**Speech**

Hi,

I’m Emon. I’m from Chongqing University of Science and Technology. Now I’m gonna talk about Big Data Analytics in Healthcare.

First I would like to say something about big data. The term “big data” refers to data that is so large, fast or complex. It is difficult or impossible to process big data by using traditional methods. The act of accessing and storing large amounts of information for analytics has been around a long time. But the concept of big data gained momentum in the early 2000s. Big data can be categorized as unstructured or structured. Structured data consists of information already managed by the organization in databases and spreadsheets; it is frequently numeric in nature. Unstructured data is information that is unorganized and does not fall into a pre-determined model or format.

The application of big data analytics in healthcare has a lot of positive and also life-saving outcomes. Big data refers to the vast quantities of information created by the digitization of everything, that gets consolidated and analyzed by specific technologies. Applied to healthcare, it will use specific health data of a population (or of a particular individual) and potentially help to prevent epidemics, cure disease, cut down costs, etc.

Now that we live longer, treatment models have changed and many of these changes are namely driven by data. Doctors want to understand as much as they can about a patient and as early in their life as possible, to pick up warning signs of serious illness as they arise – treating any disease at an early stage is far more simple and less expensive. With healthcare data analytics, prevention is better than cure and managing to draw a comprehensive picture of a patient will let insurances provide a tailored package. This is the industry’s attempt to tackle the siloes problems a patient’s data has: everywhere are collected bits and bites of it and archived in hospitals, clinics, surgeries, etc., with the impossibility to communicate properly.

Indeed, for years gathering huge amounts of data for medical use has been costly and time-consuming. With today’s always-improving technologies, it becomes easier not only to collect such data but also to convert it into relevant critical insights, that can then be used to provide better care. This is the purpose of healthcare data analytics: using data-driven findings to predict and solve a problem before it is too late, but also assess methods and treatments faster, keep better track of inventory, involve patients more in their own health and empower them with the tools to do so.

**Importance of Big Data Analytics in Healthcare**

One of the prominent opportunities available from big data usage is evident in the healthcare industry. Healthcare organizations have a large volume of data available to them and a large portion of it is unstructured and clinically relevant. This data can reside in various places such as lab and imaging systems, physician notes, and even CRM systems.

More and more healthcare organizations are leveraging big data technology to capture all patient information. The goal of such a technology is to get better insights that can aid diagnosis and treatment for patients. Harnessing big data can help achieve three critical objectives in healthcare:

* **Build sustainable healthcare systems:** The healthcare industry is constantly faced with competitive and legislative pressure and must determine ways to reduce the cost of care, while efficiently managing resources. Healthcare organizations should focus on understanding the patient and improving patient care by promoting effective resource utilization.
* **Collaborate to improve care and outcomes:** Healthcare organizations should improve patient engagement and personalize healthcare initiatives that improve the quality and efficiency of care. Understanding a patient individually is important when designing tailored yet effective healthcare programs.
* **Increase access to healthcare:** A major issue with healthcare is access. In order for the population to thrive, healthcare must be available and accessible (*and affordable – that could be a topic for another discussion in itself!*). Educating consumers on preventive care can improve health and reduce the demand and waste of healthcare resources.

**Big Data Analytics Advantages in Healthcare**

**Big data has been on its way of revolutionizing the ways by which people control, make analysis as well as leverage data regardless of any field. Among those industries, the one that big data has made a big renovation is healthcare industry. In general, big data can help healthcare industry reduce the treatment price, predict the potential diseases, prevent serious diseases as well as advance the life quality for all people. A person lifespan can be increased more and more in the future but this is also a new difficulty for those working in healthcare industry. Health experts, now like business managers, are able to gather very huge amounts of data to find out more effective methods in treating patients.**

### Improved Operational Efficiency

From the healthcare service providers perceptive, big data helps to understand the historical admission and discharge rates of patients helping to analyze the staff efficiency and productivity while handling the different volumes of patients at-a-time.

Understanding the data meticulously will help the companies, cut down their operational cost and also provide the better care to their customers. Big data analysis also helps to improve the accuracy in financial and administrative performance.

### Advance Patients Care and Treatment

Big data helps to understand the electronic health records, gather demographic and medical data like clinical data, pathology test, medical conditions and diagnosis helping doctors facilitate the better healthcare to wide range of patients.

Apart from healthcare AI development for **medical imaging analysis**, big data vitally contributes to better insights into patients age group that are highly vulnerable to diseases, thereby allowing to take proactive actions for preventive measures.

Big data also helps patients to educate and well-informed about the various illness and take care of their own wellness  minimizing the dependency on others. Overall, big data  is playing a crucial role in providing the better medical care facilities in a highly advance environment making their life easier and healthy.

### Discovering the Right Cure for Diseases

It is not necessary, a drug effective in curing a disease to a patient might not work in the same way. So, big data also helps to discover the right medicine and curing process that can help patients to get the precise treatment.

Actually, big data can provide the information to disclose the correlations, hidden patterns and other insights by analyzing the large data sets**.** And healthcare [machine learning training data sets](https://www.cogitotech.com/services/machine-learning/" \t "https://www.cogitotech.com/blog/top-benefits-of-big-data-analytics-in-healthcare-industry/_blank) also helps humans genomes and also discover the accurate treatment or medicines for life-threatening diseases like cancer etc.

### Personalize and Integrated Communication

Improving the overall communication system and customer assistance are another  advantages of [big data in healthcare](https://www.cogitotech.com/services/healthcare-training-data/" \t "https://www.cogitotech.com/blog/top-benefits-of-big-data-analytics-in-healthcare-industry/_blank)**.** Utilizing a seizable information of collected human information, healthcare marketing experts create well-informed communication system for personalize interaction through chatbots and virtual assistance.

The integrated communication also improve the customer experiences throughout the personalize devices on their finger tips. Big data is also crucial for transforming marketing communication platforms like email, patients portal and call centers.

Such holistic approach to improve the communication making the customer engagement more satisfying and personalized.

### Enhanced Access to Key Information

Thanks to Internet, the cloud-based storage services are getting improved day-by-day, allowing people to access the big data information from any location. This kind of facility also benefits doctors who can access electronic medical records anytime from anywhere to enhance the patient care.

Big data is now changing and patients can now choose their healthcare service provider. And Internet also allowing them to immediately access of information like reviews and feedbacks of customers of doctors, hospitals and healthcare clinics. And this kind of online reviews also helps hospitals and similar organization evaluate their own performance and improve the area of weakness in highly competitive environment.

**Big Data Applications in Healthcare**

**Patients Predictions For An Improved Staffing**: For the first example of big data in healthcare, we will look at one classic problem that any shift manager faces: how many people do I put on staff at any given time period? If you put on too many workers, you run the risk of having unnecessary labor costs add up. Too few workers, you can have poor customer service outcomes – which can be fatal for patients in that industry.

Big data is helping to solve this problem, at least at a few hospitals in Paris. A [Forbes article](https://www.forbes.com/sites/bernardmarr/2016/12/13/big-data-in-healthcare-paris-hospitals-predict-admission-rates-using-machine-learning/" \l "79f2f6ff79a2" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) details how four hospitals which are part of the Assistance Publique-Hôpitaux de Paris have been using data from a variety of sources to come up with daily and hourly predictions of how many patients are expected to be at each hospital.

One of they key data sets is 10 years’ worth of hospital admissions records, which data scientists crunched using “time series analysis” techniques. These analyses allowed the researchers to see relevant patterns in admission rates. Then, they could use machine learning to find the most accurate algorithms that predicted future admissions trends.

**Electronic Health Records:** It’s the most widespread application of big data in medicine. Every patient has his own digital record which includes demographics, medical history, allergies, laboratory test results etc. Records are shared via secure information systems and are available for providers from both public and private sector. Every record is comprised of one modifiable file, which means that doctors can implement changes over time with no paperwork and no danger of data replication.

EHRs can also trigger warnings and reminders when a patient should get a new lab test or track prescriptions to see if a patient has been following doctors’ orders.

Although EHR are a great idea, many countries still struggle to fully implement them. U.S. has made a major leap with 94% of hospitals adopting EHRs according to this HITECH research, but the EU still lags behind. However, an ambitious directive drafted by European Commission is supposed to change it: by 2020 centralized European health record system should become a reality.

**Real-Time Alerting:** Other examples of big data analytics in healthcare share one crucial functionality – real-time alerting. In hospitals, Clinical Decision Support (CDS) software analyzes medical data on the spot, providing health practitioners with advice as they make prescriptive decisions.

However, doctors want patients to stay away from hospitals to avoid costly in-house treatments. Analytics, already trending as one of the [business intelligence buzzwords](https://www.datapine.com/blog/business-intelligence-buzzwords-2019/) in 2019, has the potential to become part of a new strategy. Wearables will collect patients’ health data continuously and send this data to the cloud.Additionally, this information will be accessed to the database on the state of health of the general public, which will allow doctors to compare this data in socioeconomic context and modify the delivery strategies accordingly.

### Reduce Fraud and Enhance Security: Some studies have shown that this particular industry [is 200% more likely](https://www.healthcareitnews.com/blog/three-ways-big-data-continues-transform-healthcare" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) to experience data breaches than any other industry. The reason is simple: personal data is extremely valuable and profitable on the black markets. And any breach would have dramatic consequences. With that in mind, many organizations started to use analytics to help prevent security threats by identifying changes in network traffic, or any other behavior that reflects a cyber-attack. Of course, big data has inherent security issues and many think that using it will make the organizations more vulnerable than they already are. But advances in security such as encryption technology, firewalls, anti-virus software, etc, answer that need for more security, and the benefits brought largely overtake the risks.

**Telemedicine:** Telemedicine has been present on the market for over 40 years, but only today, with the arrival of online video conferences, smart-phones, wireless devices, and wearables, has it been able to come into full bloom. The term refers to delivery of remote clinical services using technology.

It is used for primary consultations and initial diagnosis, remote patient monitoring, and medical education for health professionals. Some more specific uses include telesurgery – doctors can perform operations with the use of robots and high-speed real-time data delivery without physically being in the same location with a patient.

Clinicians use telemedicine to provide personalized treatment plans and prevent hospitalization or re-admission. Such use of healthcare data analytics can be linked to the use of predictive analytics as seen previously. It allows clinicians to predict acute medical events in advance and prevent deterioration of patient’s conditions. Telemedicine also improves the availability of care as patients’ state can be monitored and consulted anywhere and anytime.

**Integrating Big Data With Medical Imaging:** Medical imaging is vital and each year in the US [about 600 million imaging](http://bigdata-madesimple.com/how-big-data-is-revolutionizing-the-health-care-industry/" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) procedures are performed. Analyzing and storing manually these images is expensive both in terms of time and money, as radiologists need to examine each image individually, while hospitals need to store them for several years.

Medical imaging provider Care stream [explains](https://www.carestream.com/blog/2016/05/23/what-is-future-of-big-data-in-radiology/" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) how big data analytics for healthcare could change the way images are read: algorithms developed analyzing hundreds of thousands of images could identify specific patterns in the pixels and convert it into a number to help the physician with the diagnosis. They even go further, saying that it could be possible that radiologists will no longer need to look at the images, but instead analyze the outcomes of the algorithms that will inevitably study and remember more images than they could in a lifetime. This would undoubtedly impact the role of radiologists, their education and required skillset.

**Predictive Analytics In Healthcare:** Predictive analytics is one of the biggest [business intelligence trend](https://www.datapine.com/blog/business-intelligence-trends/" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) two years in a row, but the potential applications reach far beyond business and much further in the future. Optum Labs, an US research collaborative, has collected EHRs of over 30 million patients to create a database for predictive analytics tools that will improve the delivery of care.

The goal of [healthcare business intelligence](https://www.datapine.com/blog/business-intelligence-in-healthcare/" \t "https://www.datapine.com/blog/big-data-examples-in-healthcare/_blank) is to help doctors make data-driven decisions within seconds and improve patients’ treatment. This is particularly useful in case of patients with complex medical histories, suffering from multiple conditions. New tools would also be able to predict, for example, who is at risk of diabetes, and thereby be advised to make use of additional screenings or weight management [4].

**Big Data Examples in Healthcare**

The industry is changing, and like any other, big data is starting to transform it – but there is still a lot of work to be done. The sector slowly adopts the new technologies that will push it into the future, helping it to make better-informed decisions, improving operations, etc. In a nutshell, here’s a short list of the examples we have gone over in this article. With healthcare data analytics, you can:

* Predict the daily patients income to tailor staffing accordingly
* Use Electronic Health Records (EHRs)
* Use real-time alerting for instant care
* Enhance patient engagement in their own health
* Use health data for a better-informed strategic planning
* Research more extensively to cure cancer
* Use predictive analytics
* Reduce fraud and enhance data security
* Practice telemedicine
* Integrate medical imaging for an broader diagnosis
* Prevent unnecessary ER visits

**Challenges of Big Data Analytics in Healthcare**

Big data analytics is turning out to be one of the toughest undertakings in recent memory for the healthcare industry.

Providers who have barely come to grips with putting data into their electronic health records (EHR) are now being asked to pull actionable insights out of them – and apply those leanings to complicated initiatives that directly impact their reimbursement rates.

For healthcare organizations that successfully integrate data-driven insights into their clinical and operational processes, the rewards can be huge.

Healthier patients, lower care costs, more visibility into performance, and higher staff and consumer satisfaction rates are among the many benefits of [turning data assets into data insights](https://healthitanalytics.com/features/turning-healthcare-big-data-into-actionable-clinical-intelligence) [5].

The road to meaningful healthcare analytics is a rocky one, however, filled with challenges and problems to solve.

By its very nature, big data is complex and unwieldy, requiring provider organizations to take a close look at their approaches to collecting, storing, analyzing, and presenting their data to staff members, business partners, and patients.

### ****Capture****

All data comes from somewhere, but unfortunately for many healthcare providers, it doesn’t always come from somewhere with impeccable data governance habits.  Capturing data that is clean, complete, accurate, and formatted correctly for use in multiple systems is an ongoing battle for organizations, many of which aren’t on the winning side of the conflict.

### ****Cleaning****

Healthcare providers are intimately familiar with the importance of cleanliness in the clinic and the operating room, but may not be quite as aware of how vital it is to cleanse their data, too.

Dirty data can quickly derail a big data analytics project, especially when bringing together disparate data sources that may record clinical or operational elements in [slightly different formats](https://healthitanalytics.com/features/health-information-governance-strategies-for-unstructured-data).  Data cleaning – also known as cleansing or scrubbing – ensures that data sets are accurate, correct, consistent, relevant, and not corrupted in any way [6].

### ****Storage****

Front-line clinicians rarely think about where their data is being stored, but it’s a critical cost, security, and performance issue for the IT department.  As the volume of healthcare data grows exponentially, some providers are no longer able to manage the costs and impacts of on premise data centers.

**Security**

The recurring incidents of hacking, high profile data breach and ransomware etc are posing credibility threats to Big Data solutions for organisations. The recommended solutions for this problem include updated antivirus software, encrypted data and multi-factor authentication to offer minimal risk and protect data.

**Conclusion**

Healthcare analytics have the potential to reduce costs of treatment, predict outbreaks of epidemics, avoid preventable diseases and improve the quality of life in general. Average human lifespan is increasing along world population, which poses new challenges to today’s treatment delivery methods. In the future we’ll see the rapid, widespread implementation and use of big data analytics across the healthcare organization and the healthcare industry. To that end, the several challenges highlighted above, must be addressed. Big data analytics and applications in healthcare are at a nascent stage of development, but rapid advances in platforms and tools can accelerate their maturing process.