INTRODUCTION TO MEDICAL INFORMATICS

Healthcare Data, Information and Knowledge
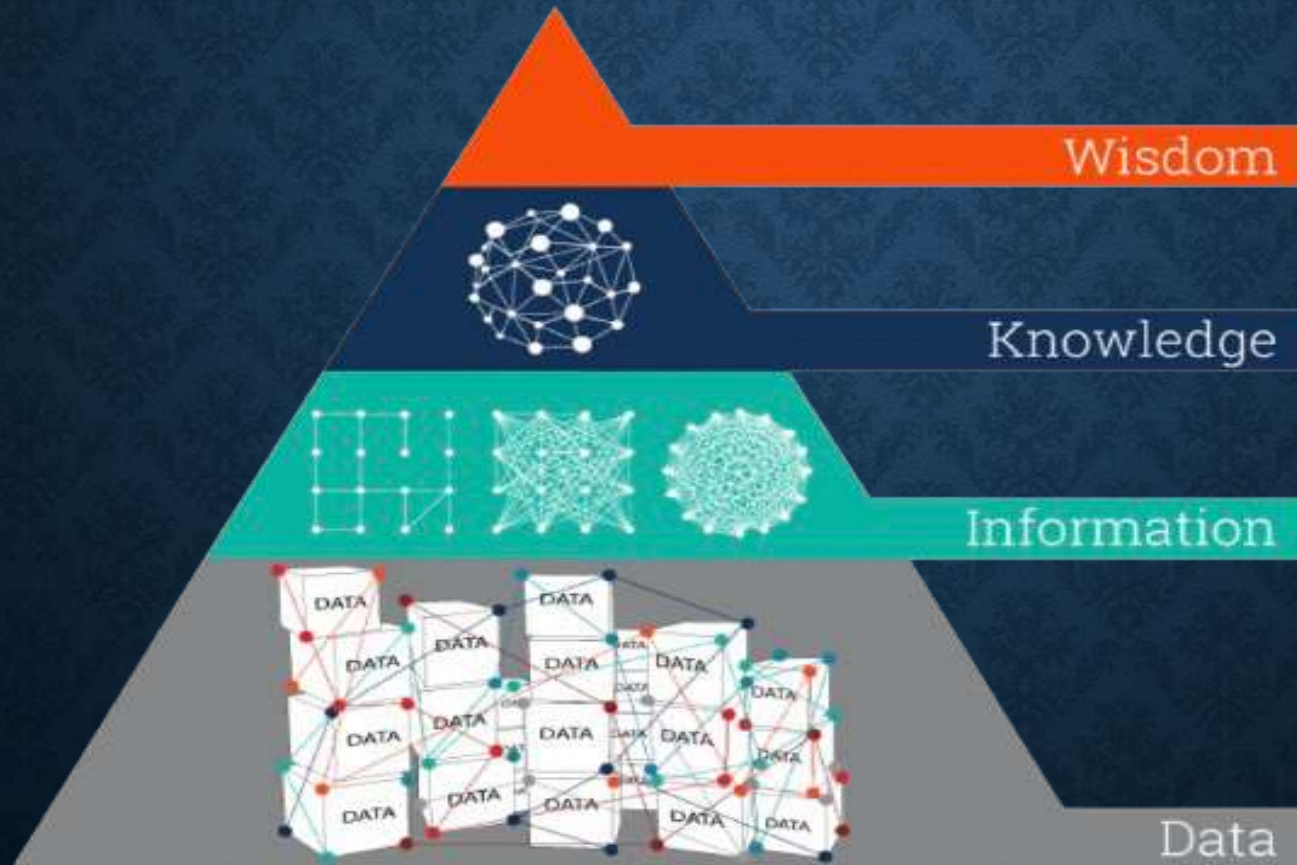
Lecture: 2

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OBJECTIVES

1. what is Data – Information

2. what is Knowledge – Wisdom

3. Data Types

4. what is Clinical Data Warehouse

- There is much more data than information, knowledge or wisdom. As Data are consumed and analyzed the amount of knowledge and wisdom produced much smaller.

- Each step up the pyramid answers questions about the initial data and adds value to it.

1- Data

 Data is a collection of facts in a raw or unorganized form such as numbers or characters.

2- information

  Information is meaningful data or facts from which conclusions can be drawn by humans or computers.

3- Knowledge

   Knowledge is information that is justifiably considered to be true.

4- wisdom

Wisdom is the critical use of knowledge to make intelligent decisions

Data types

* Computers **generate** and **analyze** binary information: zero (off) and one (on). Each zero or one is a bit; a series of 8 bits is a byte. Note that these bits and bytes have no meaning

* Bits can occur as various data types

* Integers such as 345 or 669988

* Floating point numbers such as 14.1 or -1.23

* Characters such as 'a' or 'z'

* Character strings such as "hello" or "goodbye"

Data types

In software programming, data type refers to the type of value a variable has and what type of mathematical, relational or logical operations can be applied

without causing an error. For example, many programming

languages use the data type *string* to classify text,

integer to identify whole numbers and *floating point*

to designate numbers with decimal points.

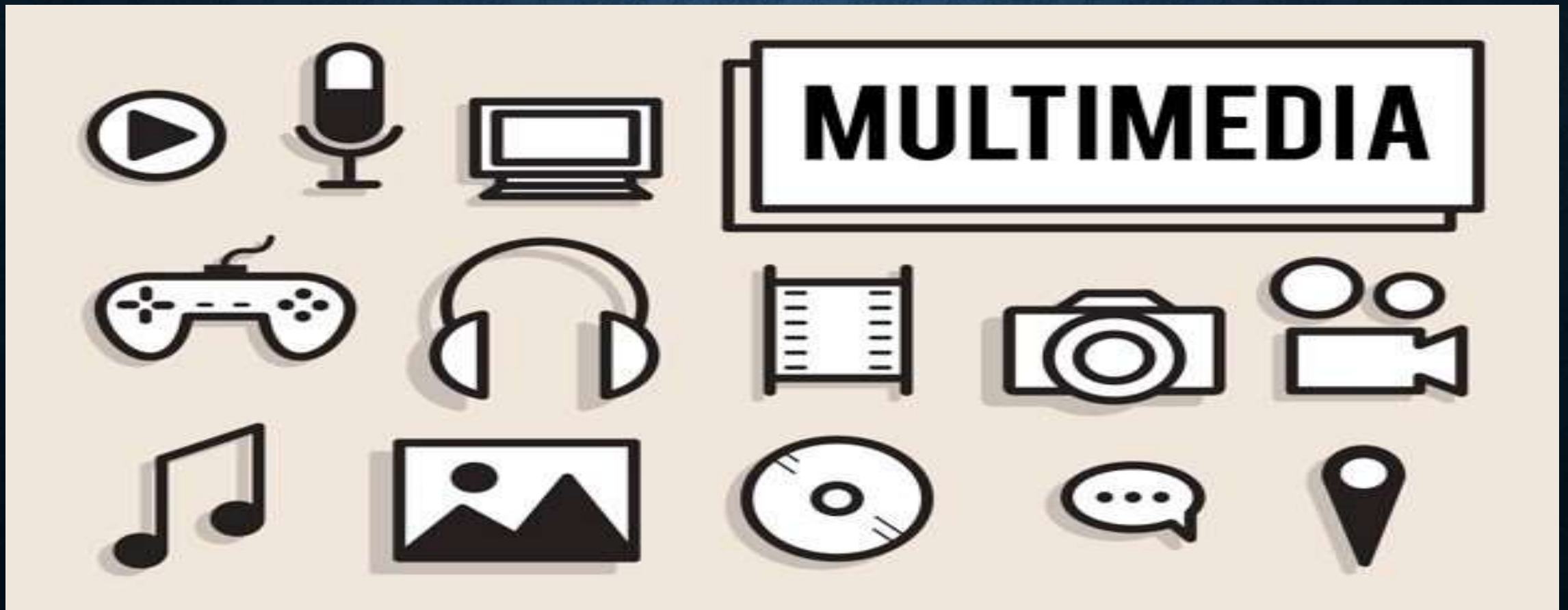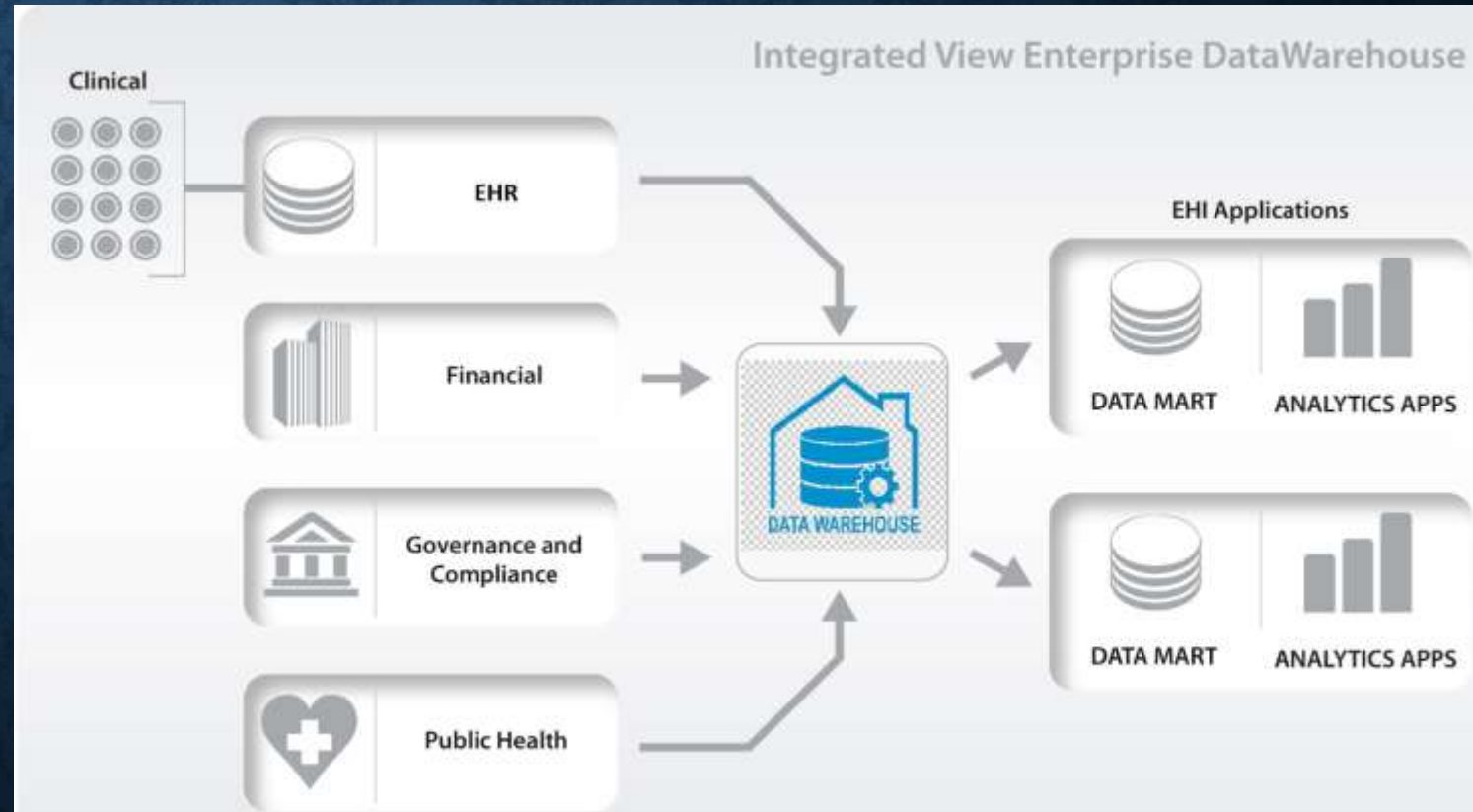|	
1 Petabyte (PB)	= 1024 Terabytes
1 Terabyte (TB)	= 1024 Gigabytes
1 Gigabyte (GB)	= 1024 Megabytes
1 Megabyte (MB)	= 1024 Kilobytes
1 Kilobyte (KB)	= 1024 Bytes
1 Byte (B)	= 8 bits

Data can be aggregated into a variety of formats such as image files (JPG, GIG, PNG), text files, sound files (WAV, MP3) or video files (WMV, MP4)

Recognize that these formats do not define what information is available, just the category format

- A data warehouse is a system that pulls together data from many different sources within an organization for reporting and analysis.

- A modern way to convert medical information to knowledge is to use a **clinical data warehouse (CDW)**

Clinical data is collected via electronic health records (EHRs). Clinical records

within EHRs are composed of both structured data and unstructured or (free text).

Structured data may include billing codes, lab results.

- free text is simply human language such as English, called natural language processing (NLP). Clinical notes are often dictated and are represented in

  records as free text in both computer science and informatics.
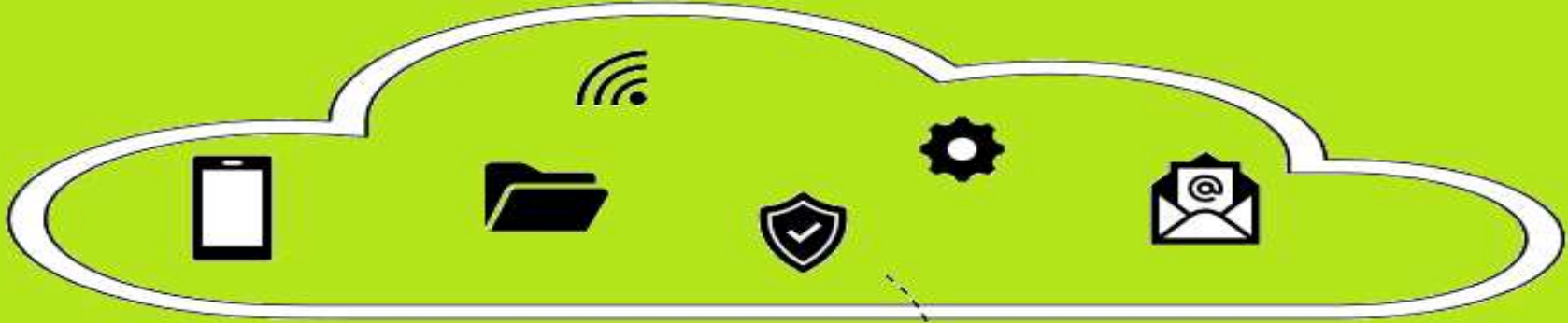
- Tools can be applied to the data in the CDW, such as simple descriptive analytics that reports the number of patients with breast cancer, their age and other disease.

- CDWs do a better job of analyzing and reporting aggregate healthcare data than the average EHR, which tends to focus on the individual

- CDWs can be used to evaluate a critical clinical process, cost estimates and they can analyze potential solutions

- CDWs are highly valuable for informatics and evidence based medical research

- CDWs can help track infections and report trends to public health

- In healthcare, there are subjective factors ("I feel sick") that are difficult to measure and vary from patient to patient and physician to physician. Lab results are more objective and easier to interpret

- Biomedical information is difficult due to incomplete, imprecise, vague, inconsistent and uncertain information.

- Humans can adapt to this dynamic and vague information but computers can not. Clinical decision support in EHRs is precise, when in reality it might need to be flexible over time.

Thank You