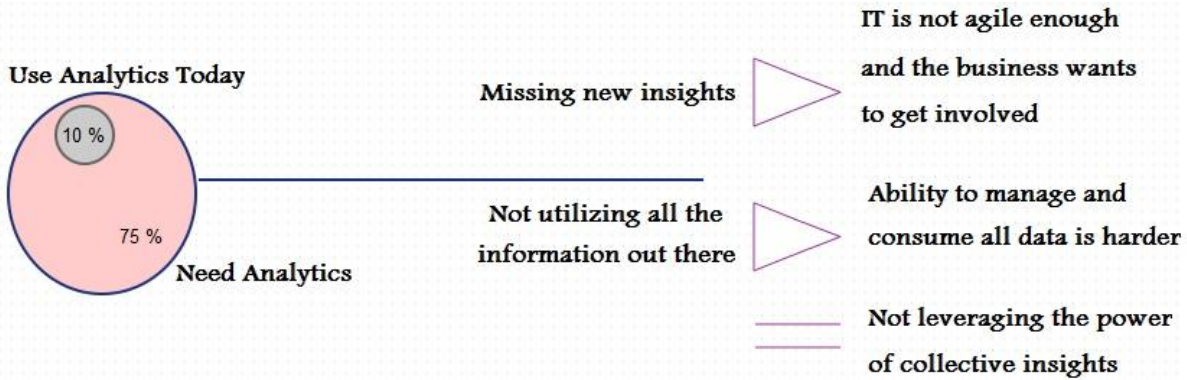
In [4], Prof. dr. med. Karl Max Einhüpl considered that "in a hospital like Charité it's an unending stream of data every day. We see an unending stream of data every day and it is unconditional important that we collect

this data, filter, control it and reuse it for patient care, or for teaching, or for driving research. In the medical field, it is critical that we move away from the flood of paper that is overwhelming doctors today; that we continually move toward electronic data capture." This means that if you have the right information at the right time then everything it's possible.

The current paper is an extended version of the work presented at the 14th International Conference on Informatics in Economy, IE 2015, 30 April - 03 May 2015, Bucharest, Romania [5].

### 2 Healthcare Analytics

When discussing about healthcare analytics, it is important to ask how are the statistics numbers regarding the usage of analytics in healthcare and how this affects the end user's knowledge? In the Figure 1 below these numbers are represented, 10% are those who use analytics today and approximately 75% need analytics [6]. The disadvantage of those who are not using analytics feature is that they can't make use of all data because the ability to manage all data is getting difficult. On the other side, those who use analytics today are missing new insights, which mean they are not able to imagine the potential.



**Fig. 1.** Healthcare Analytics

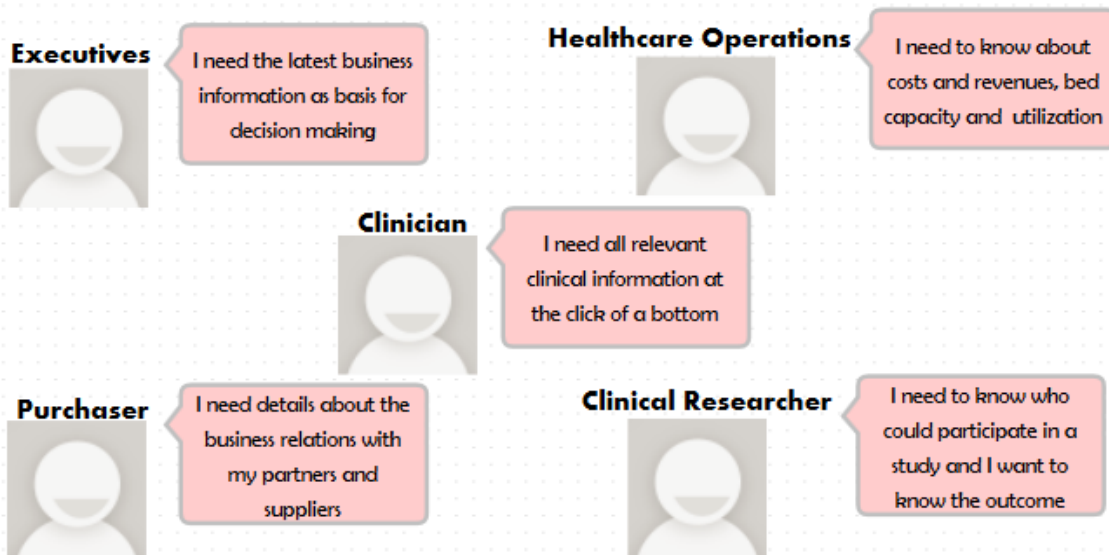
The power of collective insights is realized by following three steps:

- *Engage*: predict demand and supply of Supply Chain;
- *Visualize*: understand the customer’s thoughts;
- *Predict*: provide the proper offers and services to every customer; also predict new market trends and innovate new products [7].

Healthcare organizational data it is used in diverse cases like surgical analytics, share

healthcare visualizations and have the clinicians share the processes. Profitability and quality analysis for management can provide the critical insights to obtain the organizations goals and gain competitive advantages. Analytical applications are developed to provide the base for the use of analytics in an enterprise [8].

We must consider that analytics is about people and their needs. We can see in the Figure 2 why is this evolution so important and how the people’s thinking are.



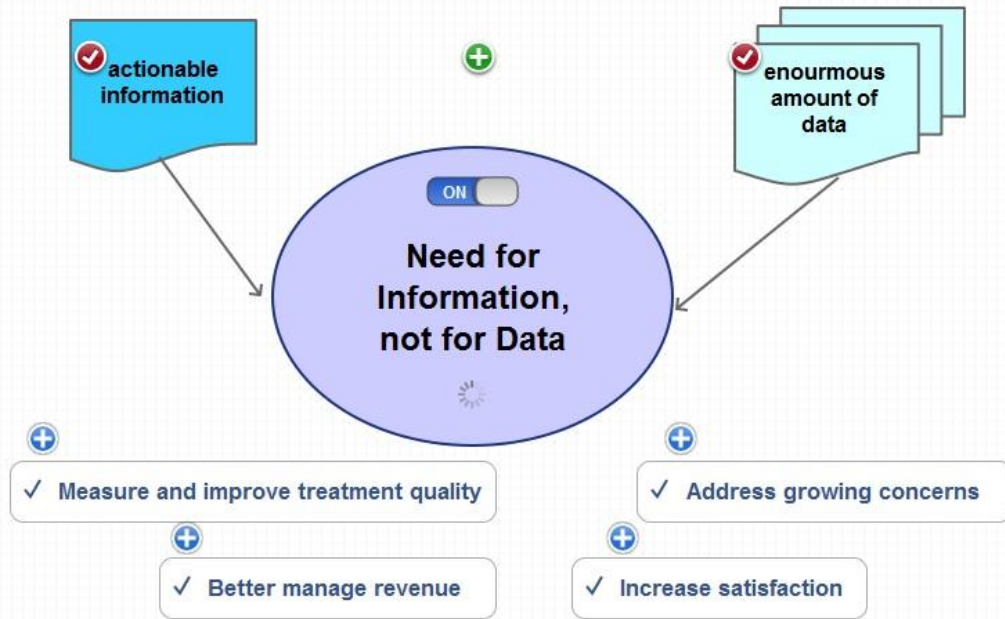
**Fig. 2.** Analytics is for People

The focus is on the empathy of the end user like executives, healthcare operations, clinician, purchaser and clinical researcher. This is in fact the user experience with these useful tools. The user experience can be sufficient in terms of satisfaction if the tools

have beautiful UI (user interface) and an easy adoption [9].

As presented in Figure 3, in the healthcare industry it is very important to help the organizations to measure and improve treatment quality, to address growing

concerns, to better manage revenue and to increase the overall satisfaction.



**Fig. 3.** Information vs. data in healthcare industry

There is not necessary to collect more data, because the companies’ needs are to reach more information, considering that in these days many companies are already confronted with processing enormous amount of data.

In our opinion, the actual context of healthcare analytics it’s about redefining the possible, while the future evolution can be described in terms like efficiency, performance, data quality, real-time analytics for patients, doctors and medical researchers.

**3 Healthcare Analytics Solutions**

A Real-Time Healthcare Analytics Solution for Preventive Medicine is a solution developed by SAP. It let users to see their analytics and to use all the functionalities of SAP HANA which is behind this application. This solution saves time and can be easily customized for any use case [10] [11] [12]. Below are collected different healthcare use-cases realized by different customers for new applications in healthcare industry.

**Acceleration of most used SAP Patient Management transactions**

Like the clinical workstation, the reasons are the following:

- a lot of user complaints related to performance;

- the transaction is a key one as it offers a view on all patients of a given ward with important data.

Many users work with it and use the refresh function which creates additional system load. This use case is currently being implemented. We could think of further opening it up to multiple providers in order to provide access to patient information of the complete Health Information Network (would need to be based on IHE specifications).

**Clinical Research Support for cancer patients**

This healthcare use-case has the following advantages:

- help medical researchers and physicians comprising up-to-date clinical and medical information into research processes;
- ability to access all relevant data across organizational boundaries real-time;
- analyses of clinical data based on structured as well as unstructured information;
- create patient cohorts for clinical trials;
- quickly determine Patient/Trial matching;

- could of course be applied to other patients and specialties;
- use cases is reflected in SAP Solution in Early Adoption "Medical Research Insights";
- this use case could be useful for these customers NCT, DKFZ hospitals.

### **Patient Segmentation**

This use-case help Healthcare Payers to quickly analyze their patient population in order to determine potential candidates for a disease management program (e.g. diabetes prevention). Potential customers for this use-case could be Healthcare Payers and Health Insurances.

### **Health Plan Analytics**

This use-case will support Healthcare Payers to analyze the effectiveness of their health programs (e.g. ROI and Performance Analysis of Disease Management Programs covering morbidity clustering). As in the previous use-case, potential customers could be also Healthcare Payers and Health Insurances.

### **Multi-Resource Planning**

In this situation, the use-case can help Healthcare Providers to quickly recalculate their outpatient schedules or inpatient surgery plans based on different types of incidents like unavailability of doctors etc. Potential customers are Healthcare Providers.

### **Treatment outcome analysis**

This will help Healthcare Providers to analyze their patient treatment outcome and costs by considering diagnosis and DRG codes, length of stay, services performed, claims and revenues. This could also be used to support the contract negotiation process with the payers, by providing hospitals with the information support on the real costs for a specific patient group. Potentially extend this to a multi provider or ACO (Accountable Care Organization) scenario for the US. As in

previous situations, potential customers are Healthcare Providers.

### **Evidence-based medicine**

Evidence-based medicine (EBM) aims to apply the best available evidence gained from the scientific method to clinical decision making. The use case is to suggest medical guidelines based on past patient treatments. Potential customers are Healthcare Providers.

### **Drug Recall**

This use-case provide fast and efficient recall procedures by determining quickly all the patients having been administered the drug to be recalled including their location and contact information. Potential customers are Healthcare Providers.

### **Track & Trace of Medical Products**

This use-case offer monitoring of the logistic chain of medical and pharmaceutical products from the raw material to the point of consumption by the patient including efficient counterfeit prevention. Potential customers are Healthcare Providers.

### **Prevention of Fraud and Abuse**

This support analysis of incoming claims in comparison to the claims history with the aim of detecting cases of fraud and abuse. Originally HANA Olympics use case submitted by Jim Brett (Partner Manager for E&Y) Jim & Steve pushing on partner development in the US GRC cross industry use case "Instant Compliance" under evaluation, Healthcare has been asked to address requirements. Potential customers are Healthcare Payers.

### **Real-time patient monitoring**

This use-case help Monitoring patients in real-time and triggering alerts of necessary interventions based upon incoming data (e.g. blood pressure). This use case is an example for a set of use cases like

- MEWS (modified early warning score) in the ICU area;

- Elderly patients at home. Potential customers are Healthcare Providers.

**Determination of copayment rates**

Offer an insured patient the possibility to quickly find out which copayment he would have to make for a given treatment. This service could be offered by a health insurance through a portal or mobile device to their customers. It would create the required output based on the insured person's health plan and on the already consumed services. This determination is data intensive and could be accelerated through HANA. Potential customers are

Health Insurances for their insured persons or Patients directly.

**Prevention of Claims Rejection**

This help medical controllers or physicians by informing them that a case might be subject to a payer investigation (e.g. MDK in Germany) because of a mismatch between claims and medical facts and other characteristics like length of stay, age etc. Potential customers are Healthcare Providers.

In the below Table 1 is realized a comparative analysis of use-cases which will be implemented in the healthcare industry and their key benefits are highlighted.

**Table 1.** Comparative analysis of Healthcare use-cases

Use cases	Potential customers	Key benefits
Acceleration of most used SAP Patient Management transactions	Healthcare industry	Acceleration of transaction processing
Clinical Research Support for cancer patients	NCT and DKFZ hospitals from Munich	Increased patient satisfaction
Patient Segmentation	Healthcare Payers and Health Insurances	Cost savings for hospitals
Health Plan Analytics	Healthcare Payers and Health Insurances	Real-time analysis
Multi-Resource Planning	Healthcare Providers	Time saving for planning
Treatment outcome analysis	Healthcare Providers	Better outcome management
Evidence-based medicine	Healthcare Providers	Better clinical decision making process
Drug Recall	Healthcare Providers	Efficient recall procedures
Track & Trace of Medical Products	Healthcare Providers	Efficient counterfeit prevention
Prevention of Fraud and Abuse	Healthcare Payers	Better fraud prevention
Real-time patient monitoring	Healthcare Providers	Real-time monitoring
Determination of copayment rates	Health Insurances for their insured persons or Patients directly	Efficient budget planning
Prevention of Claims Rejection	Healthcare Providers	Efficient claims management

Our solution proposed in the healthcare industry is based on the use-cases presented above and has the following objectives:

- real-time analysis of hospital patient management data;
- significant speed up of reporting processes;

- monitoring clinical quality of care and patient safety.

We have to eliminate the barriers of space and time between the patient, the administrator and the doctor. It's about having the data at the right moment when healthcare is delivered and consumed. The

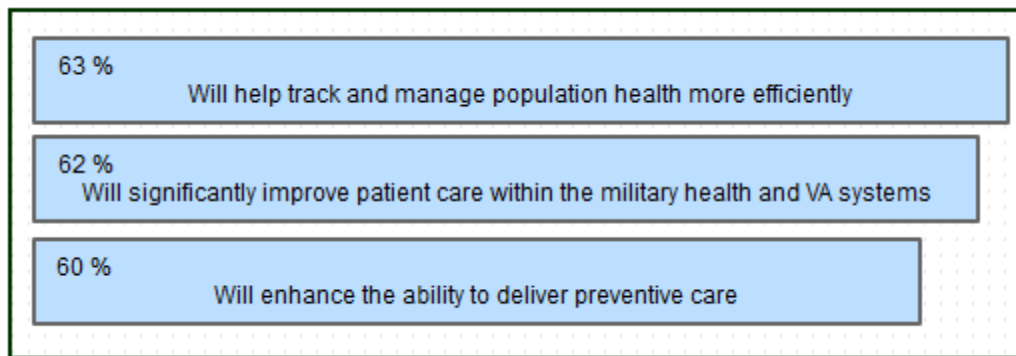
approach is to have a real-time platform which delivers medical insights while reducing costs [13].

#### 4 How Big Data Impacts Healthcare

The speed of the challenges in the healthcare industry continue to grow. But the evolution in computing technology needs effective personalized medicine and specific treatments according to patients' individual characteristics [14].

#### Many benefits of Big Data

Business executives from the healthcare agencies highlighted the benefits of big data. The question is “what is driving the push for big data?” The response is quite simple: the demand to create more value in healthcare. The benefits of big data are presented in Figure 4.



**Fig. 4.** Many benefits of Big Data

To make use of this IT evolution means to use proper data at the right moment. In fact is a work with almost the most complex and disconnected data sets of any industry. This problem has been a long-term challenge for healthcare providers. The healthcare organizations have adopted IT platforms that simplify processes and IT systems. Also, their scope is to expand and improve the spread of care at a lower cost. The evolving IT platforms present the information with visualization tools that put actionable insights into the hands of caregivers and patients, enabling providers to invent new healthcare

practices as needed. The benefits of this approach are: better preventive care; IT simplification; and improved, more personalized treatment [15].

#### Patients Taking Charge of Health Choices

The new IT platforms will need to serve the health economy. In this way the focus should be on patient outcomes. A research show the percentages of patients that would do something else in order to have a lower cost. In the Figure 5 below are represented these percentages.

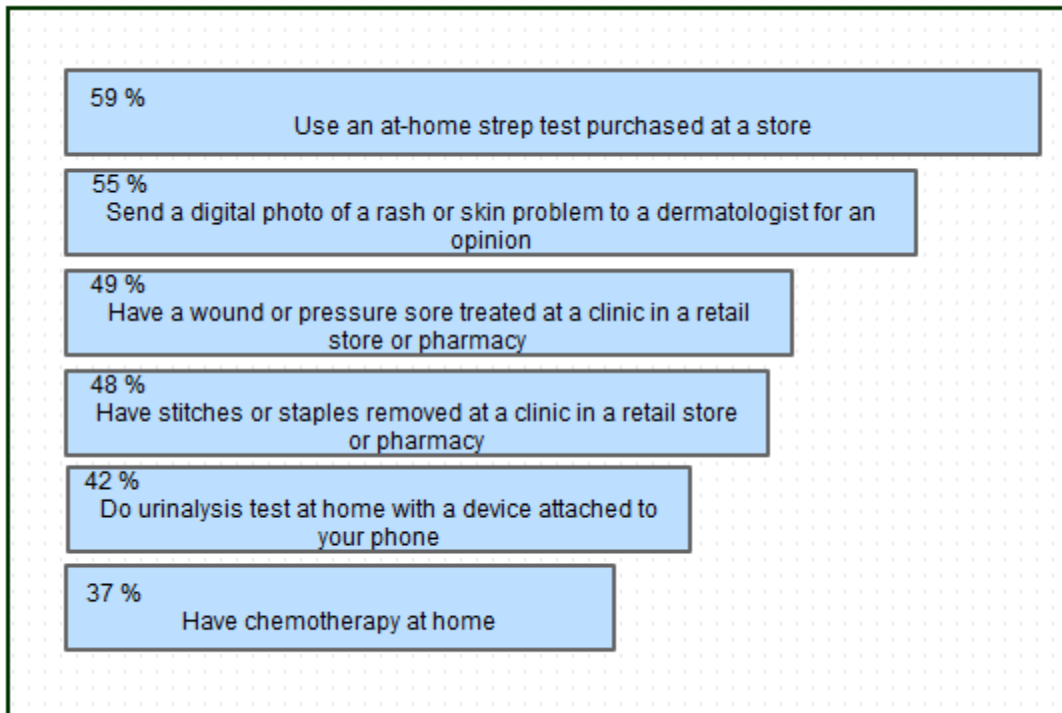


Fig. 5. Patients Taking Charge of Health Choices [16]

The patients know less things about their healthcare than they know about their food at a breakfast. The scope of IT platforms is simplification and this simplification is for patients to make informed decisions. According to a Health Research Institute survey (Figure 5) more accurate and fast available information may cut the cost of healthcare while improving its quality. Many patients are actively looking to reduce costs and improve their quality. The survey found, for example, shows that patients would likely choose nontraditional forms of healthcare, such as at-home healthcare analysis tests using a specific mobile application or a device attached to a smartphone, if these cost less [16].

**5 Conclusions**

In conclusion is time for change in Healthcare sector. The use of analytics will enable putting the right data at the fingertips of the people with the potential to generate lifesaving or lifestyle improving insights. Big data offers breakthrough possibilities for new research and discoveries, better patient care, and greater efficiency in health and health care, as detailed in the July issue of Health

Affairs [17]. The future of Healthcare industry is under construction, but it’s so clear the design of the healthcare IT platform of tomorrow means imagining not only how data is used but also how healthcare is delivered. We believe that big data analytics can significantly help healthcare research and ultimately improve the quality of life for patients from any domain.

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