Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

# Healthcare Data Analytics

## A Learning Healthcare System

Institute of Medicine (IOM) 2012 report "Best Care at Lower Cost: The Path to Continuously Learning Health Care in America"

Designed to:

- Generate and apply the best evidence for the collaborative healthcare choices of each patient and provider

- Drive the process of discovery as a natural outgrowth of patient care

- Ensure innovation, quality, safety, and value in health care

Requires fundamental commitments to incentives, culture, and leadership that foster continuous "learning".

**Healthcare Data Analytics**: How is data analytics used in healthcare? example of data analytics in healthcare, types of analytics used in healthcare.

## Learning Objectives

Discuss the difference between **descriptive**, **predictive** and **prescriptive** analytics

## 1. Introduction to Analytics

1. One of the promises of the growing critical mass of clinical data accumulating in electronic health record (EHR) systems is secondary use (or re-use) of the data for other purposes, such as quality improvement and clinical research.
2. The growth of such data has increased dramatically in recent years due to incentives for EHR adoption in the US funded by the Health Information Technology for Economic and Clinical Health (HITECH) Act.
3. The analysis of this data is usually called analytics (or data analytics).

## 2. Terminology of Analytics

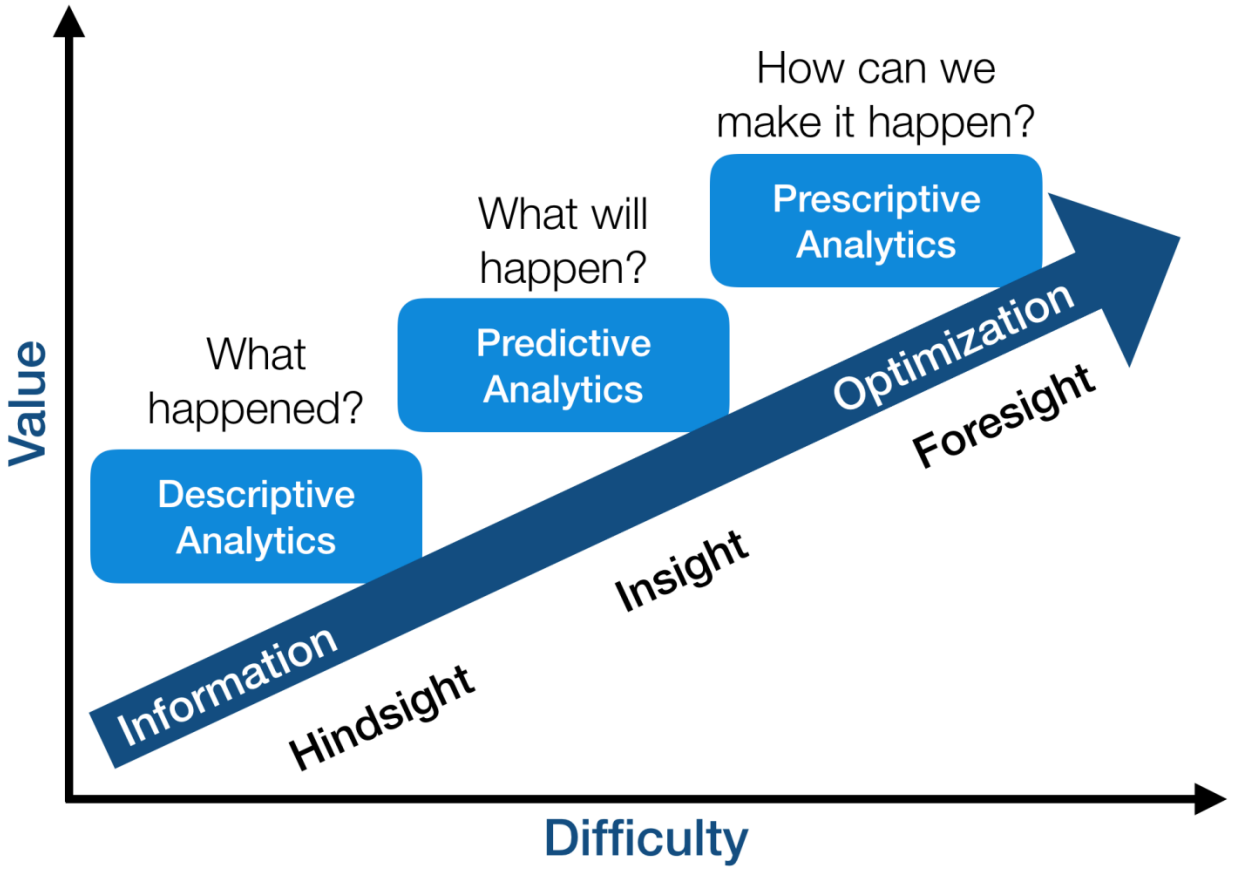
Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

- Defining analytics as "the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions."
- International Business Machines (**IBM**) defines analytics as "the systematic use of data and related business insights developed through applied analytical disciplines (e.g. statistical, contextual, quantitative, predictive, cognitive, other [including emerging] models) to drive fact-based decision making for planning, management, measurement and learning. Analytics may be descriptive, predictive or prescriptive."

Three levels of analytics, each with increasing functionality and value:

- - **Descriptive** – standard types of reporting that describe current situations and problems
- - **Predictive** – simulation and modeling techniques that identify trends and portend outcomes of actions taken
- - **Prescriptive** – optimizing clinical, financial, and other outcomes

Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)




**3. Analytics**

- There are a number of terms related to data analytics. A core methodology in data analytics is machine learning, which is the area of computer science that aims to build systems and algorithms that learn from data.
- One of the major techniques of **machine learning** is data mining, which is defined as the processing and modeling of large amounts of data to discover previously unknown patterns or relationships.
- A subarea of data mining is text mining, which applies data mining techniques to mostly unstructured textual data
- Another close but more recent term in the vernacular is big data, which describes large and ever-increasing volumes of data that adhere to the following attributes:

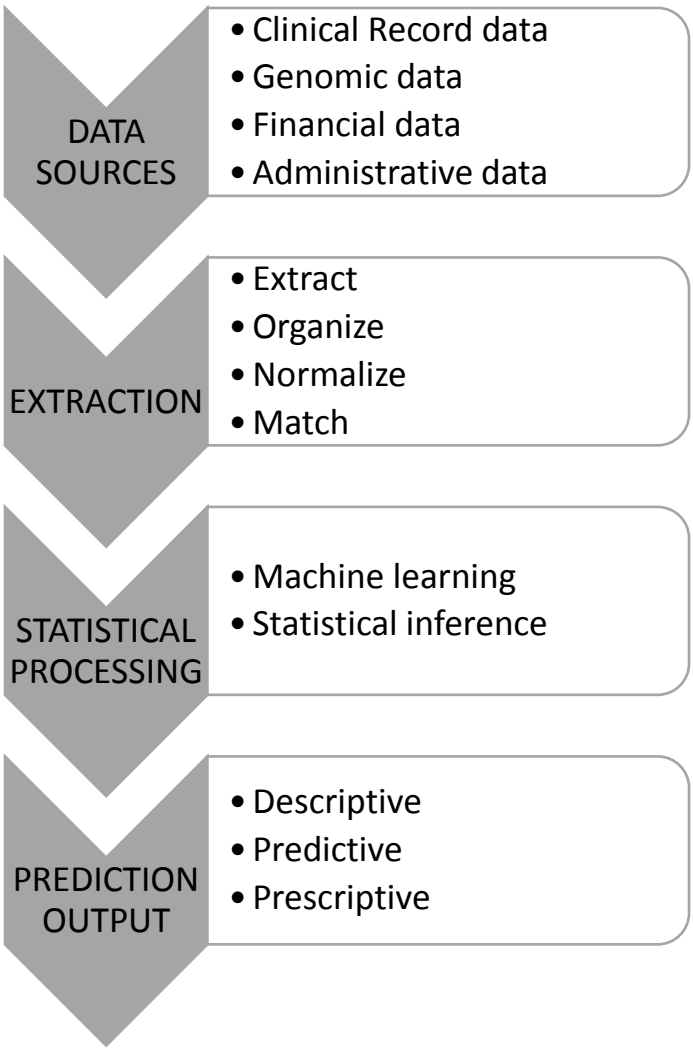
- Volume – ever-increasing amounts

Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

- Velocity – quickly generated
- Variety – many different types
- Veracity – from trustable sources

## 4. The Analytics Pipeline

Process of big data analytics resembles a pipeline, and have developed an approach that specifies four major steps in this pipeline, to which one can place data sources and actions on it pertinent to healthcare and biomedicine.



Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

- The pipeline begins with input data sources, which in healthcare and biomedicine may include clinical records, financial records, genomics and related data, and other types, even those from outside the healthcare setting (e.g., census data).
- The next step is feature extraction, where various computational techniques are used to organize and extract elements of the data, such as linking records across sources, using natural language processing (NLP) to extract and normalize concepts, and matching of other patterns.
- This is followed by statistical processing, where machine learning and related statistical inference techniques are used to make conclusions from the data. The final step is the output of predictions, often with probabilistic measures of confidence in the results.

## 5. Challenges to Data Analytics

### 1. The amount of data being collected

The need to a data system that automatically collects and organizes information. Manually performing this process is far too time-consuming and unnecessary in today's environment. An automated system will allow employees to use the time spent processing data to act on it instead.

### 2. Collecting meaningful and real-time data

A data system that collects, organizes and automatically alerts users of trends will help solve this issue. Employees can input their goals and easily create a report that provides the answers to their most important questions. With real- time reports and alerts, decision-makers can be confident they are basing any choices on complete and accurate information.

### 3.Visual representation of data

Strong data systems enable report building at the click of a button. Employees and decision-makers will have access to the real-time information they need in an appealing and educational format.

Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

**4. Data from multiple sources**

With a comprehensive and centralized system, employees will have access to all types of information in one location. Not only does this free up time spent accessing multiple sources, it allows cross- comparisons and ensures data is complete.

**5. Inaccessible data**

An effective database will eliminate any accessibility issues. Authorized employees will be able to securely view or edit data from anywhere, illustrating organizational changes and enabling high-speed decision making.

**6. Poor quality data**

A centralized system eliminates these issues. Data can be input automatically with mandatory or drop-down fields, leaving little room for human error. System integrations ensure that a change in one area is instantly reflected across the board.

**7. Shortage of skills**

This challenge is mitigated in two ways: by addressing analytical competency in the hiring process and having an analysis system that is easy to use.The first solution ensures skills are on hand, while the second will simplify the analysis process for everyone. Everyone can utilize this type of system, regardless of skill level.

**8. Scaling data analysis**

While overcoming these challenges may take some time, the benefits of data analysis are well worth the effort. Improve your organization today and consider investing in a data analytics system.

**6. Key Points**

• Healthcare data has proliferated greatly, in large part due to the accelerated adoption of EHRs

• Analytic platforms will examine data from multiple sources, such as clinical records, genomic data, financial systems, and administrative systems

Al-Mustaqbal University College
Intelligent medical systems department
Class: First
Subject: Healthcare Data Analytics
Lecturer: Dr. Ali Kareem Abbas
Lecture: (5)

• Analytics is necessary to transform data to information and knowledge

• Accountable care organizations and other new models of healthcare delivery will rely heavily on analytics to analyze financial and clinical data.