

# Health Informatics

CIS 1902103: Computer Skills for Medical Students

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# Informatics: definition!

- Is the science of information.
- **Health Informatics:**

An interdisciplinary field comprising **computer science**, **information science** and **healthcare**. It includes the various resources, data management, storage, and related processing on health information.

# Hierarchy of Data



# Data

**A set of symbols/numbers/words without any meaningful associations.**

**Example :**

**5, 10, 7**

# Information

Meaningful data or facts from which conclusions can be drawn by humans or computers .

## **Example :**

Five Fingers is the number of fingers in the normal human hand.

# Knowledge

Information that is **justified** to be considered true .

## **Example**

a rising specific antigen level suggests an increased likelihood of prostate cancer.

# Wisdom

The critical use of knowledge to produce **intelligence.**

## **Example**

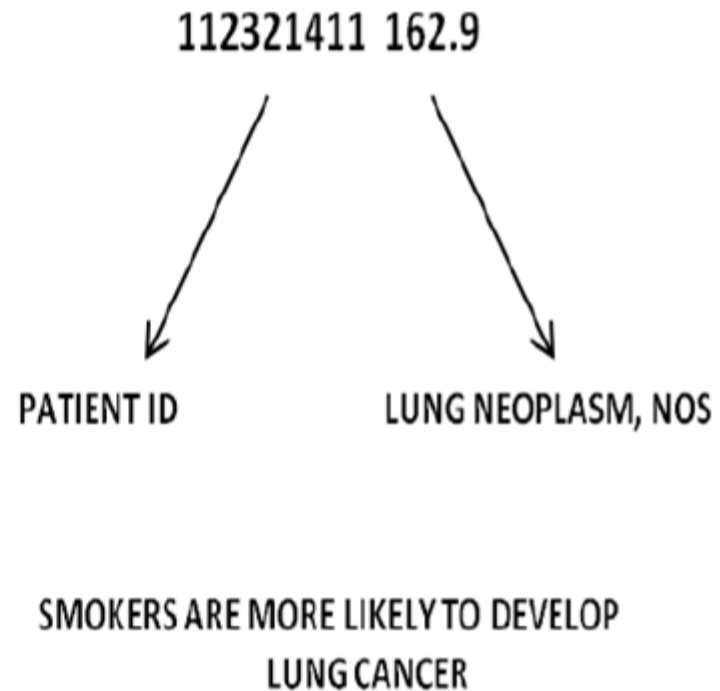
a rising prostate cancer antigen could mean prostate infection and not cancer.

# Example

**Data:** Differences (or observations) that may or may not be meaningful

**Information:** Data that has meaning

**Knowledge:** General information believed to be justifiably true.

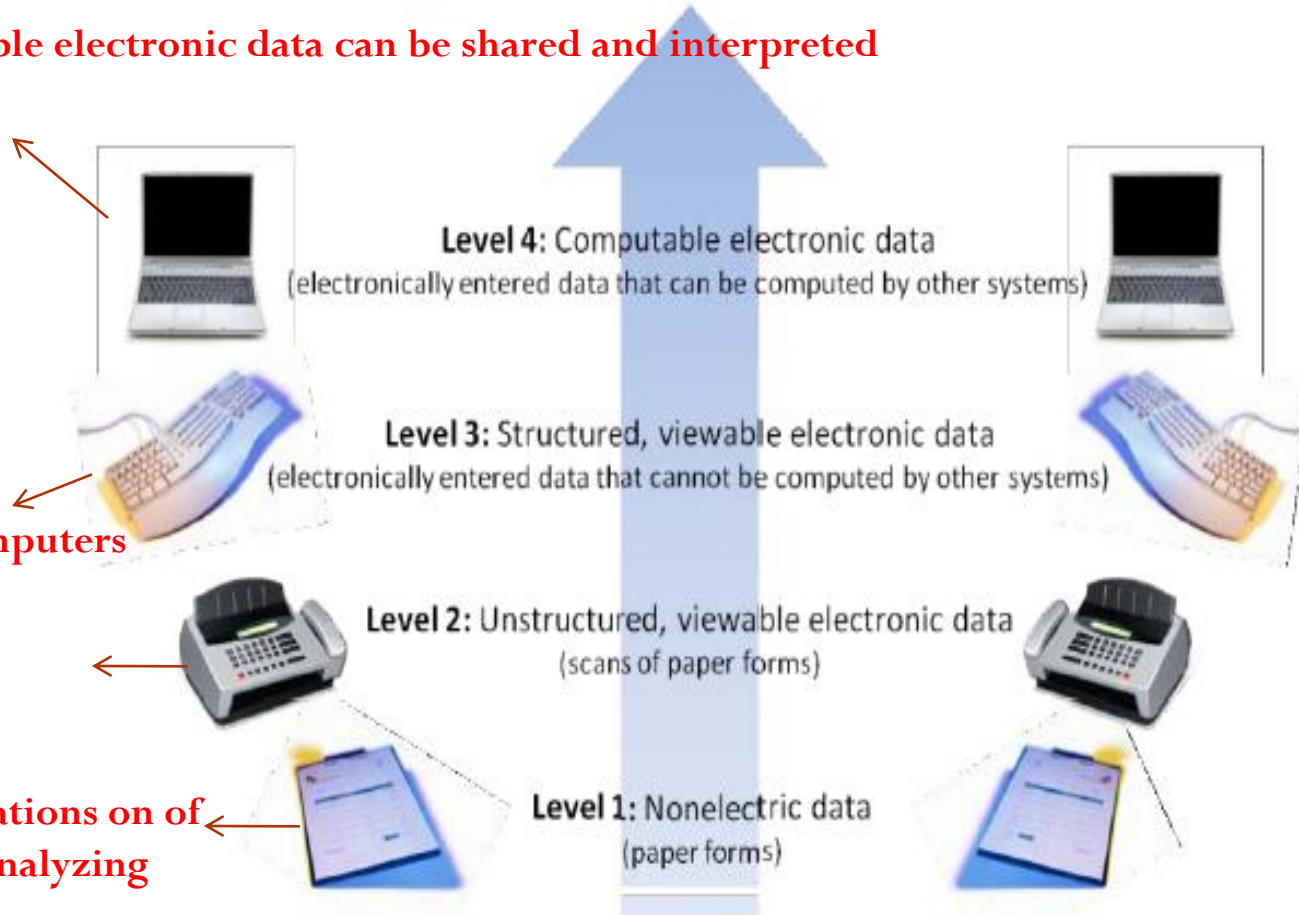




# Levels of Data

Increasingly Sophisticated and Standardized Data

Computable electronic data can be shared and interpreted



# Health Information Technology(HIT)

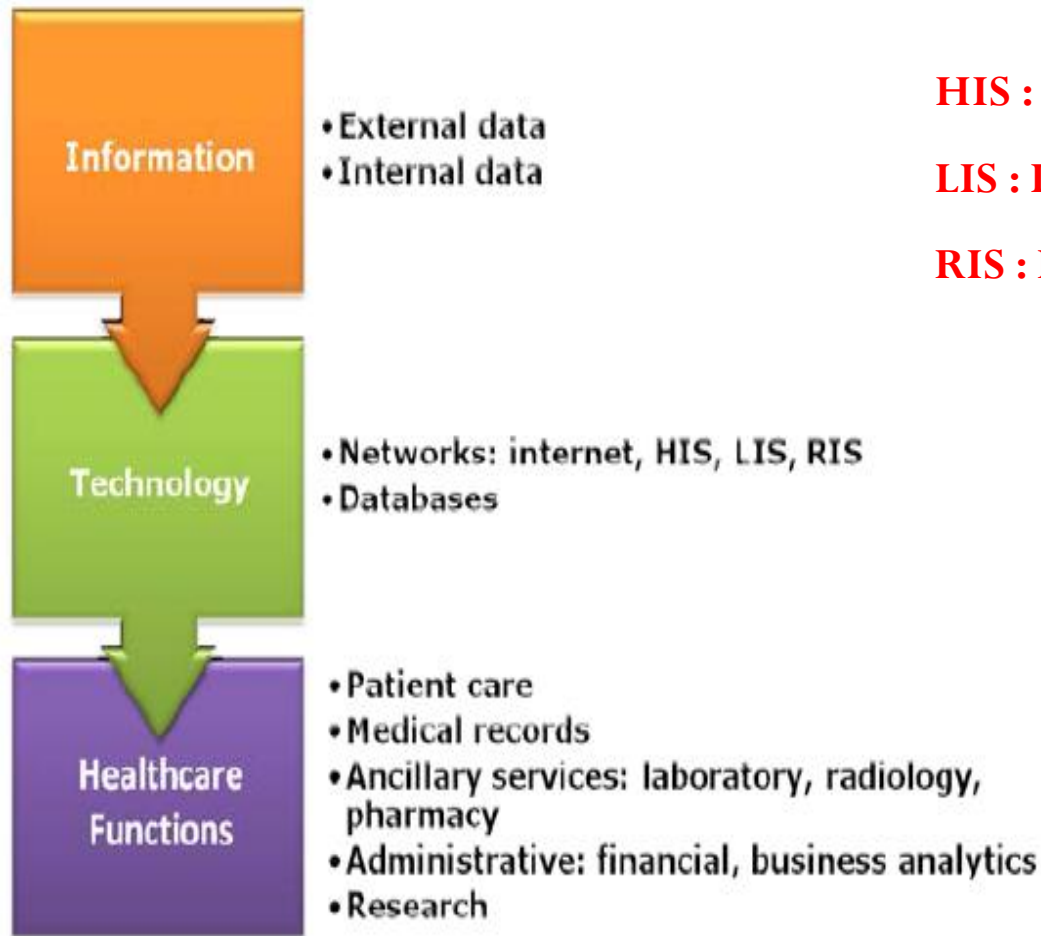
Health Information Technology (HIT or healthIT) is defined as the application of computers and technology in healthcare settings.

# Health Information Management

Health Information Management (HIM) traditionally focused on the paper medical record and coding.

HIM is mostly electronic now and requires IT support.

# Information, Information Technology and Healthcare Functions



**HIS : Hospital Information System**

**LIS : Laboratory Information System**

**RIS : Radiology Information System**

# Why Adoption of HIT ?

- Increase the efficiency of healthcare .

[decrease medical cost, improve physician productivity].

- Improve the quality (patient outcomes) of healthcare ,  
resulting in improved patients safety.

## Example on HIT:

a healthcare organization is concerned that too many of its **diabetics** are not well controlled and believes it would benefit by offering a **diabetic web portal**. With a portal, diabetics can upload blood sugars and blood pressures to a **central** web site so that diabetic educators and/or clinicians can **analyze** the results and make recommendations.

# HIT Goals

Health information technology (HIT) is important to multiple players in the field of medicine. The common goals of these different groups are outlined in the following table :

Goal	Process
<b>Improve</b>	Communication and continuity of care Quality of care Patient outcomes Clinician productivity Return on investment
<b>Reduce</b>	Medical errors and resultant litigation Duplication of tests
<b>Standardize</b>	Medical care by individuals and organizations
<b>Accelerate</b>	Access to care and administrative transactions
<b>Protect</b>	Privacy and ensure security

# KEY Players on HIT

- 1 • Patients
- 2 • Clinicians and Nurses
- 3 • Support Staff
- 4 • Public Health
- 5 • Hospitals
- 6 • Insurance company
- 7 • Medical educators



# Examples

<p><b>Patients</b></p> <ol style="list-style-type: none"><li>1. Online patients survey.</li><li>2. Personal health records</li><li>3. Telemedicine and Home Telemonitoring.</li></ol>	<p><b>Nurses</b></p> <ol style="list-style-type: none"><li>1. Online searches with Pub med , Google.</li><li>2. Online resources and digital libraries.</li><li>3. Electronic billing and coding .</li></ol>	<p><b>Public Health</b></p> <ol style="list-style-type: none"><li>1. Remote reporting using mobile technology .</li></ol>
<p><b>Support Staff</b></p> <ol style="list-style-type: none"><li>1. Patients enrollment</li><li>2. Electronic appointments</li></ol>	<p><b>Hospitals</b></p> <ol style="list-style-type: none"><li>1. Electronic Health records .</li><li>2. Wireless technology Telemedicine</li></ol>	<p><b>Insurance Company</b></p> <ol style="list-style-type: none"><li>1. Electronic Claims transmission.</li></ol>

# Barriers to Health Information Technology Adoption .

- Financial Barriers
- Physician Resistance and Work Flow Changes
- Integration with current protocols/systems
- Lack of Standards
- Privacy Concerns

# Clinician Resistance and Work Flow Changes

Clinicians resist **change** in clinical routine!

To adopt a new technology, it has to prove its **effectiveness**, utilization of clinician's **time**, **money** savings, improvement of **patient** care, **standardization** of care .... And many other factors.

Transition has to be **seamless**!

# Integration with current Systems

New technology needs to integrate with older system in place.

Usually older programming languages, older database management systems, older operating systems, ... may prevent the usage of newer technology.

# Lack of Standards

Clinicians variability is significant including: terminology, clinical exams, diagnosis, and even recommended treatment.

Healthcare IT faces significant challenges when designing newer databases and management systems due to lack of standards.

Efforts are underway for a longtime to standardize medical examinations, patient intake, exam findings, treatment dissemination.... etc

# Privacy Concerns

Clinicians and patients express privacy concerns when adopting any new technology.

In 1996, The Health Insurance Portability and Accountability Act (**HIPAA**) was created initially for the portability, privacy and security of Personal Health Information (**PHI**) that was largely paper-based.

Newer healthcare technology must take HIPAA into consideration.

# Health Records

## Electronic Medical Record (EMR)

Electronic record of health-related information for an individual that can be created, gathered, managed and consulted by authorized clinicians and staff **within one** healthcare organization.

## Electronic Health Record (EHR)

An electronic record of health-related information for an individual that conforms to nationally recognized interoperability **standards** and that can be created, managed and consulted by authorized clinicians and staff **across more than one** healthcare organization.

**Personal Health Record (PHR)** An electronic record of health-related information on an individual that conforms to nationally recognized interoperability **standards** and that can be drawn **from multiple sources** while being managed, shared and **controlled by the individual**.

# Examples of PHR

- Australian Governmental portal:



Australian Government  
Department of Health



The Personally  
Controlled eHealth  
Record System



FAQs

Learn about eHealth records

Resources

Privacy and security

Helpline: 1800 723 471

## Welcome to eHealth.gov.au

A personally controlled eHealth record is a secure online summary of your health information. You control what goes into it, and who is allowed to access it.

Your eHealth record allows you and your doctors, hospitals and other healthcare providers to view and share your health information to provide you with the best possible care.

An eHealth record gives you more control over your health information than ever before, placing you at the centre of Australia's health system. Want to know more? Visit the [eHealth record Learning Centre](#), look at our [frequently asked questions](#), or find out about [privacy and security](#).

Mobile App


### Get your personal eHealth record now

 Register

Register yourself or register your children for an eHealth record.

 Setup online access

If you have an [iVC](#) or if this is the first time you have accessed your eHealth record.

 Login

Or login if you have previously accessed your eHealth record.



#### For consumers

- [Register my child](#)
- [Take control of my existing eHealth Record](#)
- [Add me to a child's eHealth Record](#)

#### For professionals

- [Register my health organisation](#)
- [Register as a contracted service provider](#)
- [Assisting consumers to register](#)



# Examples of PHR

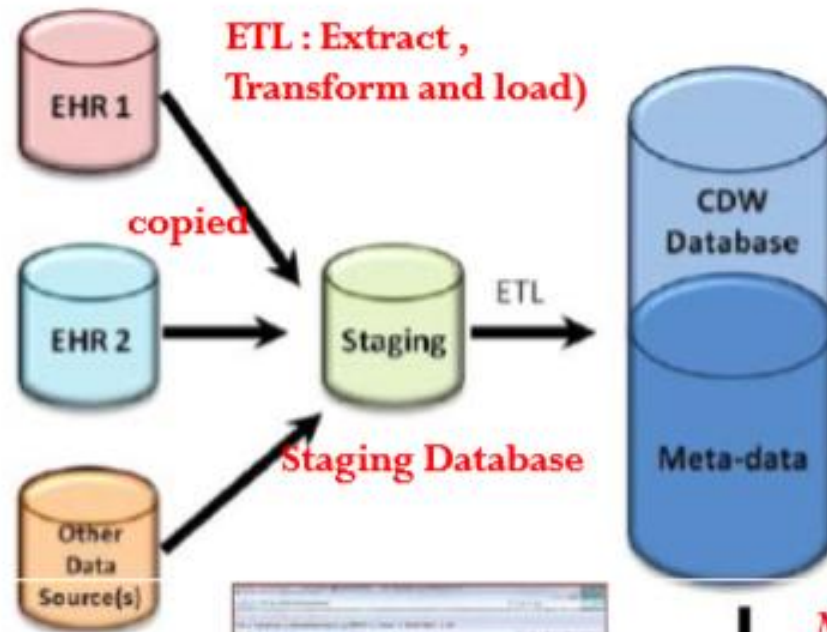
- In the United States: for Medicare (Seniors). [myphr.com]

The image shows a screenshot of the myPHR website. At the top left is the myPHR logo, followed by the text "BROUGHT TO YOU BY AHIMA AHIMA FOUNDATION". On the top right, there are links for "twitter", "FAQs", "ABOUT US", and "CONTACT US". Below these is a search bar and a link to "INCREASE TEXT SIZE" with "T+" and "T-" icons. The main content area features a large background image of three smiling elderly women. Overlaid on this image are several navigation and content elements: a horizontal menu with "START A PHR", "HEALTH LITERACY", "TOOLS + RESOURCES", "BLOG", and "FAQ"; a vertical sidebar on the left with orange buttons for "RESOURCES FOR SENIORS", "PARENTS", "CHRONICALLY ILL", "CAREGIVERS", and "PHYSICIANS"; and a yellow callout box at the bottom right titled "featured story" with the text "Just Think App! Mobile Health Apps 101: A Primer for Consumers" and a "Read More" link.

# Clinical Data Warehouse

A clinical data warehouse is a shared database that collects, integrates and stores clinical data from a variety of sources including electronic health records, radiology and other information systems .

# Clinical Data Warehouse(CDW)



The clinical records in the EHR are composed of both structured and unstructured data (free text).



Meta Data : it is the data (description) about data.  
Analytics  
Such as : counts ,means ,median...etc

# Clinical Data Warehouse (CDW)

Data from multiple sources including one or more EHRs are copied into a staging database, cleaned and loaded into a common database where they are associated with meta-data.

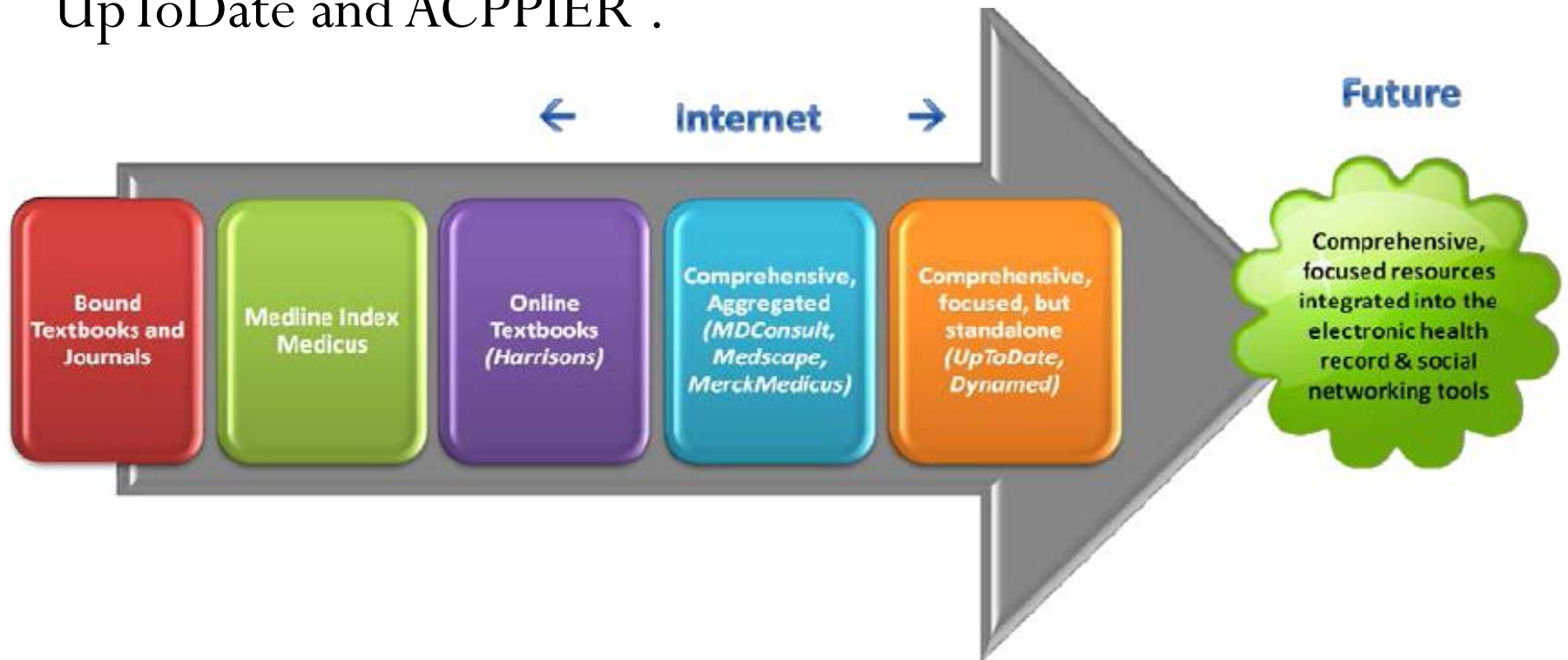
# Clinical Data Warehouses

Clinical records within EHRs are composed of both :

- **structured data:** such as billing codes , lab results .
  - +ve: much easier to organize, store and retrieve in databases .
- **unstructured data:** written in Natural Languages, clinical notes are often dedicated and are represented in records as free text.
  - +ve : Easy for clinicians.
  - ve : Difficult to implement .

# Online Medical Resources

Several medical resource vendors are in the process of making the leap towards having the resource embedded into electronic health records. Examples would include iConsult, Dynamed, UpToDate and ACPPIER .



# Search Engines

- Google : Google is by far the most widely used search engine in the world .



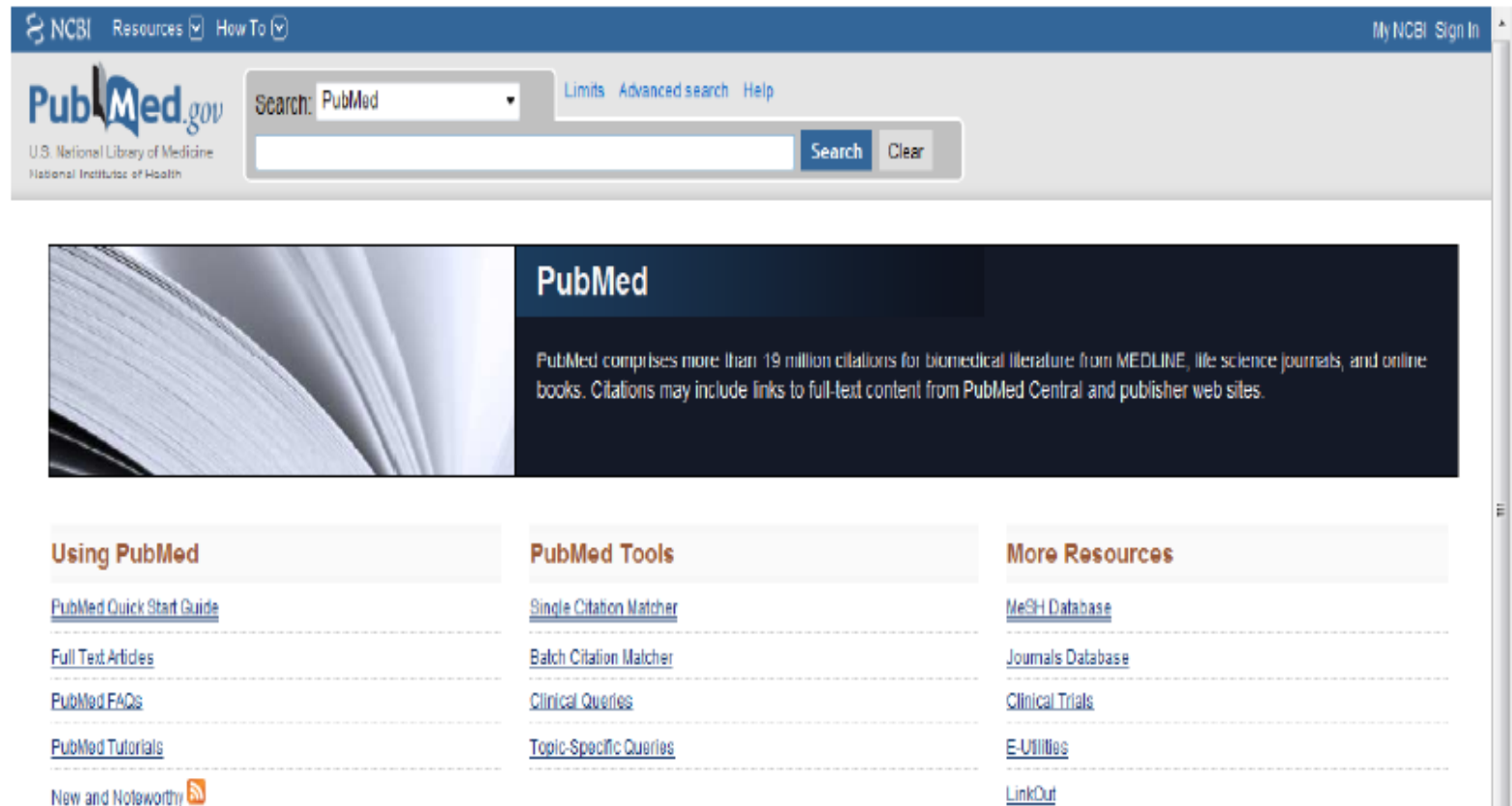
**We Can here demonstrate how to use Google for Advanced Search**

# PubMed Search Engine

is a web-based retrieval system developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM) .



# PubMed Home Page



The screenshot shows the PubMed Home Page. At the top, there is a blue navigation bar with the NCBI logo, "Resources" and "How To" dropdown menus, and "My NCBI Sign In" links. Below this is a search bar with the text "PubMed" entered, and buttons for "Search" and "Clear". To the left of the search bar is the PubMed logo and the text "U.S. National Library of Medicine National Institutes of Health".

Below the search bar is a large banner with a background image of a stack of books. The banner contains the text "PubMed" and "PubMed comprises more than 19 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites."

Below the banner are three columns of links:

- Using PubMed**
  - [PubMed Quick Start Guide](#)
  - [Full Text Articles](#)
  - [PubMed FAQs](#)
  - [PubMed Tutorials](#)
  - [New and Noteworthy](#)
- PubMed Tools**
  - [Single Citation Matcher](#)
  - [Batch Citation Matcher](#)
  - [Clinical Queries](#)
  - [Topic-Specific Queries](#)
- More Resources**
  - [MeSH Database](#)
  - [Journals Database](#)
  - [Clinical Trials](#)
  - [E-Utilities](#)
  - [LinkOut](#)

**We Can here demonstrate how to use PubMed**

# Examples

- Liver Tumor
- Brain Tumor
- Case study in cardio