Wollo University

College of Medicine and Health Sciences

Health Informatics

For 2nd Year Public Health Students

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Course Description

- **Course Title: Health Informatics**
- **Course Code: PubH2092**
- **Course Credit: 3 ECTS**

Course Objectives

- Develop basic computer skills to enhance access to timely information
- Use of basic business and communication software
- Describe computer networking and internet world
- Explain health informatics related terms
- Describe the information hierarchy
- Understand about HIS/RHIS/DHIS
- State components of clinical information systems
- Understand and practice the concept of information retrieval techniques and EBM
- Understand the concept of Info and computer ethics

Course Contents

- Chapter 1. Introduction to computers
- Chapter 2. Computer system (Hardware and Software)
- Chapter 3. Computer Networks/The Internet and web searching
- Chapter 4. Terminologies in Health Informatics
- Chapter 5. Information hierarchy
- Chapter 6. Health Information System
- Chapter 7. Routine Health Information System and DHIS
- Chapter 8. Clinical Information System
- Chapter 9. Information retrieval and evidence-based medicine
- Chapter 10. Information and Computer Ethics

Chapter 1. Introduction to computers

Lesson objectives:-

At the end of this lesson students should:

- Define computer
- Know the history of computer
- Identify and understand important characteristics of computer
- Identify different types of computer
- Know components of computer

Chapter 1. Introduction to computers

A World of Computers

- What is computer literacy?
  - It is the knowledge and ability to use computers and related technology efficiently,
  - with a range of skills covering levels from **elementary use** to **programming** and advanced problem solving.
- Definition:
  - It is electronic device that can store, retrieve, and process data

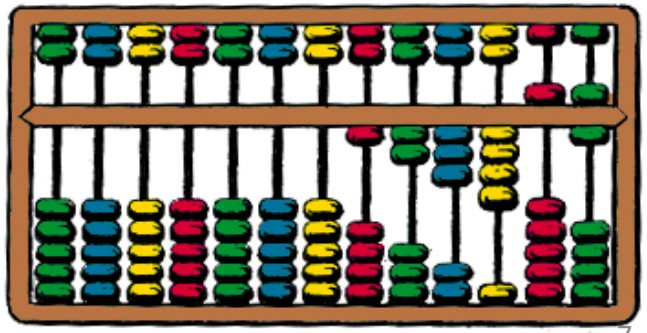
Chapter 1. Introduction to computers

Computer History

- **A Computer history timeline**
  - Counting aids → Manual calculators → Mechanical calculators → Programmable calculators → Programmable computers

1. Counting aids

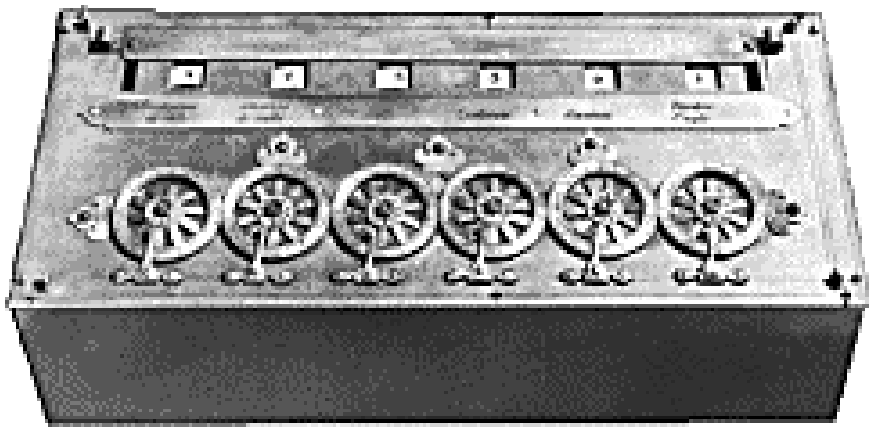
- The history of computers starts out about 2000 years ago in Babylonia (Mesopotamia), at the birth of the abacus, a wooden rack holding two horizontal wires with beads strung on them.



Chapter 1. Introduction to computers

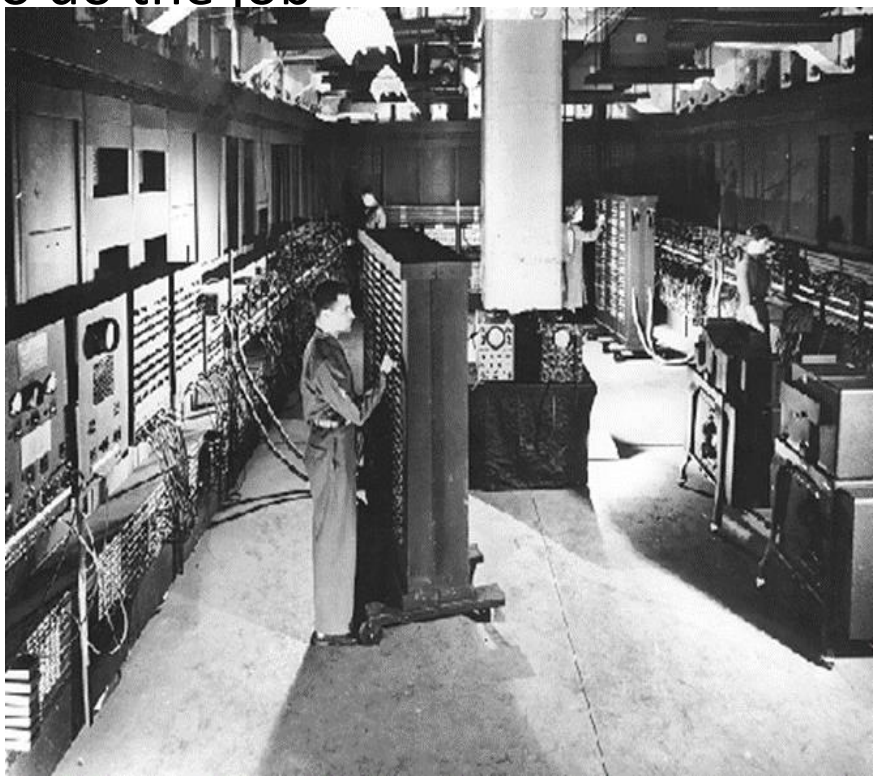
2. Manual Calculators

- Blaise Pascal is usually credited for building the first digital computer in 1642
- This first mechanical calculator, called the Pascaline



Chapter 1. Introduction to computers

3. Programmable calculators
   - Computers for World War II for the military aircraft design and fire control.
   - In 1942, John P. Eckert, John W. Mauchly, and their associates at the Moore school of Electrical Engineering of University of Pennsylvania decided to build a high-speed electronic computer to do the job



4. **Programmable computers**

Chapter 1. Introduction to computers

Characteristics of Computer

1. **Speed:** The speed o f a computer in processing information is increasing from time to time and computers can calculate at very high speed.
2. **Accuracy:** The accuracy of a computer system is very high provided that the data and the program given to it are accurate.
   - Error in computer data processing is mostly human factor. The program may be wrongly coded or the data may be wrongly entered

Chapter 1. Introduction to computers

3. **Storage:** Computers can store large amount of data using their memory unit
4. **Versatility(flexibility)**:Computers can be programmed and applied for different purposes. People can use computers for different applications.
5. **Diligence(persistence):** The computer does the same thing repeatedly without saying “I am tired or I am bored”.

Chapter 1. Introduction to computers

What can't computers do?

- Lack of intelligent thinking
- Lack of independent thought

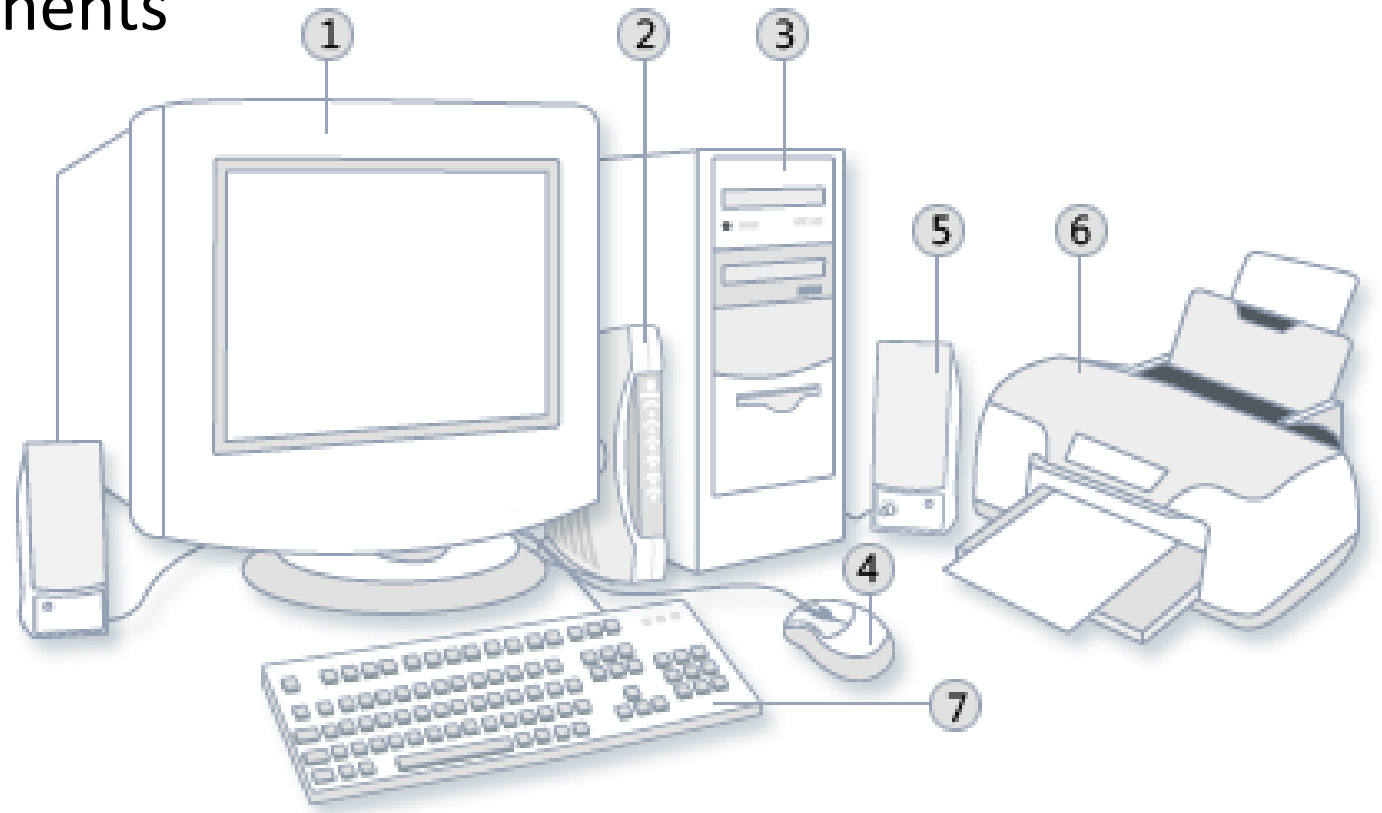
Types of Computers

1. Micro/Personal computers: Desktop, Laptop, Palmtop, PDA
2. Workstation/Server Computer(mini computers)
3. Mainframe computers
4. Super computers

Increase power, cost

Chapter 1. Introduction to computers

- Computer Components



1 Monitor
2 Modem
3 System unit
4 Mouse
5 Speaker
6 Printer
7 Keyboard

Chapter 2. Computer System (HW+SW)

Lesson objectives:-

At the end of this lesson students should:

- Identify parts of computer system
  - Computer Hardware
  - Computer software
- Describe different types of software systems

Chapter 2. Computer System (HW+SW)

- Consists of two parts
  1. Computer Hardware: A generic name for the various devices that make up a computer system
  2. Computer software: Set of instructions that direct the computer hardware to perform a particular task

Chapter 2. Computer System (Hardware)

1. COMPUTER HARDWARE

- Any visible part of a computer which can be seen and touch is known as hardware.
- Hardware are involved in the data processing cycle as an input, output or as both.
- On data processing cycle, there are hardware used to enter data which are known as input devices and other hardware used to display the information are known as output device but there are also devices used as both input and output device.
- Moreover others are involved in the processing cycle such as CPU, RAM, ROM

Chapter 2. Computer System (Hardware)

Hardware components

1. **Input Unit** – feeds data & instruction to the computer system

2. **Output Unit** – displays / prints the results of the processing

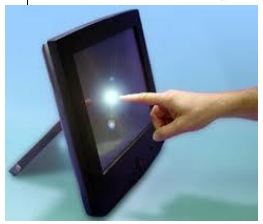
3. **CPU** – is the brain of the computer that caries out the processing of the data as per the instructions

4. **Memory** – stores data and programs within and/or outside the computer system

Chapter 2. Computer System (Hardware)

Some Input devices

- Mouse
- Keyboard
- Scanner
- Touch pad
- Microphones
- Digital Cameras
- Touch Screen
- CD-ROM



Chapter 2. Computer System (Hardware)

Some Output devices

- VDU (video display unit)
- Flat screen monitors
- Printer
- Plotters
- Speakers
- Projectors

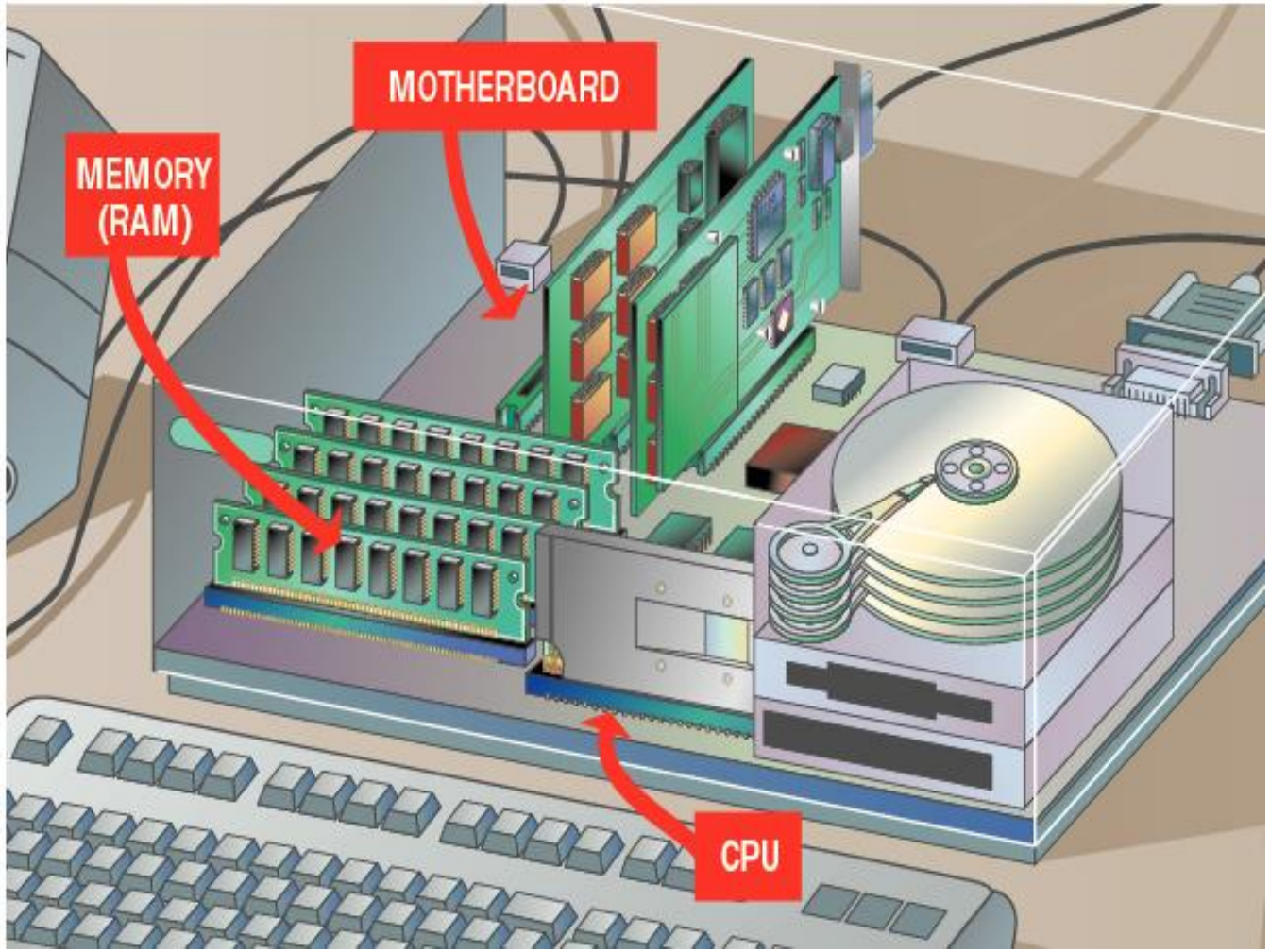
Chapter 2. Computer System (Hardware)

Central Processing Unit(CPU) – microprocessor

- It is the place where data processing takes place
- The system's memory also plays a crucial role in processing data.
- Both the CPU and memory are attached to the system's motherboard, which connects all the computer's devices together, enabling them to communicate

Chapter 2. Computer System (Hardware)

Central Processing Unit(CPU)



Chapter 2. Computer System (Hardware)

Main parts of CPU

- Arithmetic logic unit - Performs the arithmetic operations and the logical comparisons
- Control unit - Controls the entire operation of the computer

Chapter 2. Computer System (Hardware)

Computer Memory

- Computer memory refers to devices that are used to store data or programs (sequence of instructions) on temporary or permanent basis
- Types of computer memories applicable are RAM, ROM and/or ROM-BIOS

- It can be measured
  - Bit:1 or 0 level of storage
  - Byte: A byte consists of eight bits.
  - Kilobyte: A kilobyte (KB) consists of 1024 bytes.
  - Megabyte: A megabyte (MB) consists of 1024 kilobytes
  - Gigabyte: A gigabyte (GB) consists of 1024 megabytes
  - Terabyte: A terabyte (TB) consists of approximately 1,000,000,000,000 bytes.

Chapter 2. Computer System (Hardware)

- Two types of memory: Main memory and Secondary storage devices

1. Main memory: The main working area of the computer

RAM

- Volatile
- Working area of computer
- Allows both read and write

ROM

- Non-volatile
- Permanently stored programs
- Allows read only

2. Secondary storage devices: Store data and programs for later use

Chapter 2. Computer System (Hardware)

ROM

- Read Only Memory (ROM) as the name suggests is a special type of memory chip which holds software which can be read but not written to.

- A good example is the ROM-BIOS chip, which contains read-only software.

- Often network cards and video cards also contain ROM chips

Chapter 2. Computer System (Hardware)

RAM

- The amount of RAM in a PC has a direct impact on the system's speed.

- The more RAM a PC has, the more program instructions and data can be held in memory, which is faster than storage on disk.

- If a PC does not have enough memory to run a program, it must move data between RAM and the hard disk frequently. This process, called **swapping**, can greatly slow a PC's performance.

Chapter 2. Computer System (Hardware)

RAM or **R**andom **A**ccess **M**emory

- "Waiting room" for computer's CPU.
- Holds instructions for processing data, processed data, and raw data.
- Ram is measured by:
  - Capacity (in Megabytes or Gigabytes)
  - Speed (in Nanoseconds)
- Amount of RAM installed will determine.
  - Which software applications will run (efficiently)?
  - How many software applications can be open simultaneously (multitasking ability)?

Chapter 2. Computer System (Hardware)

Secondary Storage Devices

- Storage devices are both input and output devices in one. A storage device is a place to keep data that has been processed so that it can be retrieved at a later time to be used again.
- Any storage device designed to retain data and instruction in a more permanent form
- Non-volatile storage media
- Currently used ones
  - hard disks,
  - floppy disk,
  - optical disk (CD-ROM)
  - Flash disk

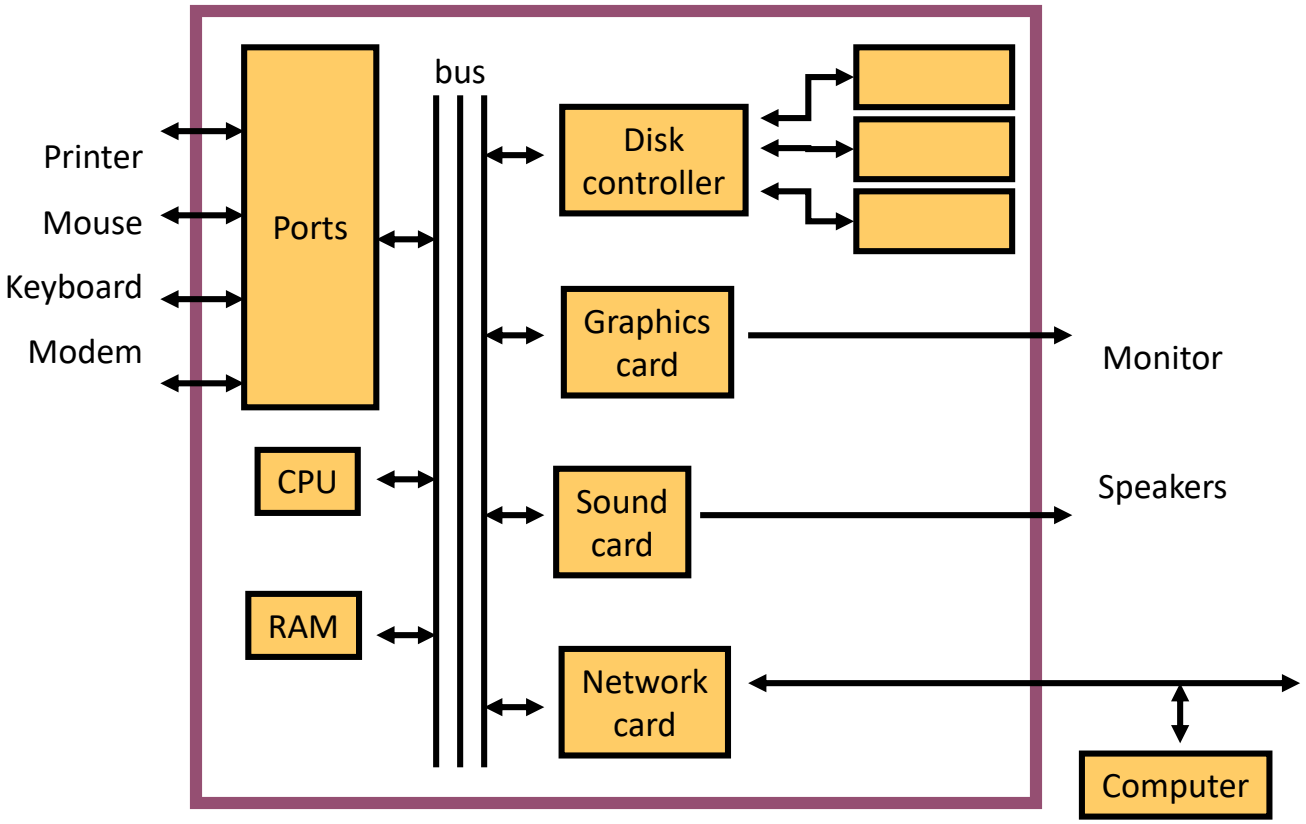
Chapter 2. Computer System (Hardware)

Storage Technology

- **Magnetic storage devices** store data by magnetizing particles on a disk or tape. They have a limited life-span of 1 to 5 years, depending on the device.

- **Optical storage devices** store data as light and dark spots on the disk surface. They have an unlimited life-span.

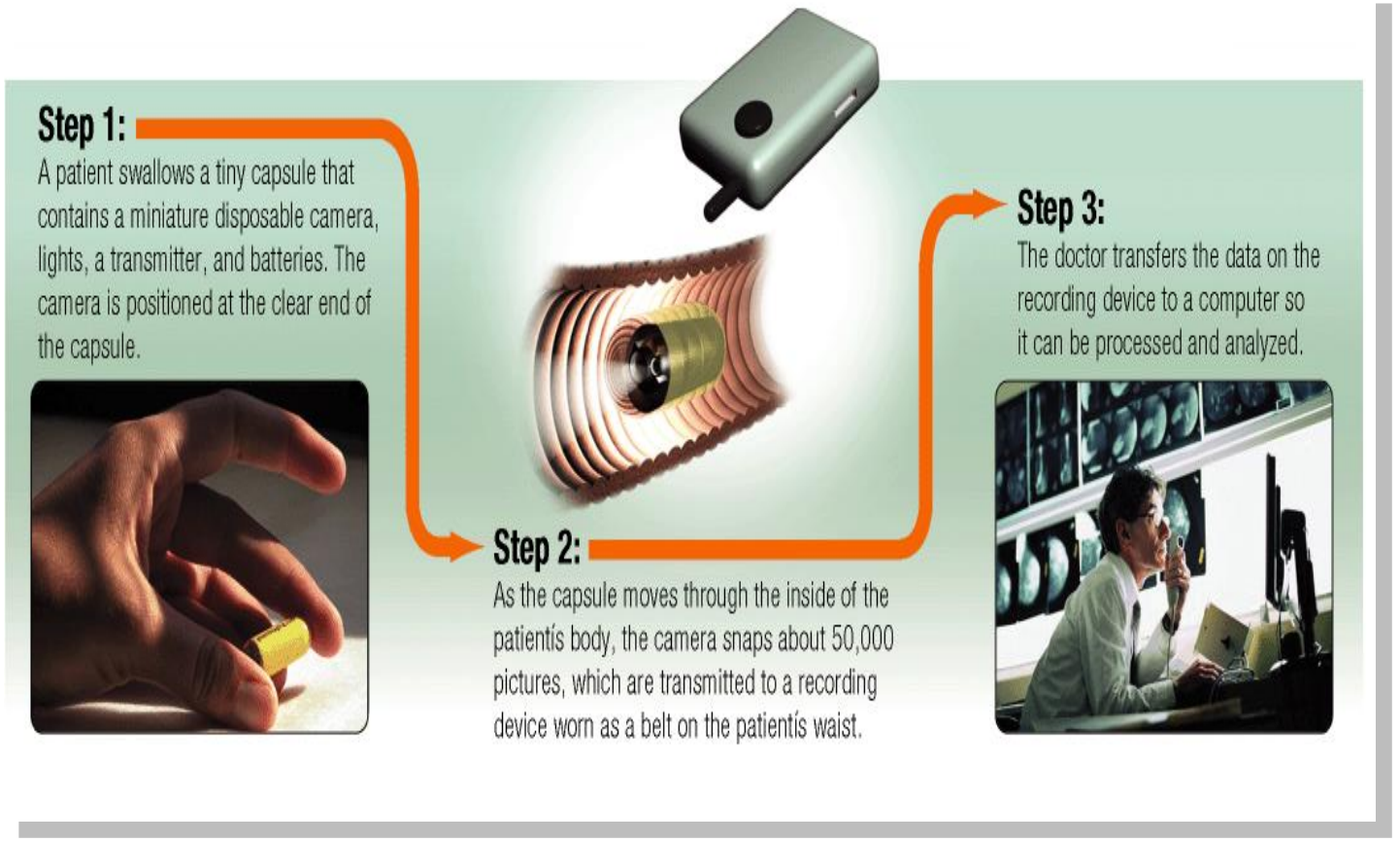
Chapter 2. Computer System (Hardware)



Chapter 2. Computer System (Hardware)

What are some examples of computer applications in society?

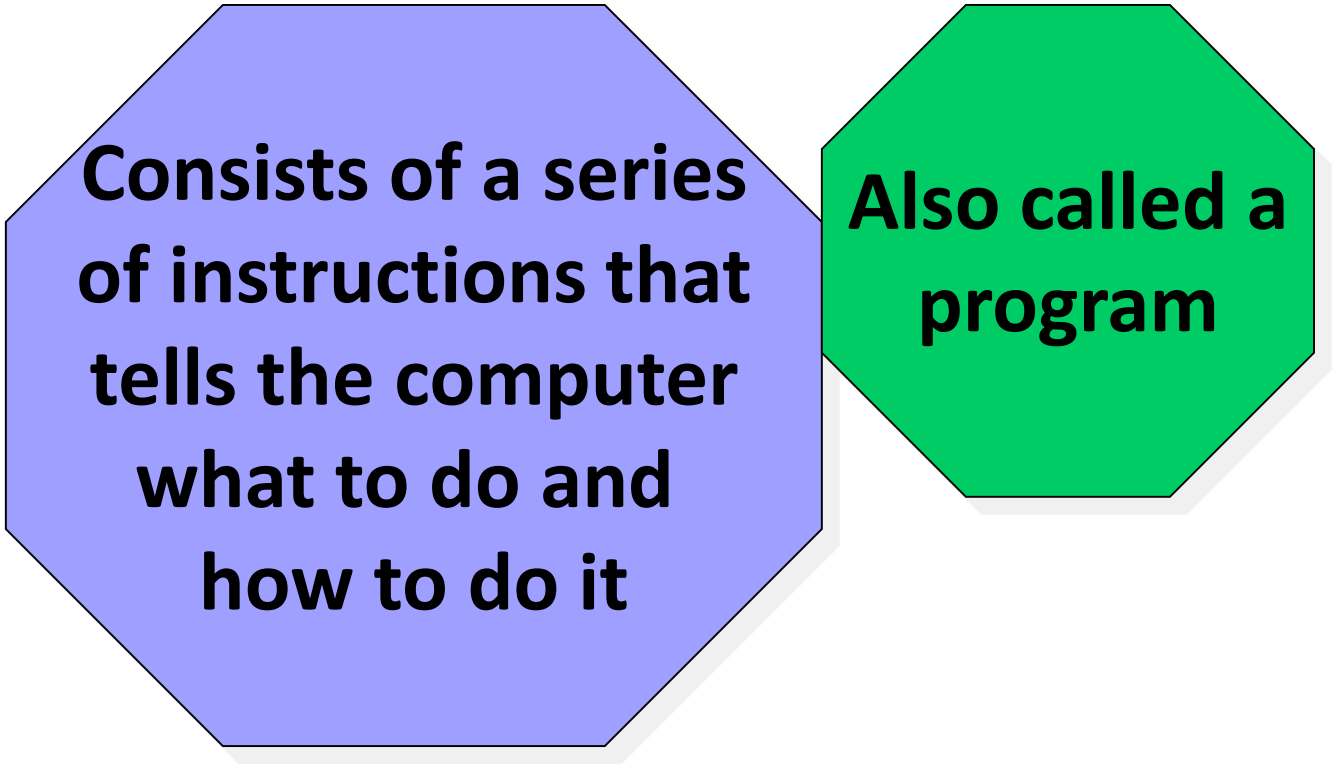
- Education
- Finance
- Government
- Healthcare
- Science
- Publishing
- Travel
- Manufacturing



Chapter 2. Computer System (Software)

2. COMPUTER SOFTWARE

- What is software?



Chapter 2. Computer System (Software)

Software?

- Instructions and associated data, stored in electronic format, that direct the computer to accomplish a task.

Types of software

A. System software

B. Application software

Chapter 2. Computer System (Software)

A. **System software**: Programs that control or maintain the operations of the computer and its devices

i. **Operating software (OS)**: is a set of programs that coordinates all activities among computer hardware devices

- GUI based OS: GUI-made up of 4 main parts:- Windows, Icons, Menus and Pointer. This is sometimes referred to as WIMP system. Windows – A productivity program will be displayed in its own window along with common window **controls** such as minimize, maximize and exit.
- CMD (CLI) based: cmd- text based representation in which the user types the commands to operate the software or devices

ii. **Utility software**: allow the user to perform maintenance-type tasks usually related to managing a computer, its devices or its programs. E.g. **antivirus** software, backup software and **disk tools**

Chapter 2. Computer System (Software)

Operating software (OS)

- It is the master controller within a computer
- It interacts with
  - All hardware installed in or connected to a computer system.
  - All software installed or running from a storage device on a computer system
- It directs all the activities and sets all the rules for how the hardware and software will work together
- Examples would be:
  - DOS, Windows 95, 98, ME, NT, XP, 7, 8, 10
  - Unix, Linux,
  - MAC system OS 6,7,8,9,10

Chapter 2. Computer System (Software)

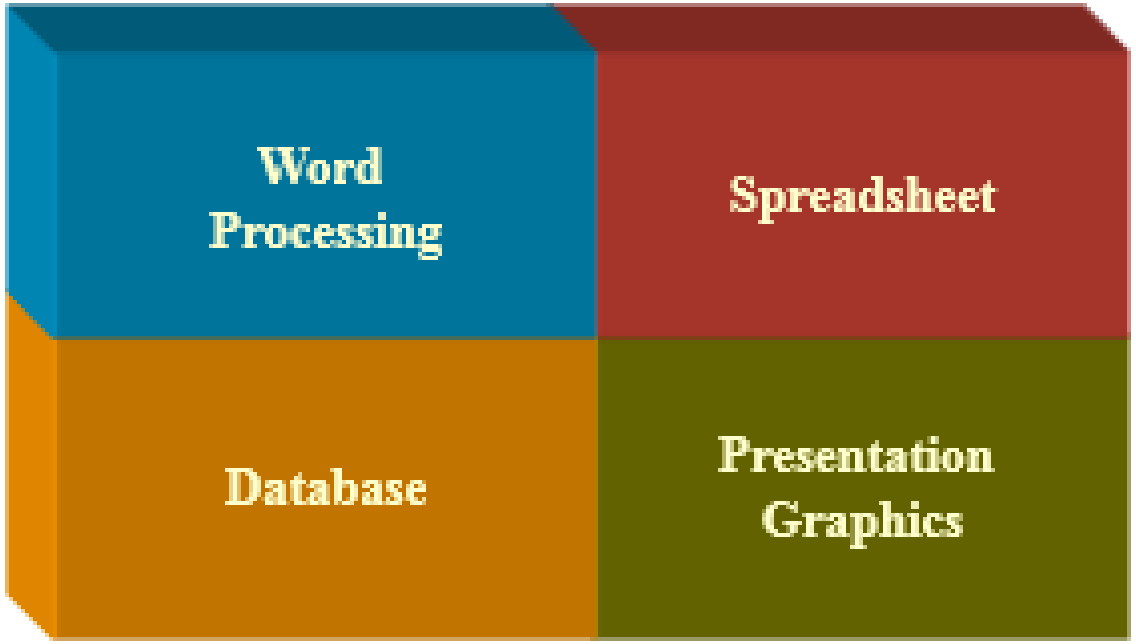
Operating software (OS)….(cont'd)

- **Microsoft Windows**
  - Most popular operating system.
  - Supports a vast array of application software and peripheral devices.
- **MacOS**
  - For Macintosh computers
  - Proprietary system
  - Does not have same functionality and support for software and peripheral devices
- **Network operating system** (NOS)
  - Manages network resources.
  - Maintains security.
  - Tracks user accounts.
  - Handles communication between workstations and servers.
- **Popular network operating systems**
  - Windows NT, Novell Netware, UNIX

Chapter 2. Computer System (Software)

B. Application software

- Programs that work with operating system software to help the computer to do specific types of work
- Enables a computer to become a multi-purpose machine



Chapter 2. Computer System (Software)

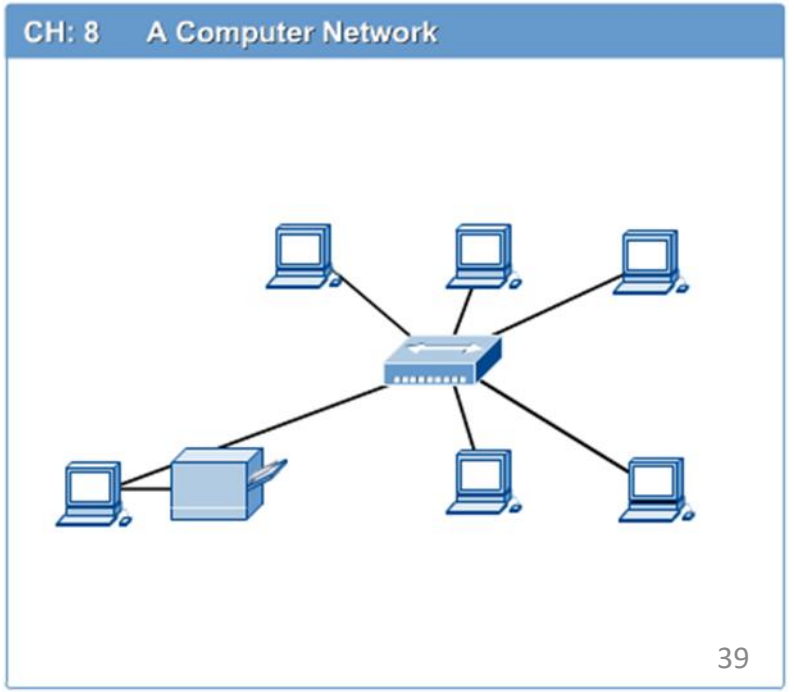
- There are six basic types of application software

1. Business software: word processors, spreadsheets, and database programs.
2. Communication software: allows computers to communicate with other computers
   - E.g fax software, Novell NetWare, AOL, Modem Software.
3. Graphics software: software that allows users to create and manipulate graphics.
   - E.g Photoshop, Print Shop, etc.
4. Education and Reference software: Programs that help teach new material and ideas, and programs that can be used to find information
   - E.g: Encarta, Worldbook Encyclopedia, Jumpstart Kindergarten, MicroType.
5. Entertainment and Leisure software:
   - E.g: Warcraft, Age of Empires, Barbie Design Center, Mrs. Pacman, Solitai
6. Integrated software: Combines several types of software into one program or package, Quicken (Spreadsheet /data base /communications /reference) or Print Shop (Graphics /Word processor).

Chapter 3. Computer Network and Internet

Computer Network

- It is a collection of computers and devices connected to each other
- Multiple computers that are connected together to share information and other resources
- Computer network connects two or more autonomous computers
- The computers can be geographically located anywhere



Chapter 3. Computer Network and Internet

Types of Computer Networks

- According to the network access policy:
  - ❖Private
  - ❖Public
- According to the distance between nodes:
  - ❖Network in small geographical Area (Room, Building or a Campus) is called LAN (Local Area Network)
  - ❖Network in a City is call MAN (Metropolitan Area Network)
  - ❖Network spread geographically (Country or across Globe) is called WAN (Wide Area Network)

Chapter 3. Computer Network and Internet

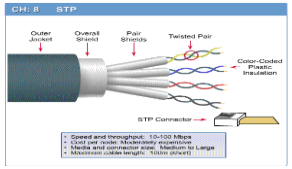
LAN

- Supplies networking capability to a group of computers in close proximity to each other such as in an office building, a school, or a home.
- Built with relatively inexpensive hardware such as Ethernet cables, network adapters, and hubs.
- Wireless LAN and other more advanced LAN hardware options also exist.
- Types of Communication Channels
  - Wire
  - Wireless (becoming popular)

Chapter 3. Computer Network and Internet

Network Components

- Physical/networking/ Media: the means by which signals (data) are sent from one computer to another (either by cable or wireless means)



- Interconnecting/network/ Devices
  - Ethernet Hub - connects multiple Ethernet devices together, making them act as a single segment
  - Network switch - is a small hardware device that joins multiple computers together within one LAN
  - Routers
  - Wireless Access Points
  - Modems

- Computers
- Networking Software
- Applications

Chapter 3. Computer Network and Internet

The Internet and web searching

A. Internet

- **Intranet**:
  - It is a smaller, closed version of the Internet, which can only be accessed by authorized members of an organization (same organ.)
  - Becoming an increasingly popular way to share information within a company or other organization
- **Extranet:**
  - It is an Internet which is partially accessible to authorized outsiders
  - It also allows outsiders who have been issued with a password to gain limited access to information
- **Internet**
  - It is the largest network in the world that connects hundreds of thousands of individual networks all over the world
  - The popular term for the Internet is the “information highway”

Chapter 3. Computer Network and Internet

- **Internet…(cont'd)**
  - It is similar to the world wide telephone system
  - A large number of networks, interconnected physically capable of communicating and sharing data with each other
  - it moves your ideas and information through cyberspace
  - No one owns it (It has no formal management organization)
  - As it was originally developed by the Department of defense, this lack of centralization made it less vulnerable to wartime or terrorist attacks.
  - To access the Internet, an existing network need to pay a small registration fee and agree to certain standards based on the TCP/IP (Transmission Control Protocol/Internet Protocol)

Chapter 3. Computer Network and Internet

B. Web searching

- The World-Wide Web
  - ❖It can be written as WWW (is global standard), web, W3
  - ❖Often what people mean by the Internet
  - ❖Uses hypertext mark up language - HTML
  - ❖The ability to link text and documents dynamically and interactively
  - ❖Can use text, graphics, sound and video
- Tools & Services Available on the Internet (web)
  - ❖Electronic mail (Yahoo, Gmail…)
  - ❖Instant messaging (yahoo messenger, Google talk, Skype)
  - ❖Remote login
  - ❖File transfer (ftp)
  - ❖WWW (http)

Chapter 3. Computer Network and Internet

B. Web searching …(cont'd)

Why do users access the Internet? For

- Communications/share information
- Shopping
- Banking
- Entertainment
- Download
- Research

Chapter 3. Computer Network and Internet

B. Web searching …(cont'd)

For web searching, use

1. Your personal computer or mobile device
2. *Web browser software* to access the web
3. A connection to an Internet Service Provider (ISP)

What is a Browser?

- It is a program that runs on your computer.
- It displays information that was sent to you.
- Enables you to respond to the information that was went to you.

Chapter 3. Computer Network and Internet

B. Web searching …(cont'd)

Browser Brands?

- Internet Explorer
- Mozilla Firefox
- Apple Safari
- Google Chrome
- Opera
- Baidu

Chapter 3. Computer Network and Internet

B. Web searching …(cont'd)

Anatomy of web browsers

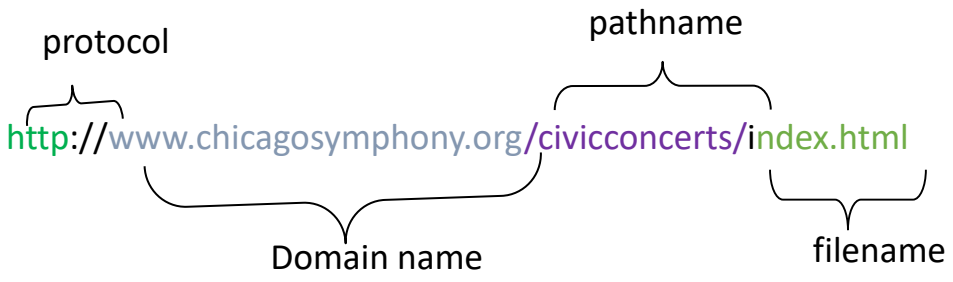
- URL (Uniform Resource Locator) Address Box Tab Search box

Chapter 3. Computer Network and Internet

What is in a Web Address?

- http://www.brev.org
- www – find page on “world wide web”
- brev – “domain” or web site name
- org – extensions – gov, com, int, edu, mil, net, org, info

Structure of URL



http => Hypertext Transfer Protocol

Chapter 4. Terminologies in Health Informatics

Lesson objectives

At the end of this lesson students should:

- Define health informatics
- Understand terminologies like computer science, information science and information technology
- Know the sub domains of health informatics
- Recognize the activities of public health informatics
- Define compare data and information
- Understand the information pyramid
- Know the type of information needed by different level of management in an organization

Chapter 4. Terminologies in HI

- **Information Technology**: it "is the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware''
- **Information science**: "is an interdisciplinary science primarily concerned with the analysis, collection, classification, manipulation, storage, retrieval and dissemination of information"
- **Information System**: it is any combination of information technology and people's activities using that technology to support operations, management, and decision making
- **Information mgt**: Assuring that the right information is available to the right people, within and outside an organization, at the right time and place, and with affordable price.

Chapter 4. Terminologies in HI

- **Informatics**
  - Historically, in 1957 the German computer scientist Karl Steinbuch coined the word *Informatik* by publishing a paper called *Informatik*: "Informatics: Automatic Information Processing“
  - It is the application of information technologies to optimize the information management function within an organization
- **Health informatics**
  - It is the intersection of information science, computer science, and health care.
  - It deals with the resources, devices, and methods required to optimize in putting , storage, retrieval, and use of information in health and biomedicine
  - Its tools include **not only** computers but also clinical guidelines, formal medical terminologies, and information and communication systems.

Chapter 4. Terminologies in HI

- **e-Health**
  - It is defined as the use of emerging interactive technologies (e.g., Internet, CD-ROMs, PDAs, interactive television and voice response systems, computer kiosks, and mobile computing) to enable health improvement and health care services
- **Electronic Medical Records (EMR)**
  - A longitudinal collection of electronic health information for and about persons
- **m-Health**
  - the provision of health-related services via mobile communications
- **Telemedicine**
  - the use of electronic signals to transfer medical data from one site to another via the internet, telephones, PCs, satellites, or videoconferencing equipment in order to improve access to health care

Chapter 4. Terminologies in HI

Telemedicine types

- **Tele-surgery**: the ability for a doctor to perform surgery on a patient even though they are not physically in the same location
- **Tele-radiology**: the transmission of radiological patient images, such as x-rays, CTs, and MRIs, from one location to another for the purposes of interpretation and/or consultation
- **Tele-care**: The use of telecommunication systems to provide remote assistance in therapy to patients
- **Tele-Health**: The delivery of health-related services and information via telecommunications technologies

Chapter 4. Terminologies in HI

Sub-domains of Health informatics

- Clinical informatics
- Nursing informatics
- Imaging informatics
- Consumer health informatics
- Public health informatics
- Dental informatics
- Clinical research informatics
- Translational research informatics
- Bioinformatics
- Veterinary informatics
- Pharmacy informatics
- Healthcare management informatics, etc…

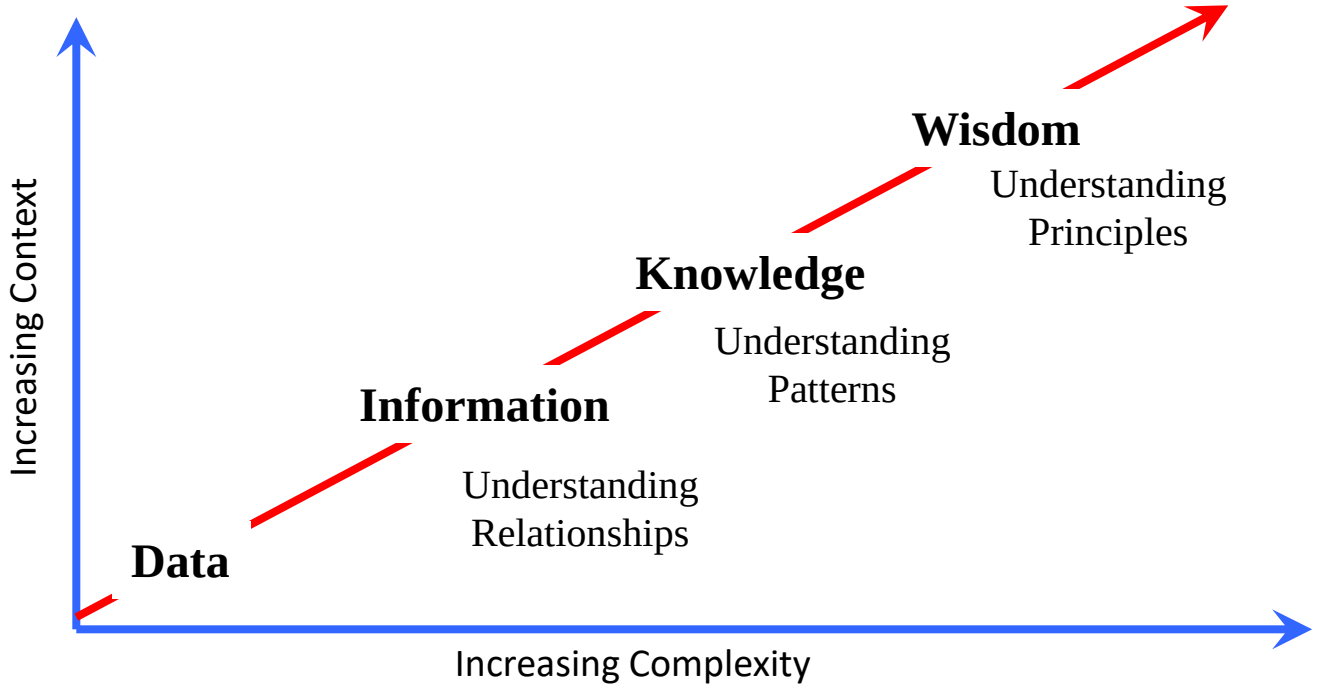
Chapter 5. Information Hierarchy

- **Data**
  - refer to a collection of raw facts usually collected as the result of experience, observation or experiment, or processes within a computer system, or a set of premises
  - It simply exists and has no significance beyond its existence (no meaning)
- **Information**
  - It is data that has been given meaning by way of relational connection.
  - Aggregation of data that makes decision making easier
  - It answers epidemiological questions: what, who, when, where?

Chapter 5. Information Hierarchy

- **Knowledge**
  - ➢It is an elusive concept which is difficult to define
  - ➢includes facts about the real world entities and the relationship between them.
  - ➢It is an understanding gained through experience
  - ➢It is a deterministic process. It answers “how” question
- **Wisdom**
  - ➢Embodies principles, insight and moral by integrating knowledge
  - ➢“Wisdom is not a product of schooling but of the lifelong attempt to acquire it.” Albert Einstein
  - ➢It is an extrapolative and nondeterministic, non-probabilistic process. It calls upon all the previous levels of consciousness, and specifically upon special types of human programming (moral, ethical codes, etc.)

Chapter 5. Information Hierarchy

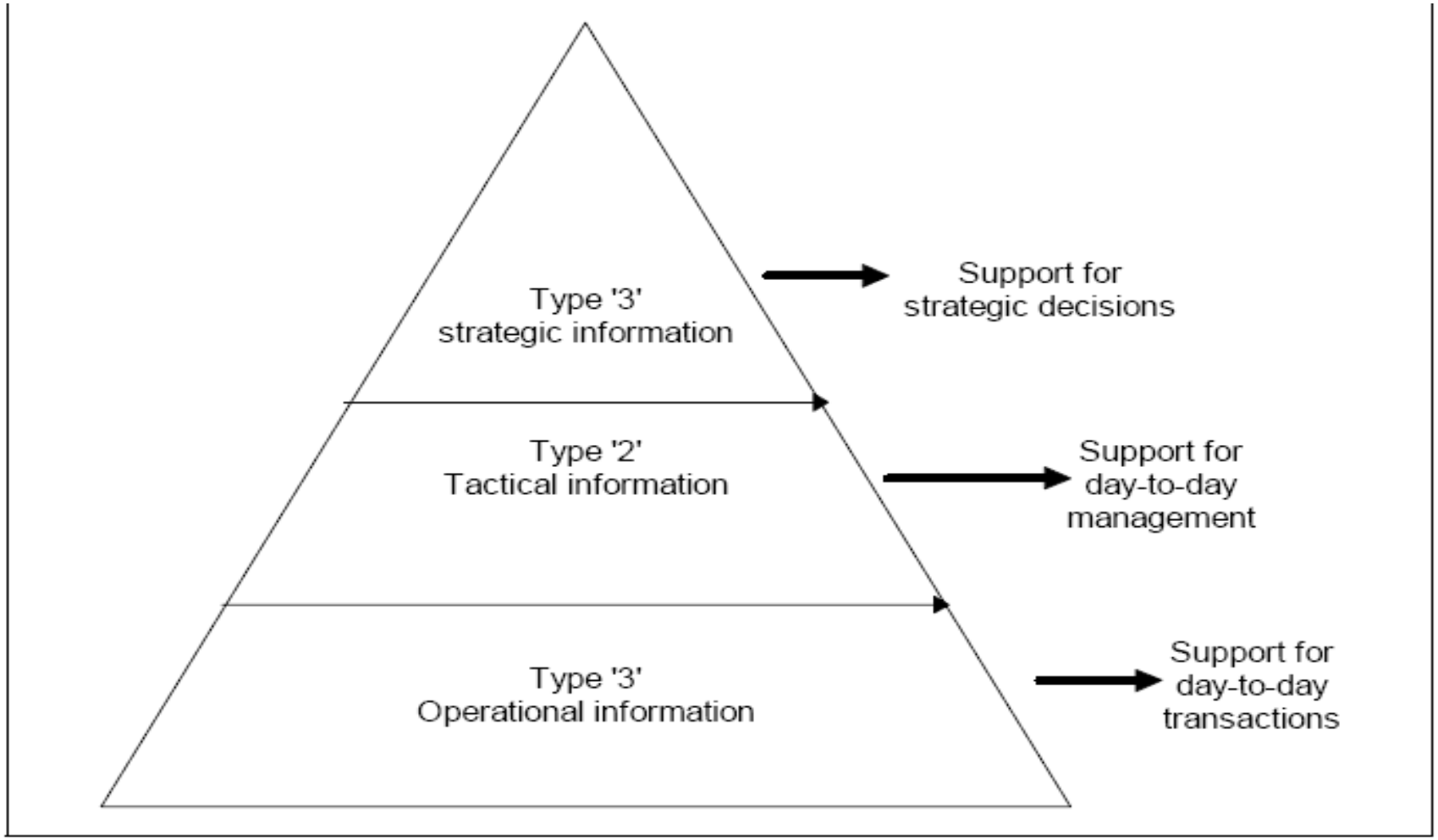


Chapter 5. Information Hierarchy

- Example

Chapter 5. Information Hierarchy

The Information Pyramid



Chapter 5. Information Hierarchy

Operational information

- This is information needed by those at the bottom of the corporate hierarchy.
- It is detailed information relating to the day-to-day running of the divisions of the corporation.
- Within the health care arena this can be considered to be the few clinical, and many administrative, systems that exist in health facilities.

Chapter 5. Information Hierarchy

Tactical information

- This is the information needed by those part-way up the corporate hierarchy (who will usually be the managers of the ones at the bottom)

- It is not as detailed as type '1' information.

- In fact, it frequently summarizes it (by group, perhaps, or over time period).

- For this reason, it is often termed derived data, and the systems which provide it are termed feeder systems.

Chapter 5. Information Hierarchy

Strategic information

- This is information needed by those at the top of the corporate hierarchy.
- It is highly abstracted and summarized, and typically relates to the organization as a whole rather than to its individual divisions.

Chapter 5. Information Hierarchy

Management Functions and Information Support		
Management Level	**Functions**	**Information Need**
Patient/client	Provide quality care Provide continuity of care	Diagnostic information Past history Family history
Health unit	Provide pregnancy care to all pregnant women in catchment area	Service coverage Geographic pockets of underserved women Commodity supply data
Health system	Ensure distribution of health commodities in the district	Number of stockouts for essential drugs or vaccines Drug cost and efficacy

Chapter 5. Information Hierarchy

Assignment: Consider which category of information (operational, tactical or Strategic) each of the following belong to and to whom the information would be most appropriate?

1. Present pulse rate of a patient
2. Occupancy on a daily basis for a single hospital ward over the past month
3. Total number of admissions to the pediatric department at the Dessie Referral Hospital for diarrhea and vomiting by month for the past year
4. Total number of infant deaths in each of the Regions in the past year
5. Daily urine output for a ward based renal patient
6. Total reported number of new HIV infected individuals in Eth. in the past year

Chapter 6. Health Information System (HIS)

Overview

- A health information system (HIS) refers to a system designed to manage healthcare data.
- This includes systems that collect, store, manage and transmit a patient's electronic medical record (EMR), a hospital's operational management or a system supporting healthcare policy decisions.
- WHO: The HIS provides the underpinnings for decision-making and has four key functions: data generation, compilation, analysis and synthesis, and communication and use.
- The HIS collects data from the health sector and other relevant sectors, analyses the data and ensures their overall quality, relevance and timeliness, and converts data into information for health-related decision-making.

Chapter 6. Health Information System (HIS)

- Health Information System (HIS)
  - Health information has been variously described as the “foundation” for better health, as the “glue” holding the health system together, and as the “oil” keeping the health system running
  - It is a system that provides specific information support to the decision-making process at each level of the health system
  - HIS is an integral part of the health system, the operational boundaries of which include:
    - … all resources, organizations and actors that are involved in the regulation, financing, and provision of actions whose primary intent is to protect, promote or improve health.

Chapter 6. Health Information System (HIS)

- However, the health information field is complex
- Unfortunately, supply and demand in the health information field are not currently in equilibrium, with an oversupply of data coexisting with large unmet needs for information

The goal of HIS:

- The ultimate objective of a health information system is to ***produce information for taking action in the health sector***.
- Performance of such a system should therefore be measured **not only** on the basis of the **quality of data produced**, **but on evidence** of the **continued use of these data** for improving health systems operations and health status

Chapter 6. Health Information System (HIS)

Why health information system

- Good mgt is a prerequisite for increasing the efficiency of health services
- Improved HIS is clearly linked to good management
- Info is crucial at all mgt levels of the health services
- The system provides info on past, present and projected future and relevant events inside and outside the organization
- It is required by policy makers, managers, healthcare providers, community health workers
- Changing the way info is gathered, processed, and used for decision-making implies changing the way an organization operates.
- With the widespread computerization of health records and other info sources (including hospital admin functions, health HRs, HI and HIT) are being increasingly utilized in info mgt practices in the health care sector.

Chapter 6. Health Information System (HIS)

Classification of HIS

- Operational and tactical systems for easy classification of information.
- Clinical and administrative systems for managing patient details on an administrative level.
- Subject and task based systems such as Electronic Medical Records (EMRs) or Electronic Health Records (EHRs).
- Financial systems for tracking revenue and managing billing submissions.

Chapter 7. Routine Health Information System (RHIS)

Introduction/Defn

- RHISs are defined as systems that provide information at regular intervals of a year or less to meet predictable information needs.
- These include paper-based or electronic health records and facility- and district-level management information systems.

Chapter 7. Routine Health Information System (RHIS)

Health Systems and Health Information Systems

- **Health system** - It also sometimes referred to as health care system or as healthcare system, is the organization of people, institutions, and resources that deliver health care services to meet the health needs of target populations.
- HIS refers to a system designed to manage healthcare data.
- This includes systems that collect, store, manage and transmit a patient's EMR, a hospital's operational management or a system supporting healthcare policy decisions

Chapter 7. Routine Health Information System (RHIS)

Health Management Information System (HMIS) in Ethiopia

- **System**: A collection of components that work together to achieve a common objective
- **Health System**: All the activities whose primary purpose is to improve, restore or maintain health.
- **Information**: Meaningful collection of facts or data.
- **Information System**: A system that provides info support to the decision-making process at each level od an organization
- **Health Information System**: A system that integrates data collection, processing, resorting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services

Chapter 7. Routine Health Information System (RHIS)

- **Management information system**: A formal method of making available accurate and timely information to management that is necessary to facilitate the decision making process and enable the organizations planning, control and operational functions to be carried out effectively.
- Health Management Information System: it is an application of the principles of mgt info system in healthcare systems
- Or HMIS is an info system specially designed to assist in the mgt and planning of health programs, as opposed to delivery of care

Chapter 7. Routine Health Information System (RHIS)

HMIS in developing countries

- Info system procedures were not intentionally planned to provide mgt support in an integrated way
- Too much emphasis was given (placed) on the mgt of impacts which called for costly assessment
- Many decisions on policy, planning and resource allocation are made without analysis of the info that is readily available
- The data received are often incomplete, inaccurate, untimely, obsolete, and unrelated to priority tasks and functions of the local health personnel

Chapter 7. Routine Health Information System (RHIS)

Deficiencies in HMIS in Ethiopia

- It was inadequate in providing the required info for mgt support
- Data coming from the system is not a resourceful input for decision making
- Underutilization of the info generated by the system for decision making at all levels specially in the front line where the data is collected and info is generated
- Poor quality of data and use of info
- Poor data analysis, and less accessible for decision making (using eHMIS)
- Due to such constraints, HMIS (manual and electronic) **reform** was needed based on the guiding principles: Standardize, Integrate, and Simplify.

Chapter 7. Routine Health Information System (RHIS)

- At national level, the current reformed HMIS is working with 131 standardized indicators that were revised since 2017.
- The revised indicators are tracking using the new software adopted called District Health Information System version two (DHIS 2)
- DHIS is both a paper-based and electronic based (recently DHIS 2) information system that uses a combination of forms, procedures and analytical tools to convert **routine anonymous data** into useful management information that can be used by local program and facility managers.
- Six classical epidemiological questions; *who, what, when, where, why* and *how* about the health status of the people will be answered

Chapter 7. Routine Health Information System (RHIS)

Who gets sick?

- Information about who gets sick is collected on a set of data collection tools, client cards, registers, tally sheets and data input forms
- The DHIS deals with aggregated, anonymous data; no individuals are identified in the reports
- The DHIS emphasizes the community aspects of health, looking wherever possible at the entire relevant population to determine what proportion of them have a priority condition

Chapter 7. Routine Health Information System (RHIS)

What conditions?

- The DHIS concentrates on diagnoses of local public health importance that are identified in the situation analysis
- The diseases tracked by the DHIS are all priority conditions on which local staff can take action

Where do clients come from?

- The DHIS is based upon facility information so that all information can be related to the geographical catchment area of the facility and the people who live there
- The computer can be used to prepare larger scale maps of entire districts or provinces using a Geographical Information System (GIS).
- Early action based on knowledge of **where** clients are found can be a powerful tool to control outbreaks of disease

Chapter 7. Routine Health Information System (RHIS)

When do people get sick?

- The monthly DHIS data allows facility staff to graph conditions and use of services over time and to compare numbers of cases in different months of the year.

Why do they get sick?

- Social or economic conditions; water, sanitation, diet, housing, education, and habits like smoking or sexual practice have more direct influence over health than health services.
- These underlying causes are almost impossible to determine from routine health data, but the DHIS provides information to enable research to be focused on the most important conditions

Chapter 7. Routine Health Information System (RHIS)

How do we overcome the problems?

- Analysis of the DHIS identifies the common problems, the age groups that are affected and the places they occur.
- This gives facility health managers the knowledge to plan, implement and evaluate activities to overcome such problems.
- This comparison of individual facilities at district level allows weaker facilities to learn from stronger facilities and has been shown to be a vital way of improving health services

Chapter 7. Routine Health Information System (RHIS)

The DHIS has a number of basic principles:

1. Supports the district-based PHC approach.
2. Collects essential data used to calculate indicators.
3. Encourages decentralized use of information by health workers.
4. Includes all service providers at all levels.
5. Integrated with and supports other information systems.

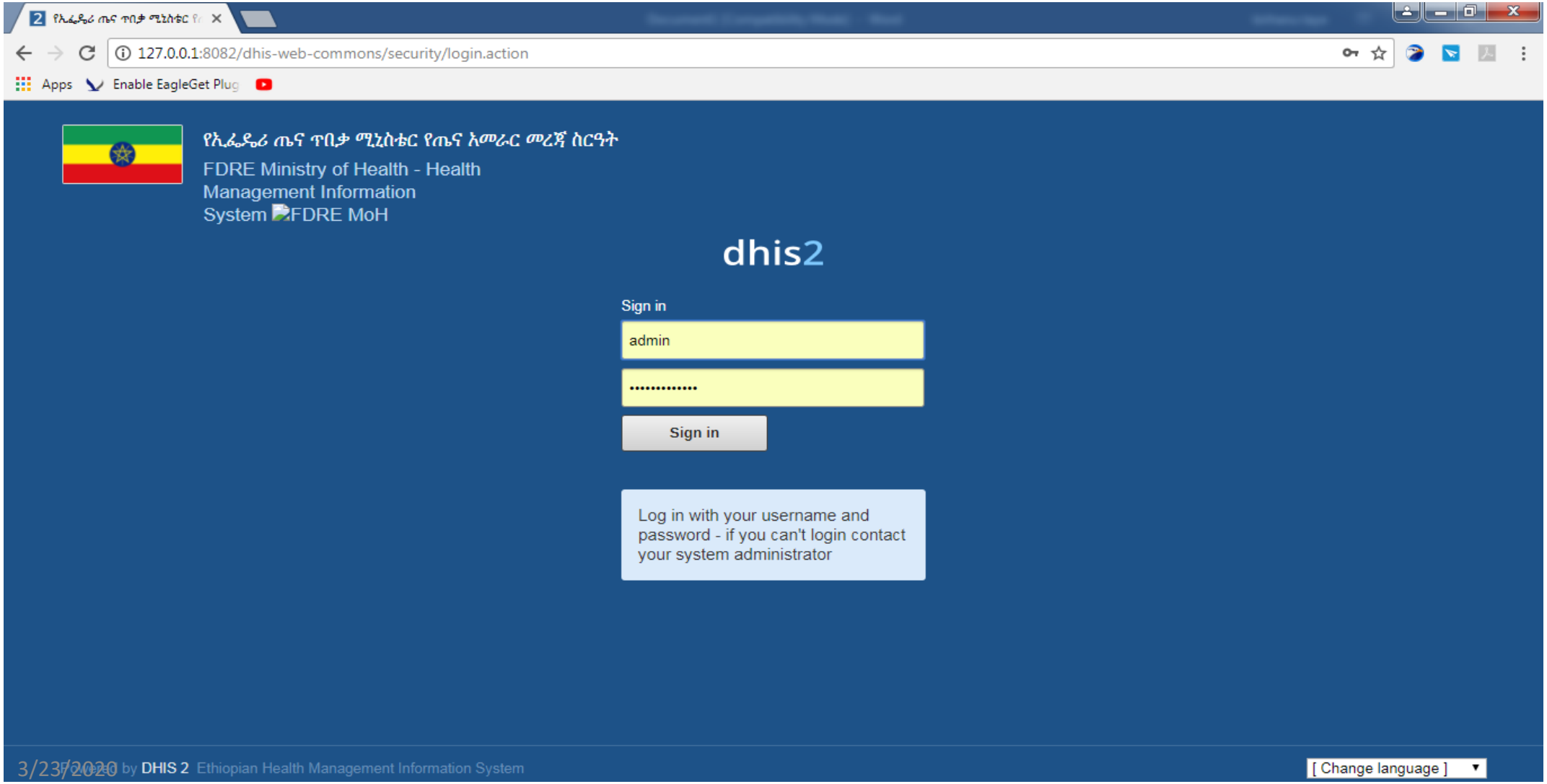
Chapter 7. Routine Health Information System (RHIS)

Building Blocks of e-DHIS:

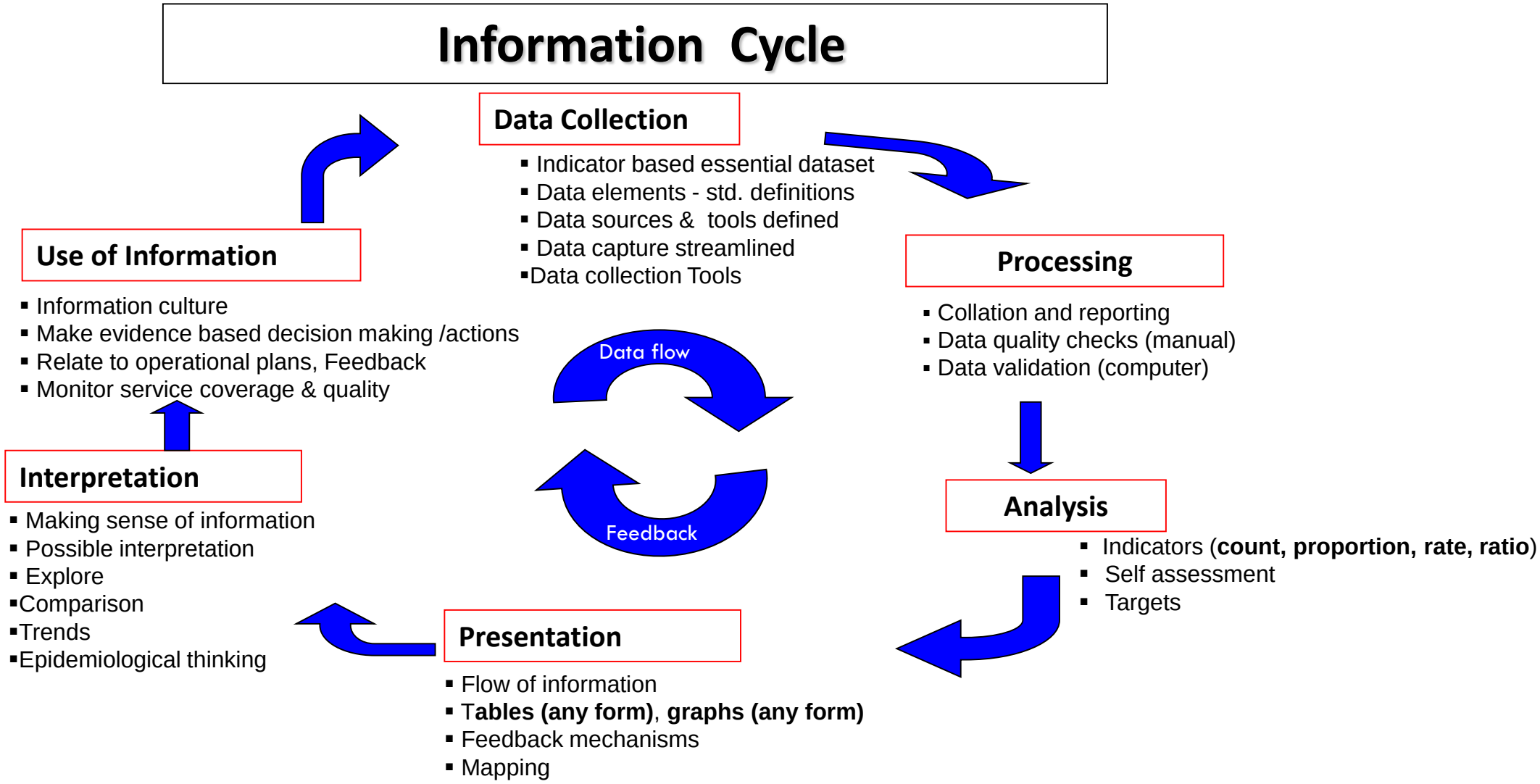
- **They are data dimensions of DHIS 2**
- **They are:**
  - Three dimensions that answer three questions: the **WHERE**, the **WHEN** and the **WHAT**
  - The '**Where**' represents '**Organization Units**'
  - The '**When**' represents '**Periods**: Pre-defined and Relative periods'
  - The '**What**' for '**Data Elements/Indicators**'

Chapter 7. Routine Health Information System (RHIS)

DHIS 2 is a Web-based tool



Chapter 7. Routine Health Information System (RHIS)



Chapter 7. Routine Health Information System (RHIS)

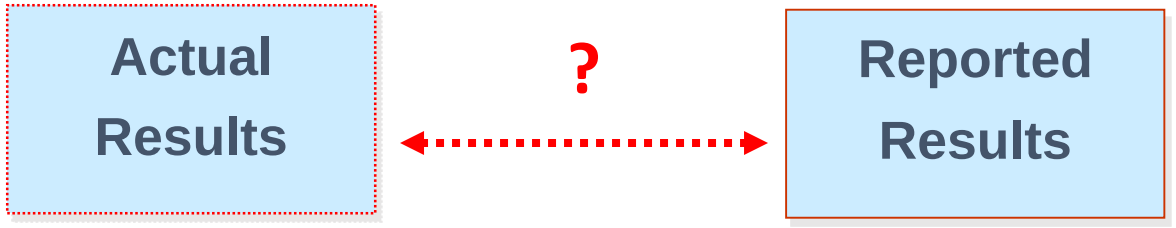
- Commonly seen data quality errors

Error	Example
Missing data	Data items for whole months missing
Duplicate data	Multiple counting of a fully immunised child
Thumb suck	When data collection tools are not used routinely, staff just fills in a likely-looking number (often using preferential end digits!)
Unlikely values for a variable	A man being pregnant; low birth weight babies exceeding number of deliveries
Contradictions between variables	100 births in a month when there are only 2,000 women in childbearing age
Calculation errors	Mistakes in adding
Typing error	Data is wrongly entered onto the computer

Chapter 7. Routine Health Information System (RHIS)

Data quality

What is Data Quality?



Data Quality:

How well our M&E data "tell the true story."

Chapter 7. Routine Health Information System (RHIS)

Elements of Data Quality

Validity	Data measure what they are supposed to measure.
Reliability	Everyone defines, measures, and collects data the same way—all the time.
Completeness	Data include all of the values needed to calculate indicators. No variables are missing.
Precision	Data have sufficient detail. Units of measurement are very clear.
Timeliness	Data are up to date. Information is available on time.
Integrity	Data are true. The values are safe from deliberate bias and have not been changed for political or personal reasons.

Chapter 7. Routine Health Information System (RHIS)

Validity and Reliability: Hitting the Target

NOT Valid
NOT Reliable

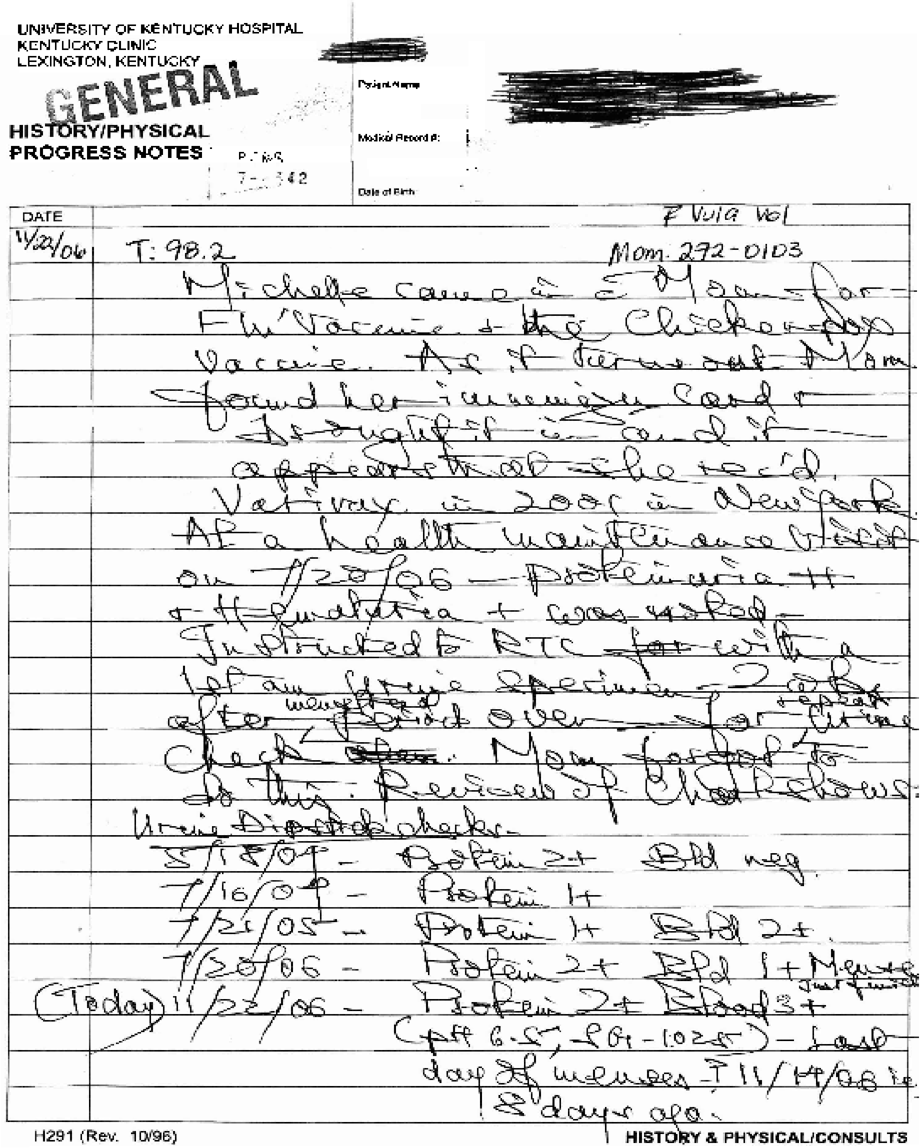
Reliable but
NOT valid

Reliable AND
Valid!!!

Chapter 8. Clinical Information System

Paper-based medical record has tremendous problems:

- It occupies space, search and retrieval are time consuming & difficult, misplacement leads to loss of record, patients cannot easily get appointment and treatment related information, doesn't provide decision support system, etc
- Medical records are written by hand and illegible to everyone but their authors.
- Paper medical records cannot be searched for keywords and do not have indices.
- Paper medical records cannot be aggregated for study, but must be examined one by one.
- Case-based reasoning is difficult.


UNIVERSITY OF KENTUCKY HOSPITAL
KENTUCKY CLINIC
LEXINGTON, KENTUCKY [redacted]
GENERAL
HISTORY/PHYSICAL
PROGRESS NOTES

Patient Name [redacted]
Medical Record #:
Date of Birth

DATE
11/22/06 T: 98.2 Mom: 292-0103

H291 (Rev. 10/96)
HISTORY & PHYSICAL/CONSULTS

If you can read it, how long did it take you to decode the handwriting?

Chapter 8. Clinical Information System

EMR Vs PHR Vs ERHs

- PHR = Personal Health Record
- EMR = Electronic Medical Record
- EHRS = Electronic Health Records System

Chapter 8. Clinical Information System

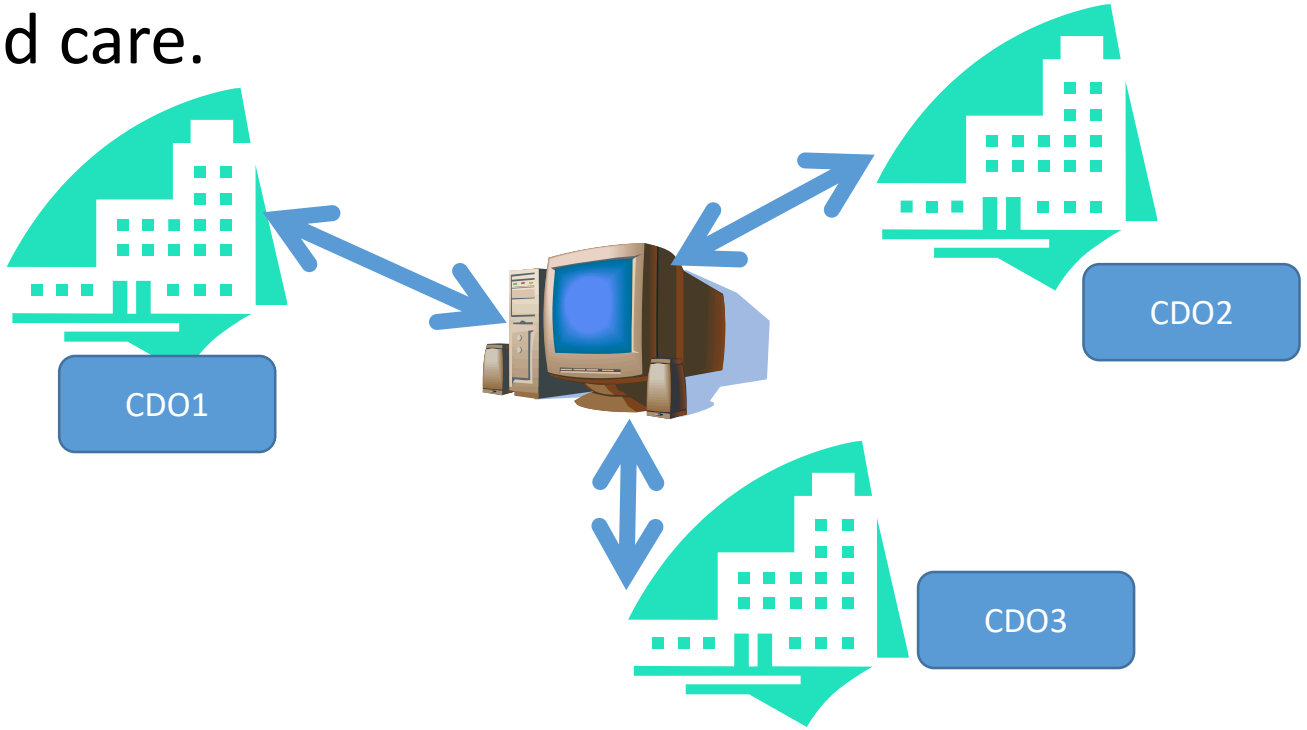
PHR

- A tool you can use to gather, organize and manage your health care information, including medical history, medications, immunizations, health care providers, etc.
- You control the PHR:
- Enter your medical info
- Decide who gets access
- Update info
  - E.g. Google Health

Chapter 8. Clinical Information System

EHRs

- The aggregate electronic record of health-related information on an individual that is created and gathered cumulatively across more than one health care organization and
- It is managed and consulted by licensed clinicians and staff involved in the individual's health and care.



Chapter 8. Clinical Information System

EMR

- The electronic record of health-related information on an individual that is created, gathered, managed, and consulted by licensed clinicians and staff from a single organization (CDO) who are involved in the individual's health and care.
- Your health care provider controls the EMR.
- Practice management tool:
  - Appointments
  - E-prescribing
  - Lab/Imagining results
  - Health History

Chapter 8. Clinical Information System

Difference Between EMR & EHRs

EMR

- The legal record of the CDO (care delivery organization)
- A record of clinical services for patient encounters in a CDO
- Owned by the CDO
- These systems are being sold by enterprise vendors and installed by hospitals, health systems, clinics, etc.
- May have patient access to some results info through a portal but is not interactive
- Does not contain other CDO encounter information

EHR

- Subset (i.e. CCR or CCD) of information from various CDOs where patient has had encounters
- Owned by patient or stakeholder
- Community, state, or regional emergence today or nationwide in the future
- Provides interactive patient access as well as the ability for the patient to append information.
- Connected by NHIN (National Health Information Network)

Chapter 8. Clinical Information System

Needed outcomes from EMR

- Increased revenues
  - Increased patient volume
  - Increased charge capture
  - Decreased accounts receivable days
  - Decreased denied claims
  - New business opportunities, clinical trials, data
  - Improved competitiveness
  - Improved quality of care
- Improved patient satisfaction
- Decreased costs
  - Reduced chart filing costs
  - Reduced transcription costs
  - Decreased telephone calls, faxes from pharmacy
  - Increased efficiencies, decreased hassles
- Improved quality of life
  - Improved provider satisfaction
  - Improved staff satisfaction
  - Less time after hours

Chapter 8. Clinical Information System

Main activities in EMR

- Patient Registration
- Appointments
- E-prescribing
- Lab/Imagining results
- Health History

Chapter 8. Clinical Information System

EMR software in Ethiopia

TenaCare/EMR System

Chapter 8. Clinical Information System

- The Core objectives of Electronic Health records are:
  - ❖Electronic Health Record (EHR) improve quality, safety and efficiency & reduces costs
  - ❖Through Electronic Health Records Systems, physician and health practitioner improves care coordination.

Chapter 8. Clinical Information System

Benefits of EHR

- Improved data integrity:
  - readable , better organized, accurate, complete
  - Helps minimize medical errors
- Improved productivity:
  - access data whenever, wherever for timely decision
- Increased quality of care:
  - tailored views, “dash-board”
- Increased satisfaction for caregivers:
  - easy access to client data and related
- Time Efficiency – Reduce waiting time
- Monitoring Capability – increase quality of care
- Safety, Security & Space - efficiency of storage
- Data Access - Simultaneous & remote access
- Encourage data use
- On time Reporting
- Easy to use
- Follows service design
- Expandability

Chapter 8. Clinical Information System

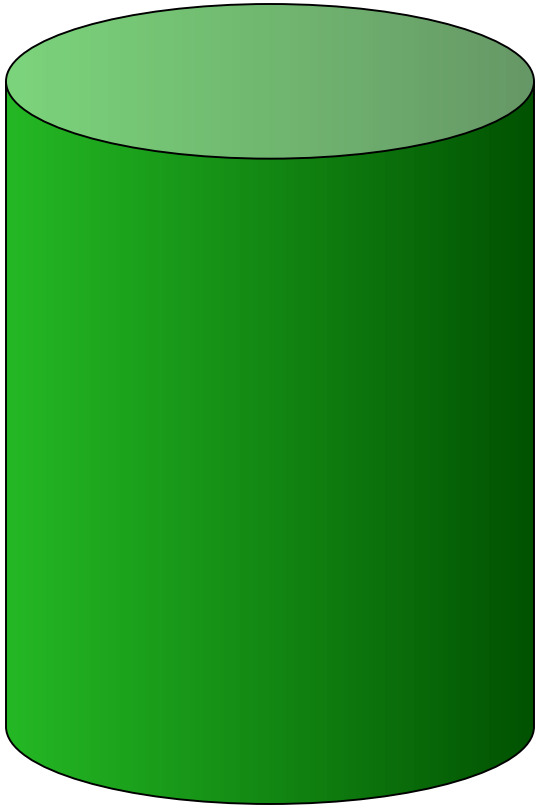
TenaCare Overview

- TenaCare (previously known as SmartCare) is a computerized health records system developed based on the new HMIS that has been acknowledged by FMOH
- TenaCare was first developed, tested and deployed in Zambia by CDC for HIV/AIDS care and treatment.
- TenaCare software development in Ethiopia happened in collaboration with the SmartCare team in Zambia and the United States.
- TIE in collaboration with CDC & FMoH developed the software


Federal Democratic Republic of Ethiopia
Ministry of Health
TenaCare EMR
Exceptional technology. Extraordinary care.
Attempting to obtain single instance lock.....
CDC
Tulane University
Version: 3.0

Modules/ Service Units Included

1. Outpatient
    1. OPD
    2. HIV
    3. TB
    4. VCT/PIHCT
2. Inpatient
3. MCH
    1. FP
    2. ANC/PMTCT
    3. Pediatrics
    4. Delivery
    5. Postnatal
4. Laboratory
5. Pharmacy
6. Reports
7. Etc …



Why TenaCare chosen as a Solution ?

Data Transport

Data Entry

Data Storage

Data Use and Reporting

Why TenaCare chosen as a Solution ?

Data Transport

Data Entry

Data Storage

Data Use and Reporting

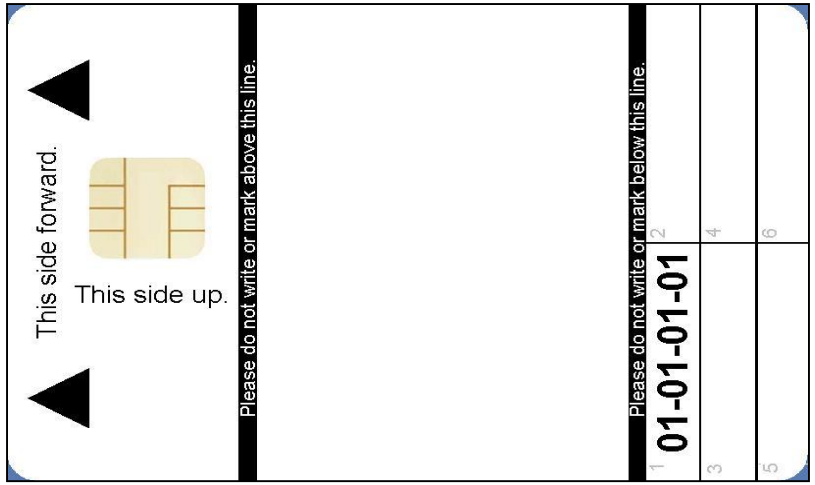
Data Transportation

- Data transportation can be done in two ways:
    1. The patient can take the data from one place to another using a **SmartCard** (usually used for referral case patients)
    2. Through a networked/centralized system

Data Transportation

- **1. SmartCard:**
  - it is a card through which patient data is getting loaded
  - Enforces patient confidentiality and data security
  - System is password driven, with a role based security model (RBS)

•Entire EHR is stored on card (64-100 pages)
•OPD, TB, ART, MCH (ANC/PMTCT, Delivery,U5), Lab, Pharmacy, VCT, etc



Data Transportation

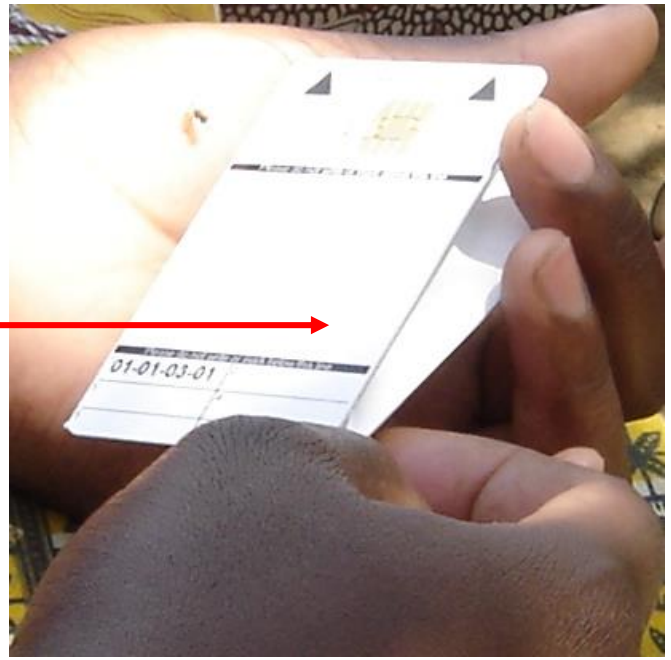
- **1. SmartCard:**

•Card data is compressed and encrypted
•Card can not be read by other systems – requires specialized card driver and code logic to read the data from the smart card

Data Transportation

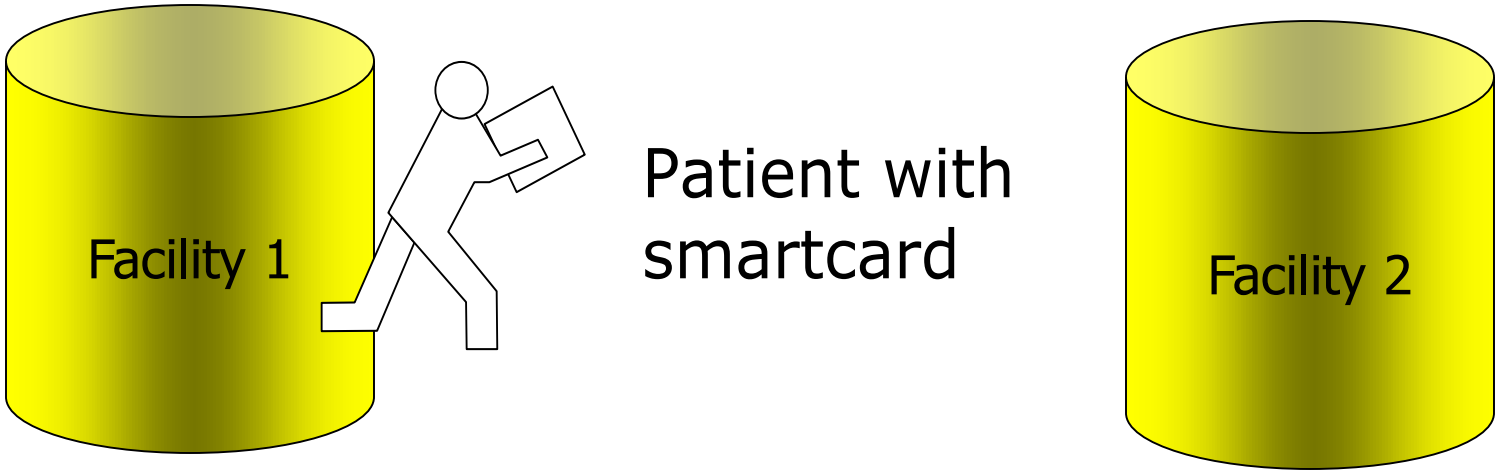
- **1. SmartCard:**

'the client serves AS the network' to connect the facilities



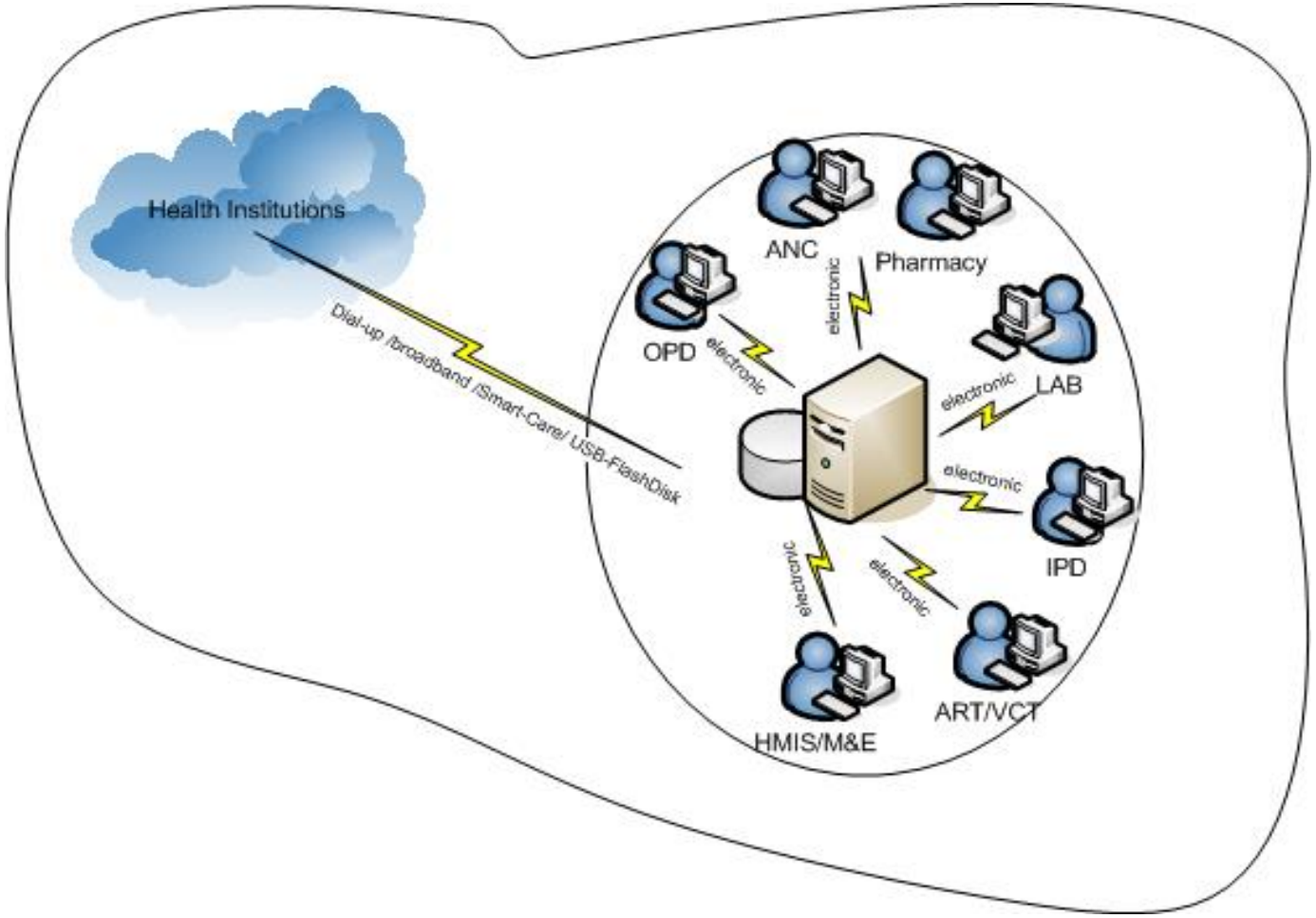
Data Transportation

- **1. SmartCard:**
  - databases are linked via a virtual network for data communication / synchronization, *driven by the patient*



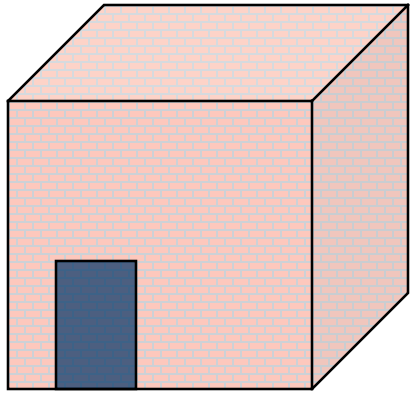
Data Transportation

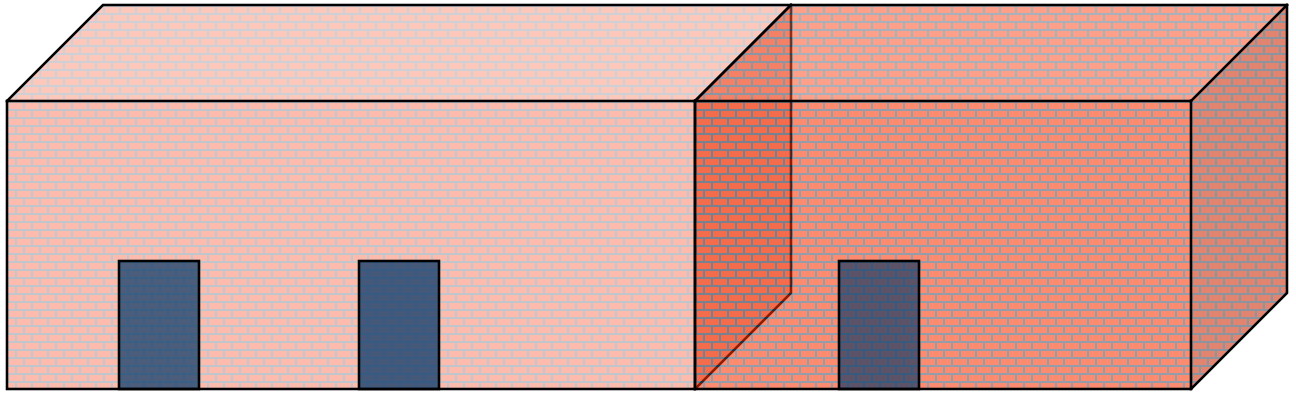
- **2. Online/networked data transport**



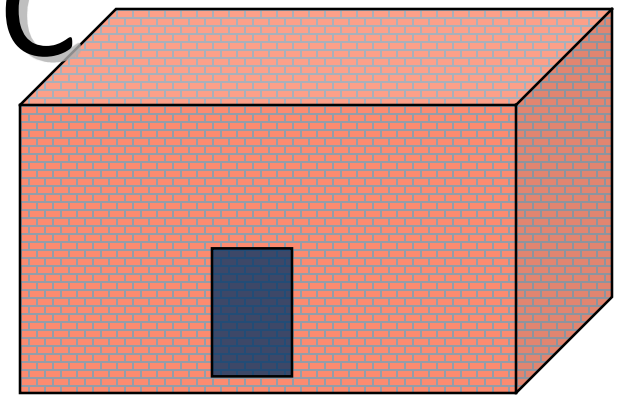
TenaCare System

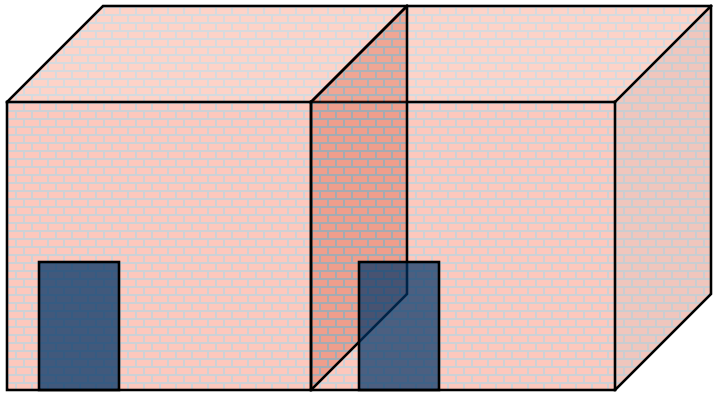
EMR SYSTEM
Simulation

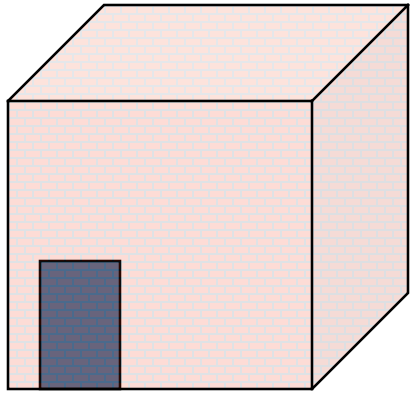


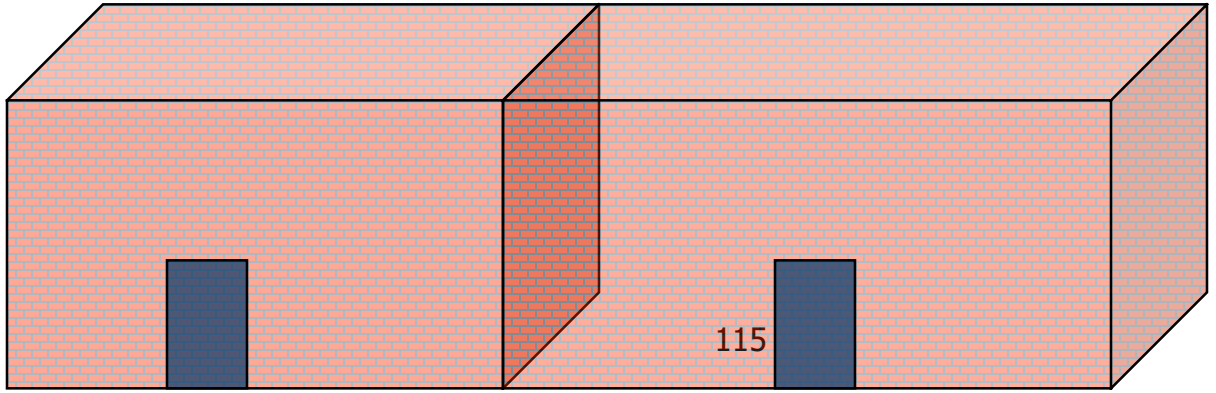


Dessie HC









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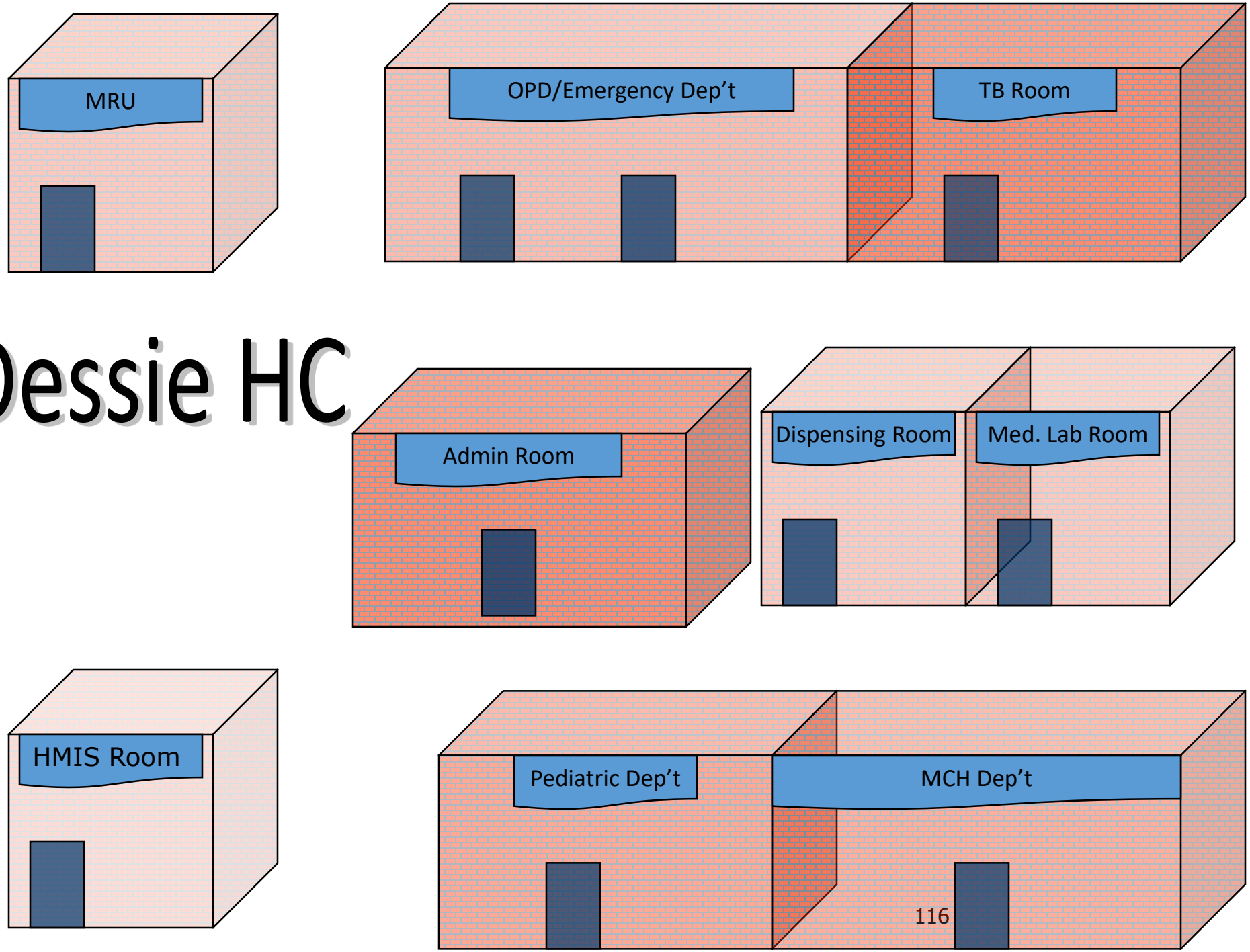
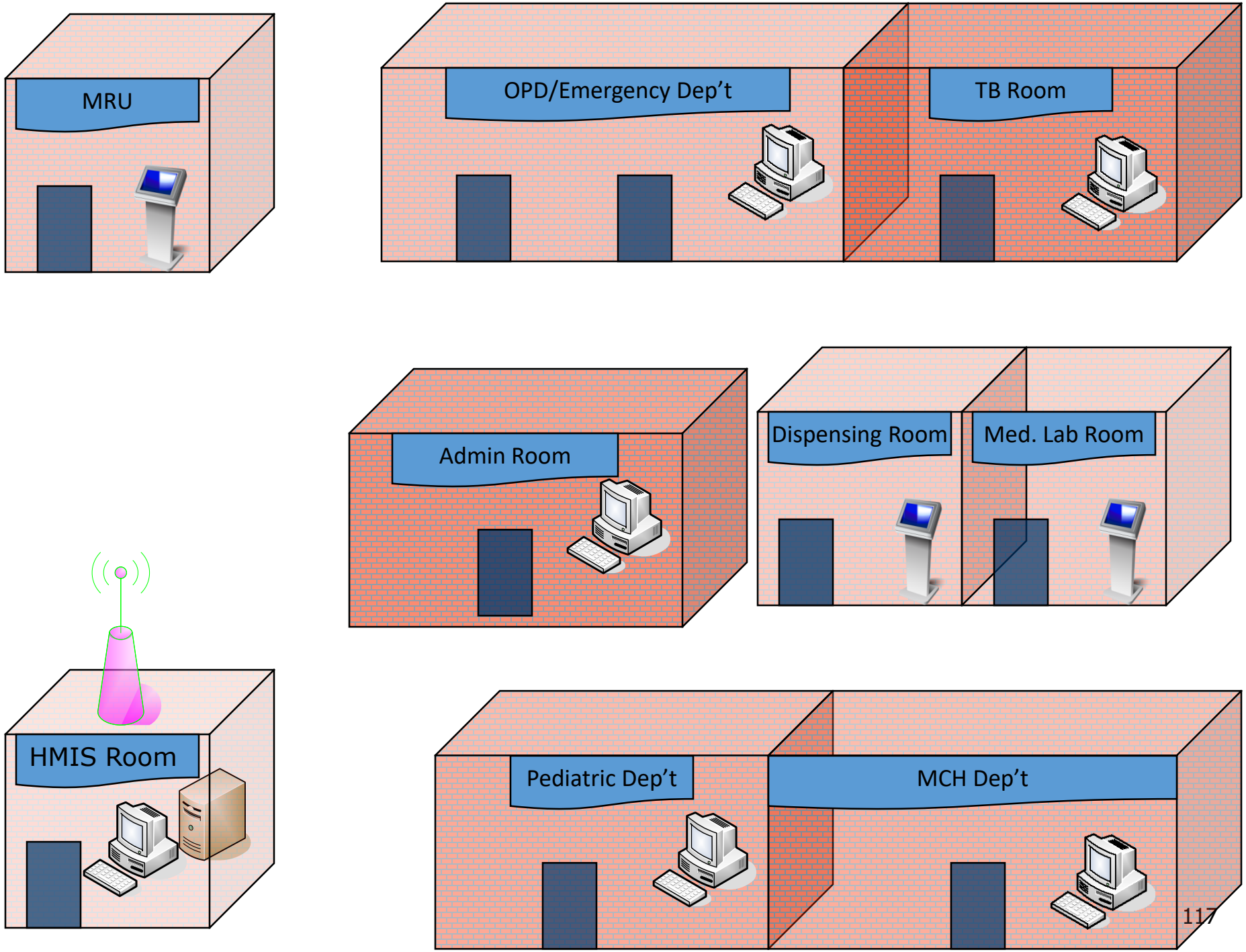

MRU
OPD/Emergency Dep't
TB Room
Admin Room
Dispensing Room
Med. Lab Room
HMIS Room
Pediatric Dep't
MCH Dep't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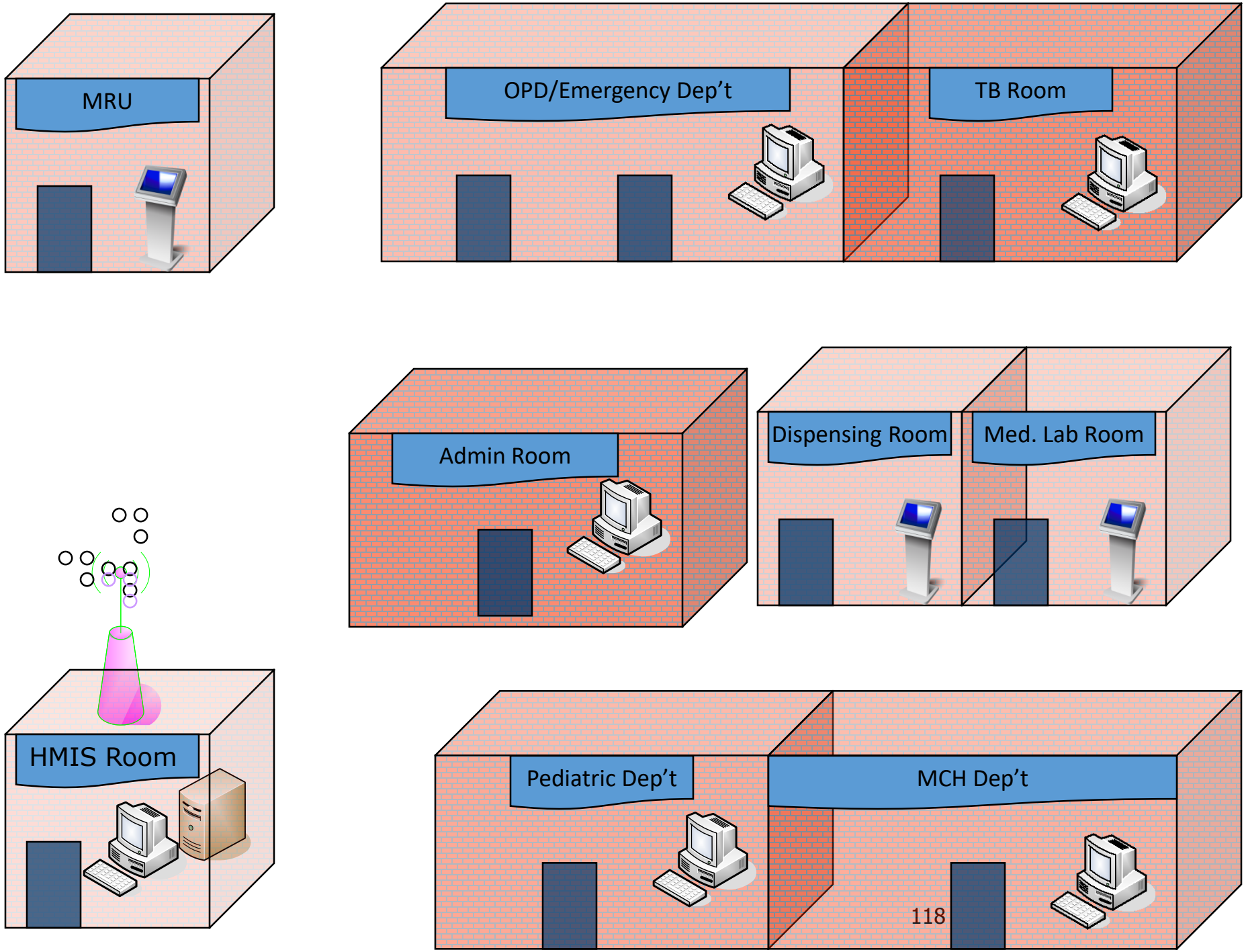
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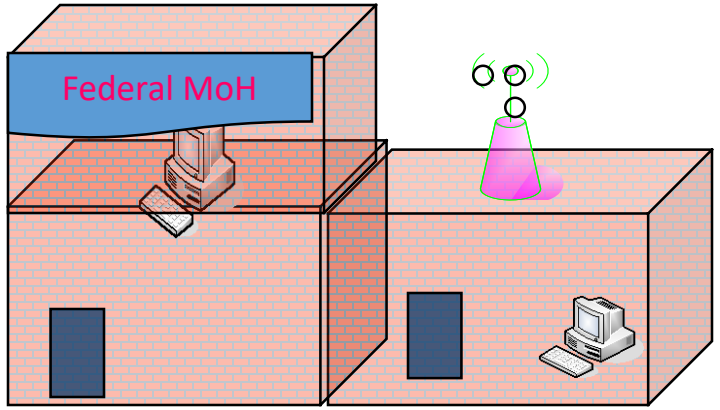
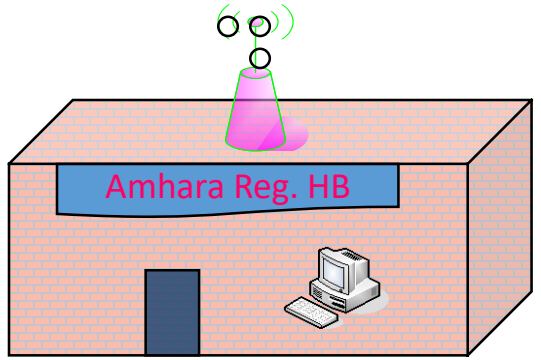
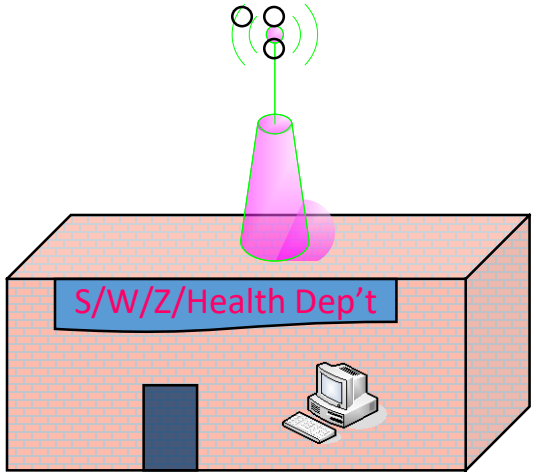
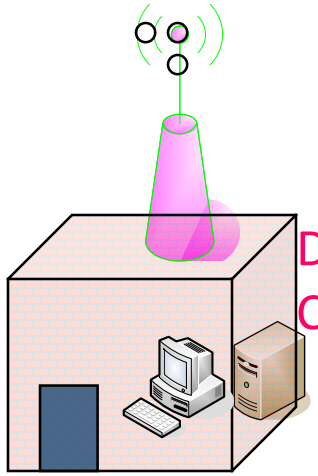
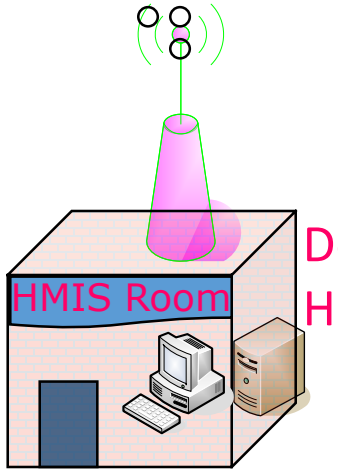






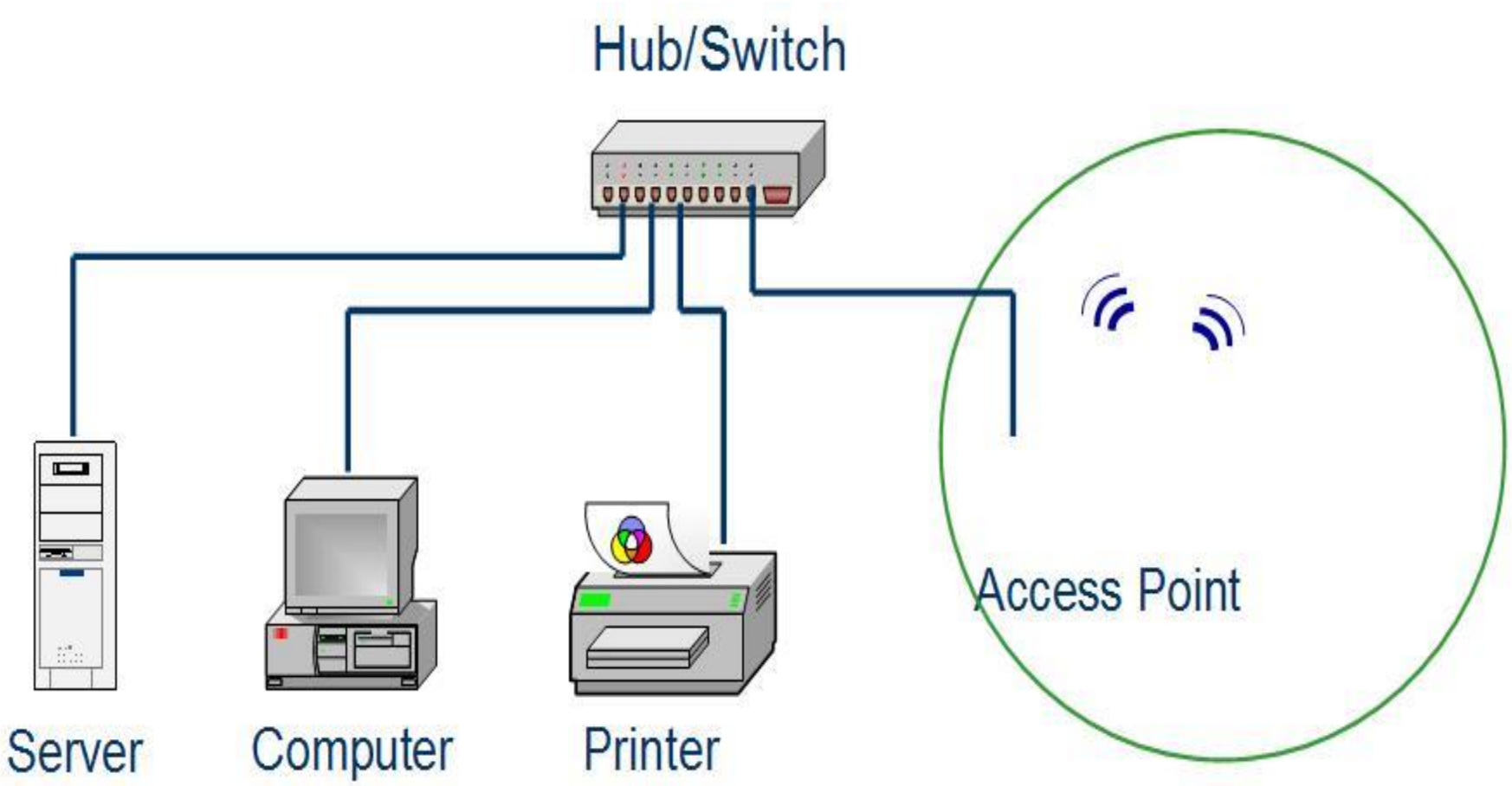


Dessie Health Center



Dessie Referral Hospital

Network Infrastructure in EMR



Ayder Hospital Case Study

Why TenaCare chosen as a Solution ?

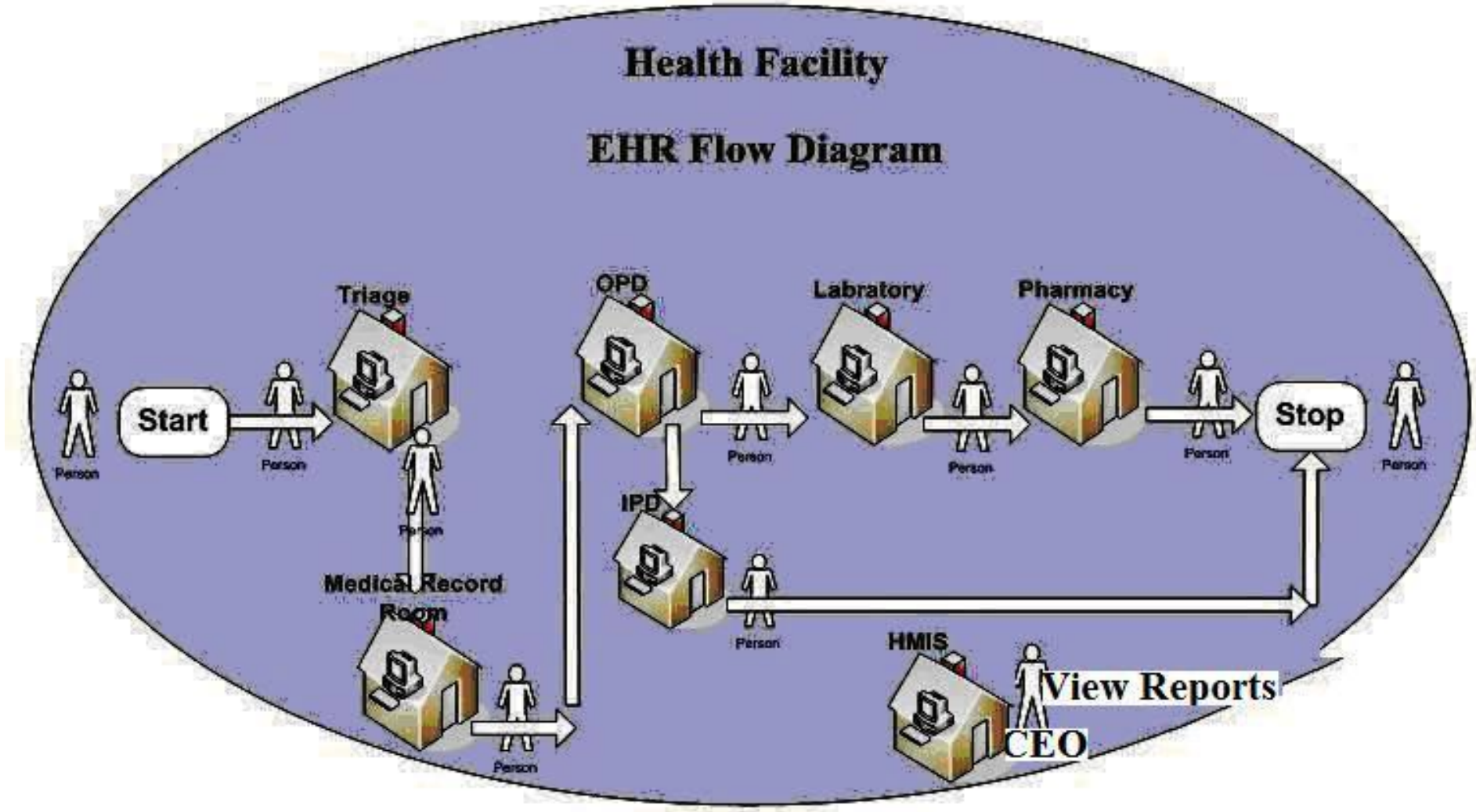
Data Transport

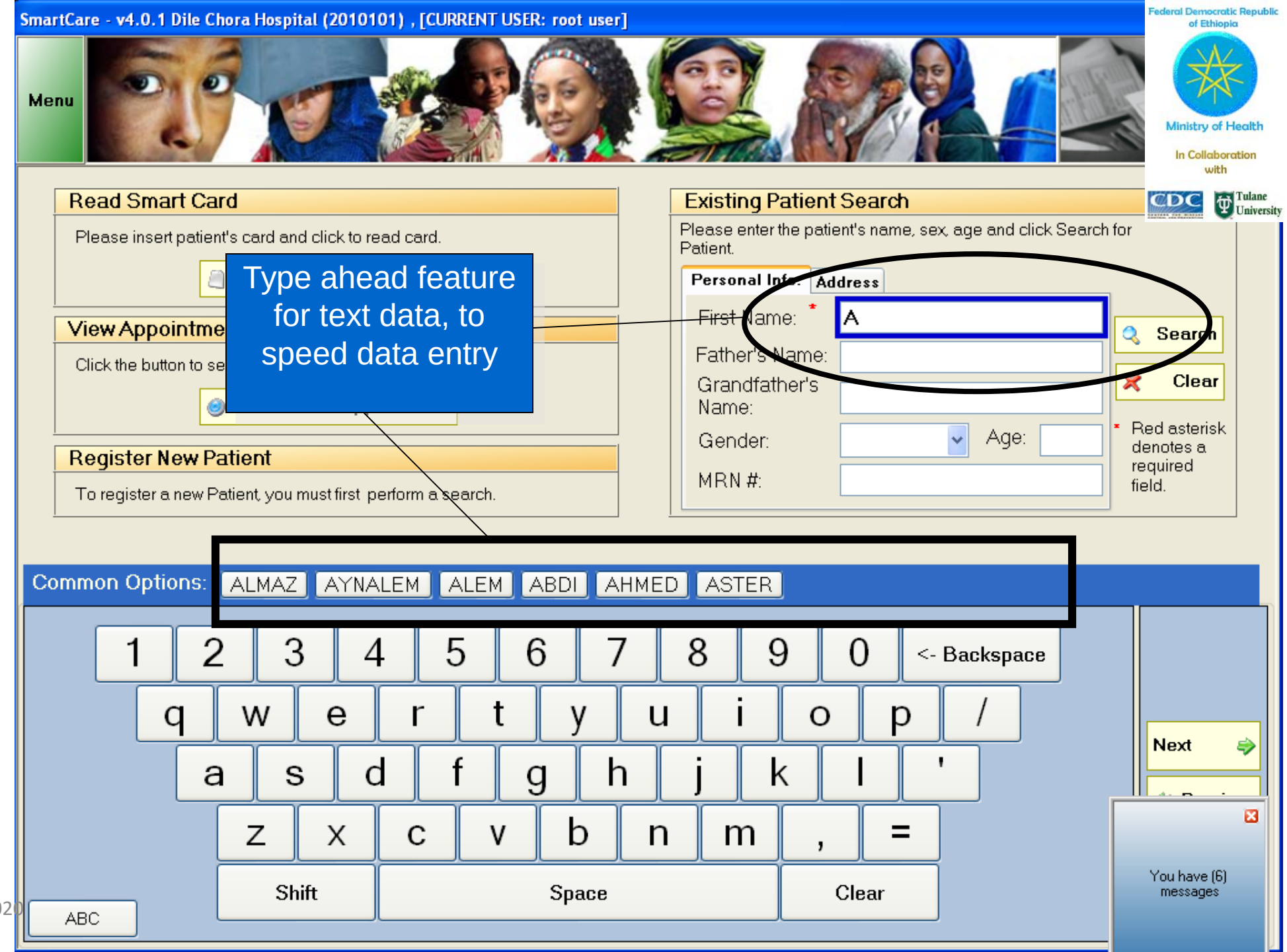
Data Entry

Data Storage

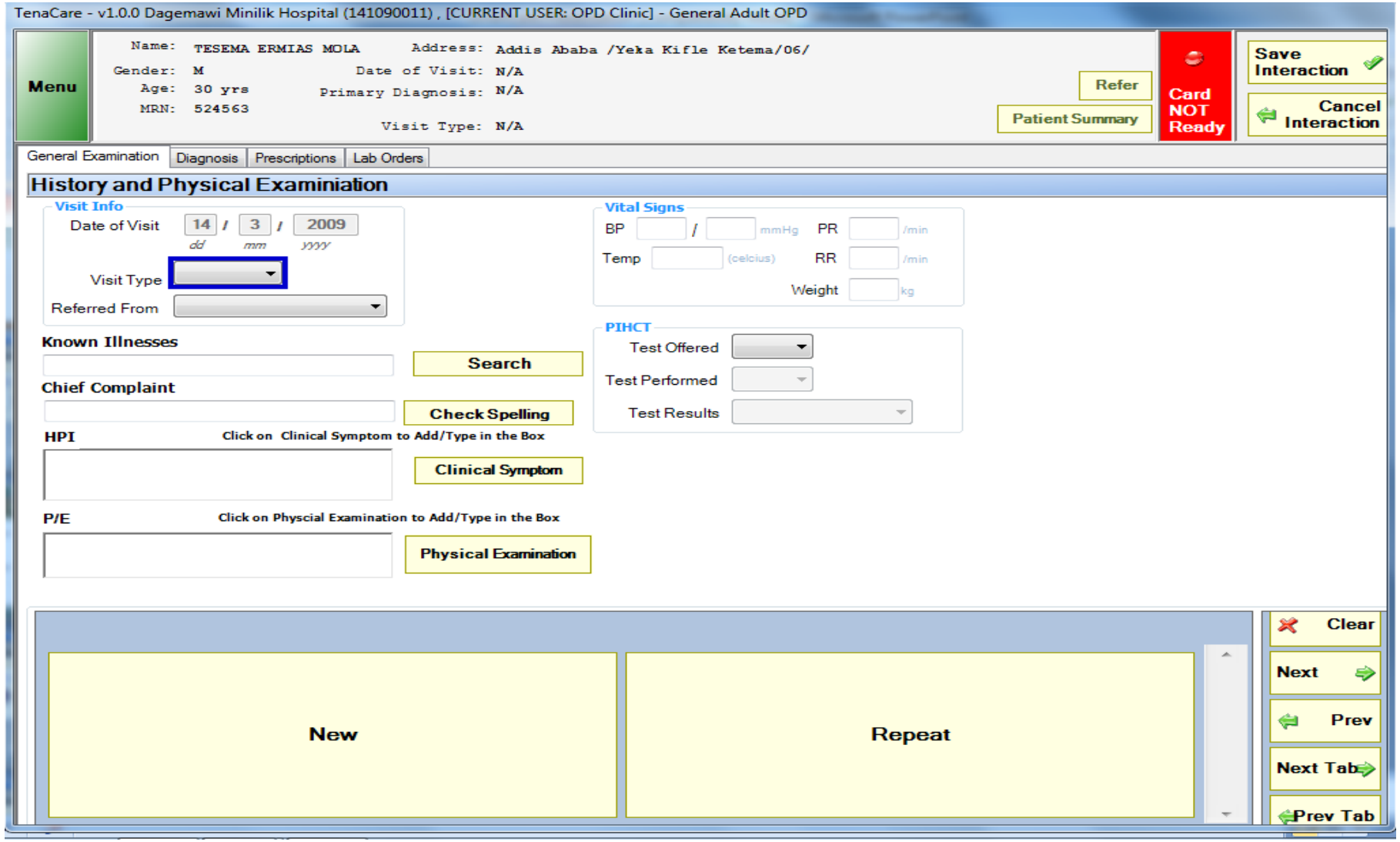
Data Use and Reporting

EMR Data Flow

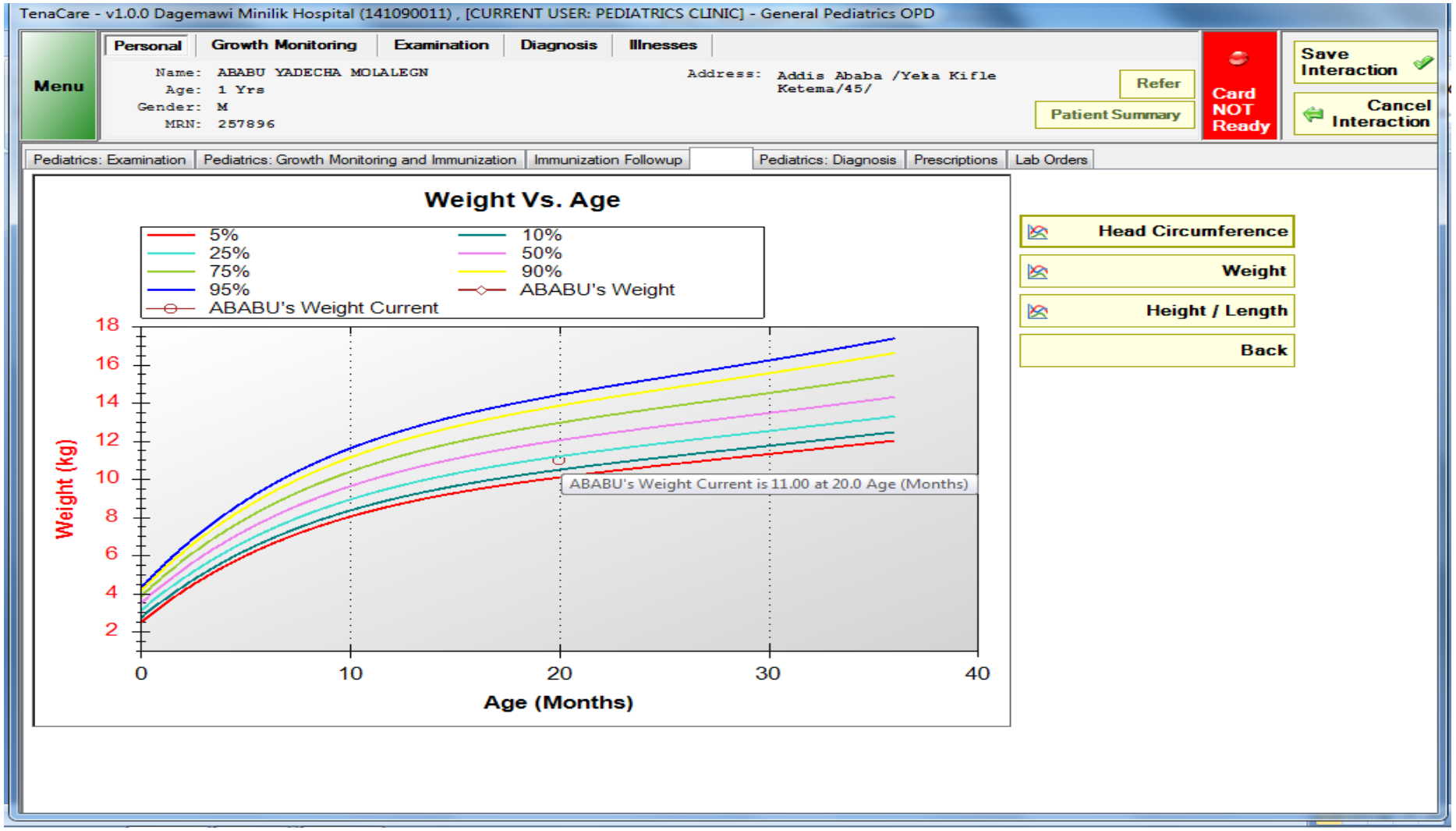



SmartCare - v4.0.1 Dile Chora Hospital (2010101) , [CURRENT USER: root user]
Menu
Federal Democratic Republic of Ethiopia
Ministry of Health
In Collaboration with
CDC
Tulane University
Read Smart Card
Please insert patient's card and click to read card.
View Appointme
Click the button to se
Register New Patient
To register a new Patient, you must first perform a search.
Type ahead feature for text data, to speed data entry
Existing Patient Search
Please enter the patient's name, sex, age and click Search for Patient.
Personal Info.
Address
First Name:
A
Father's Name:
Grandfather's Name:
Gender:
Age:
MRN #:
Search
Clear
Red asterisk denotes a required field.
Common Options:
ALMAZ
AYNALEM
ALEM
ABDI
AHMED
ASTER
1 2 3 4 5 6 7 8 9 0 <- Backspace
q w e r t y u i o p /
a s d f g h j k l '
z x c v b n m , =
Shift
Space
Clear
ABC
Next
You have (6) messages

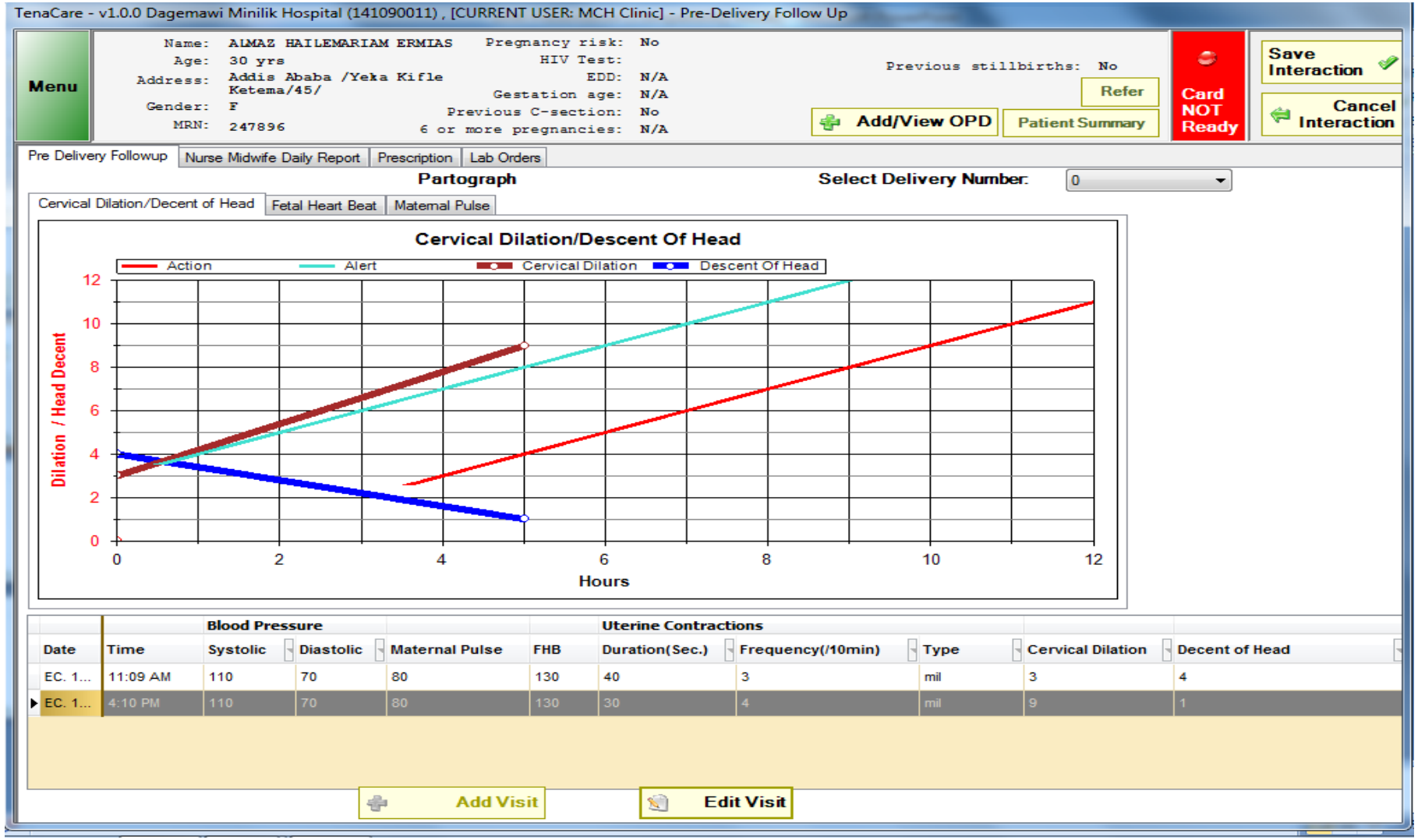
General Examination Page



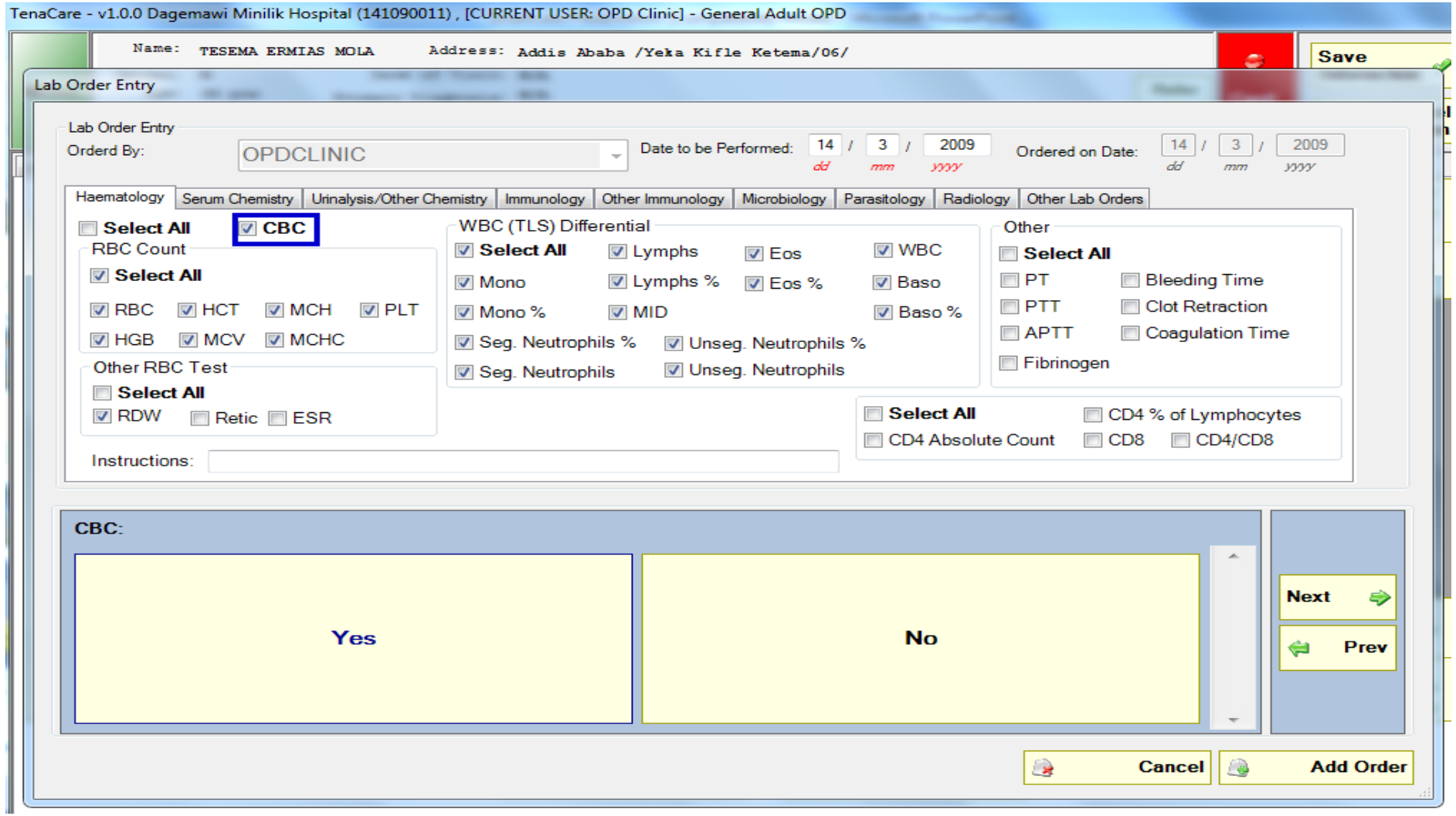
Growth Monitoring and Immunization



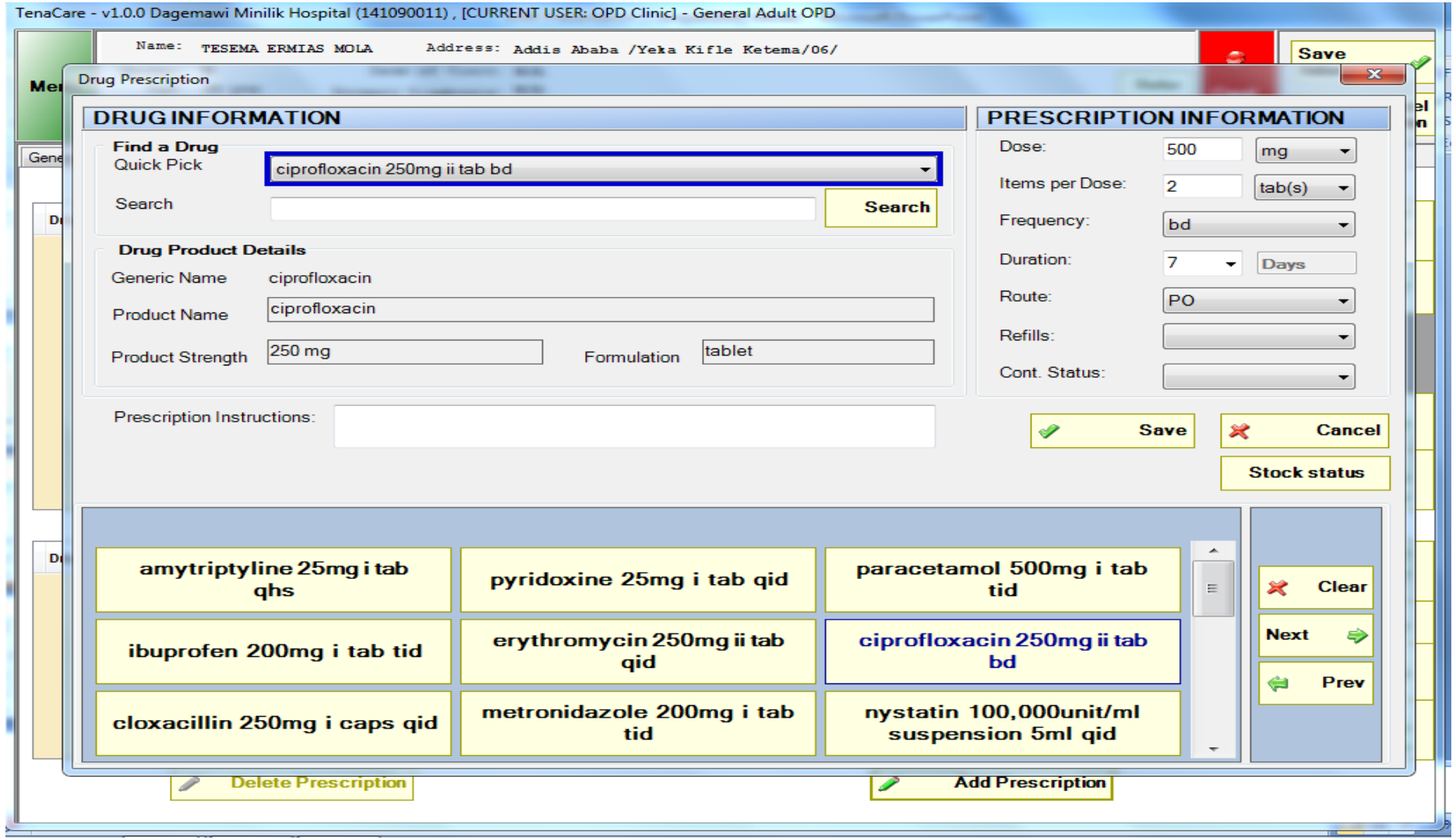
Partograph


TenaCare - v1.0.0 Dagemawi Minilik Hospital (141090011) , [CURRENT USER: MCH Clinic] - Pre-Delivery Follow Up
Menu
Name: ALMAZ HAILEMARIAM ERMIAS
Age: 30 yrs
Address: Addis Ababa /Yeka Kifle Ketema/45/
Gender: F
MRN: 247896
Pregnancy risk: No
HIV Test:
EDD: N/A
Gestation age: N/A
Previous C-section: No
6 or more pregnancies: N/A
Previous stillbirths: No
Refer
Add/View OPD
Patient Summary
Card NOT Ready
Save Interaction
Cancel Interaction
Pre Delivery Followup
Nurse Midwife Daily Report
Prescription
Lab Orders
Partograph
Select Delivery Number: 0
Cervical Dilation/Decent of Head
Fetal Heart Beat
Maternal Pulse
Cervical Dilation/Descent Of Head
Action
Alert
Cervical Dilation
Descent Of Head
Dilation / Head Decent
Hours
Blood Pressure
Uterine Contractions
Date
Time
Systolic
Diastolic
Maternal Pulse
FHB
Duration(Sec.)
Frequency(/10min)
Type
Cervical Dilation
Decent of Head
EC. 1...
11:09 AM
110
70
80
130
40
3
mil
3
4
EC. 1...
4:10 PM
110
70
80
130
30
4
mil
9
1
Add Visit
Edit Visit

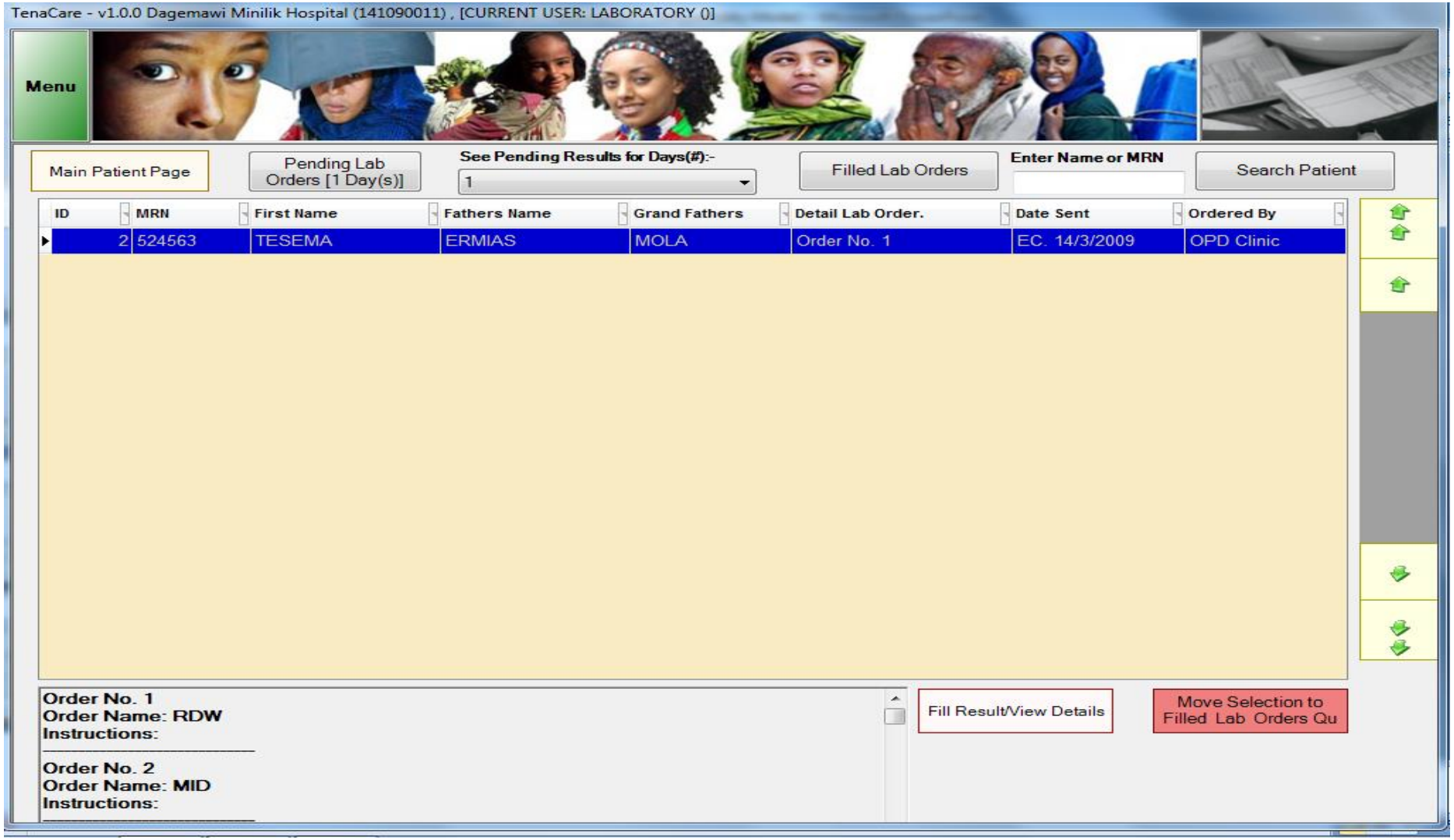
Lab Request Form



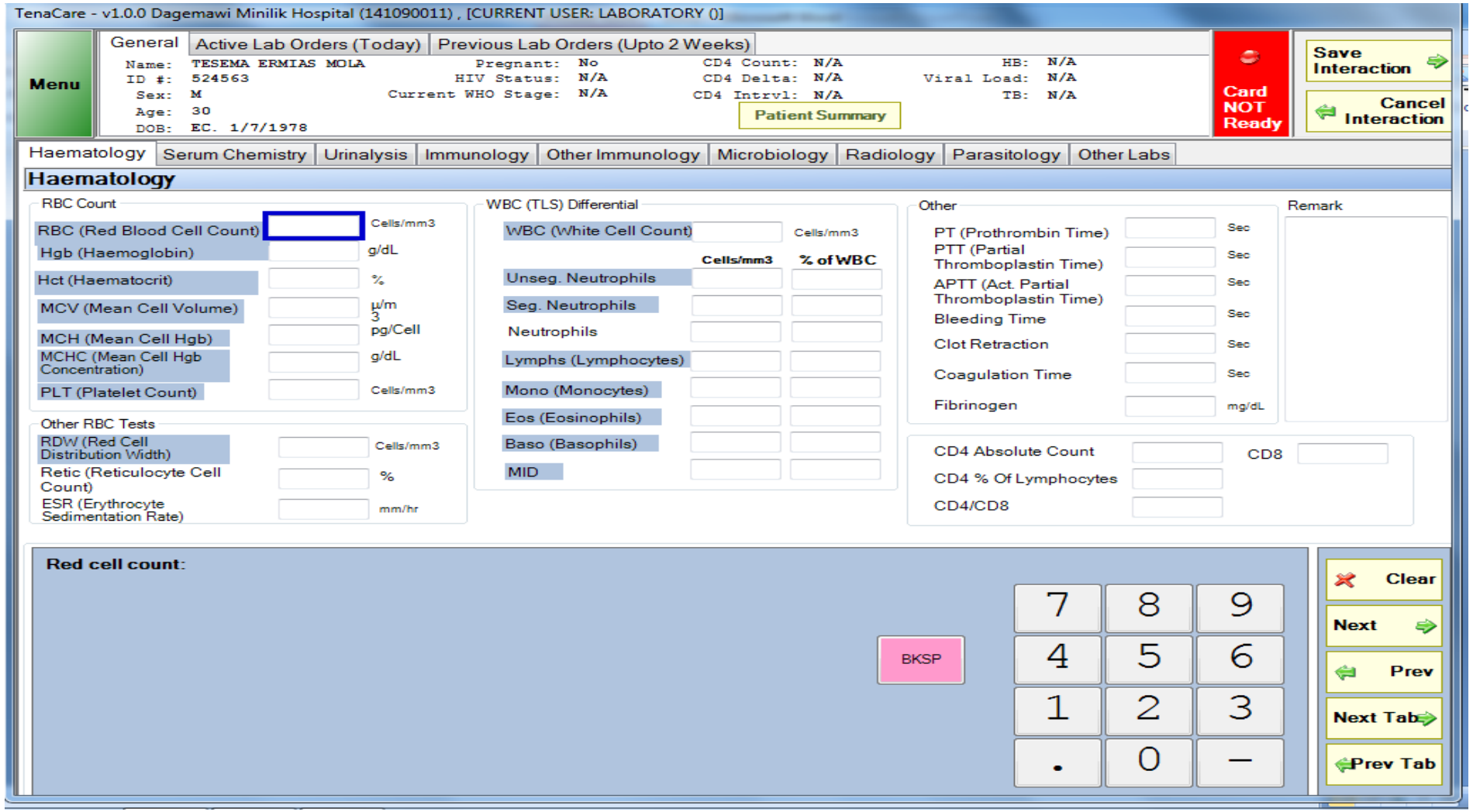
Prescribe Medication



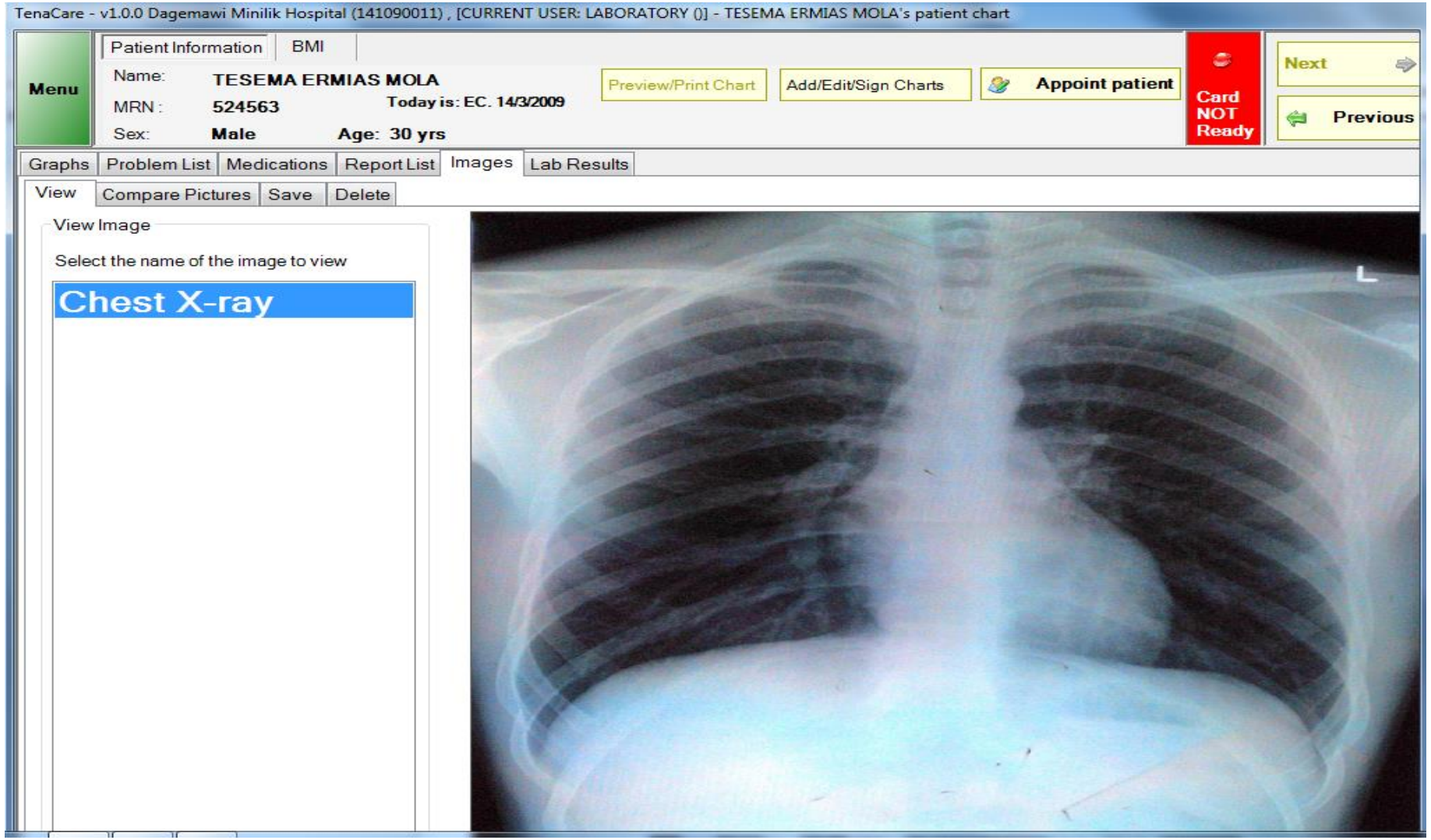
Fill Lab Orders



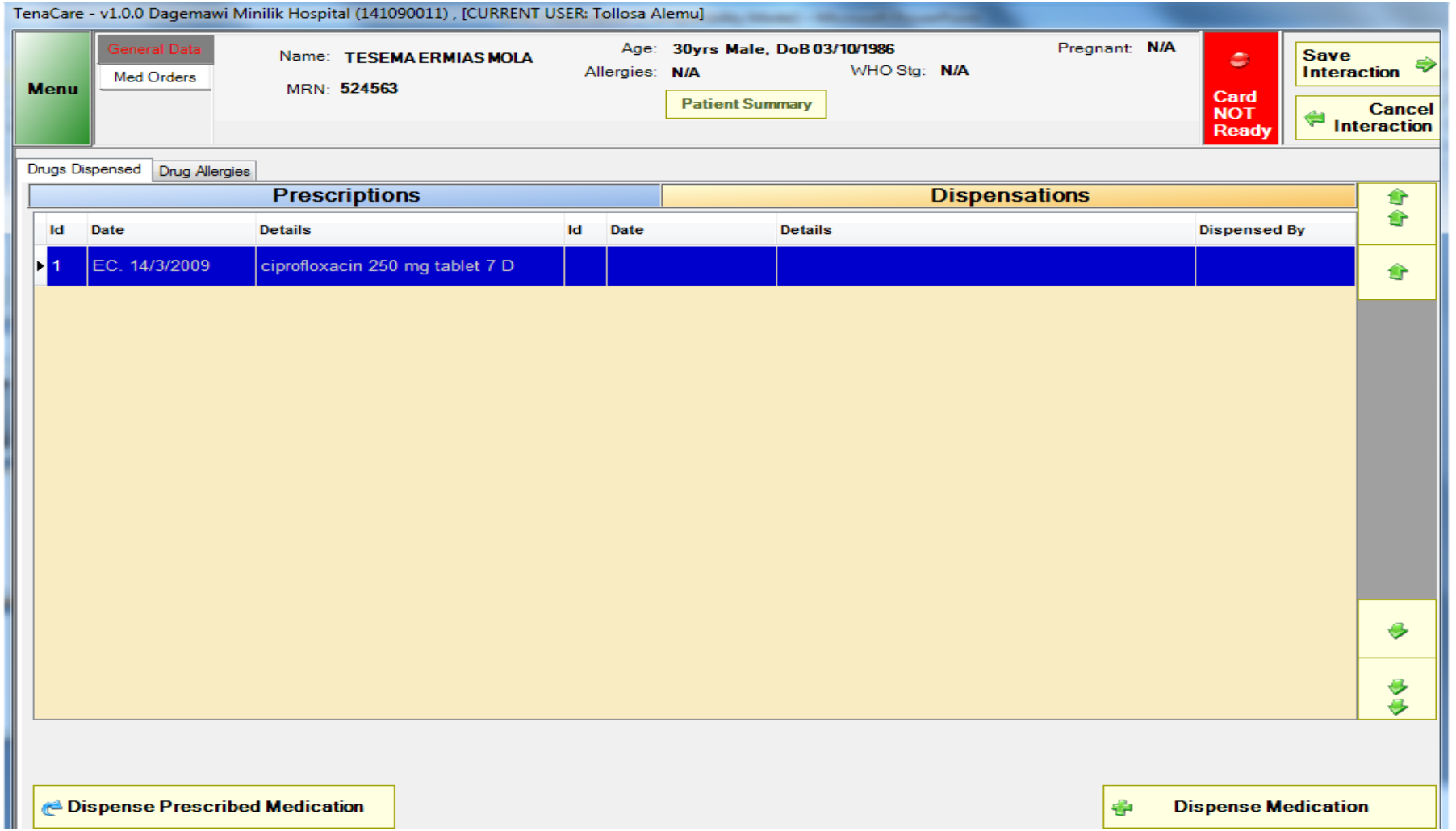
Fill Lab Orders



Fill Lab Orders



Dispense Medication



Why TenaCare chosen as a Solution ?

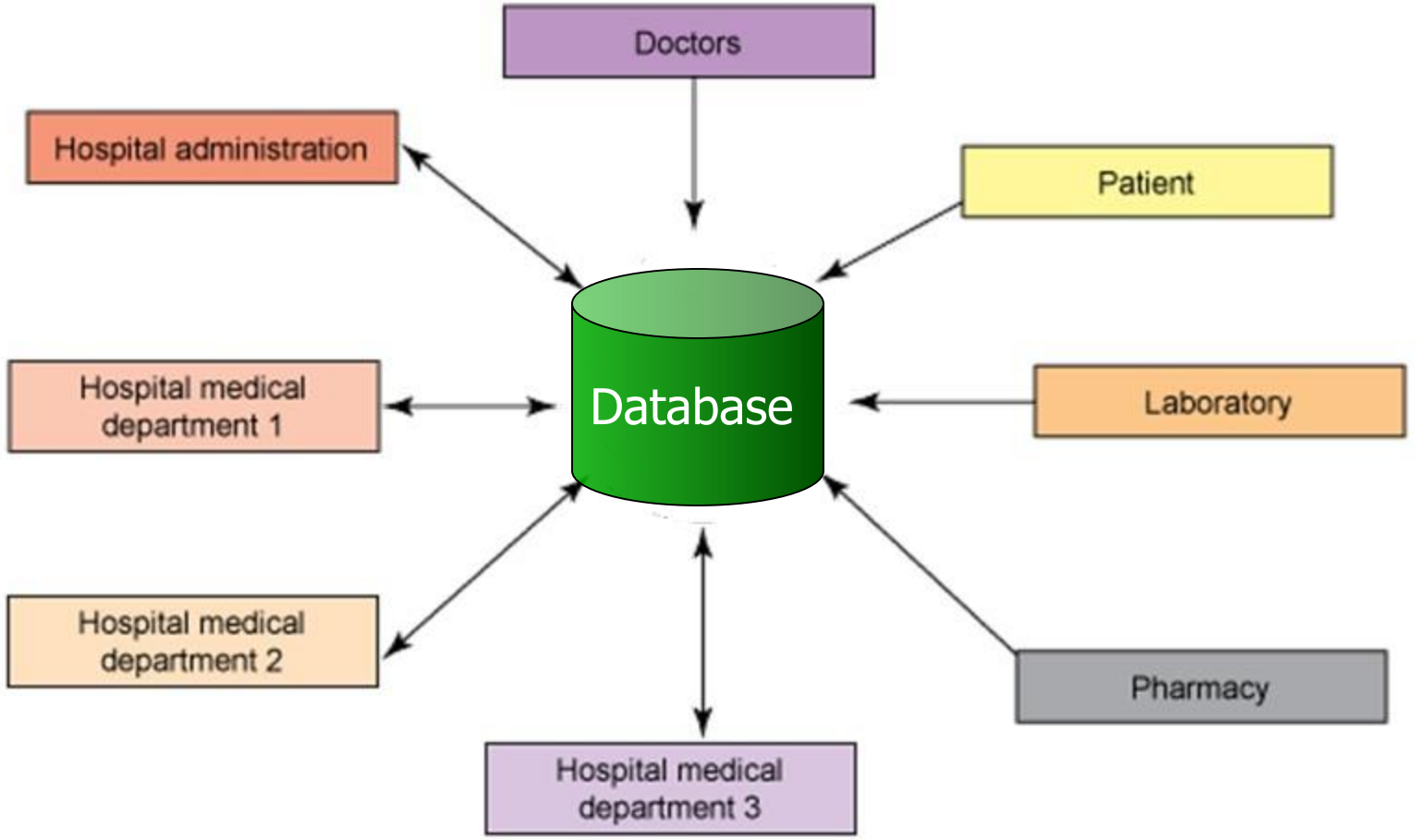
Data Transport

Data Entry

Data Storage

Data Use and Reporting

Centralized Patient Data Storage



Why TenaCare chosen as a Solution ?

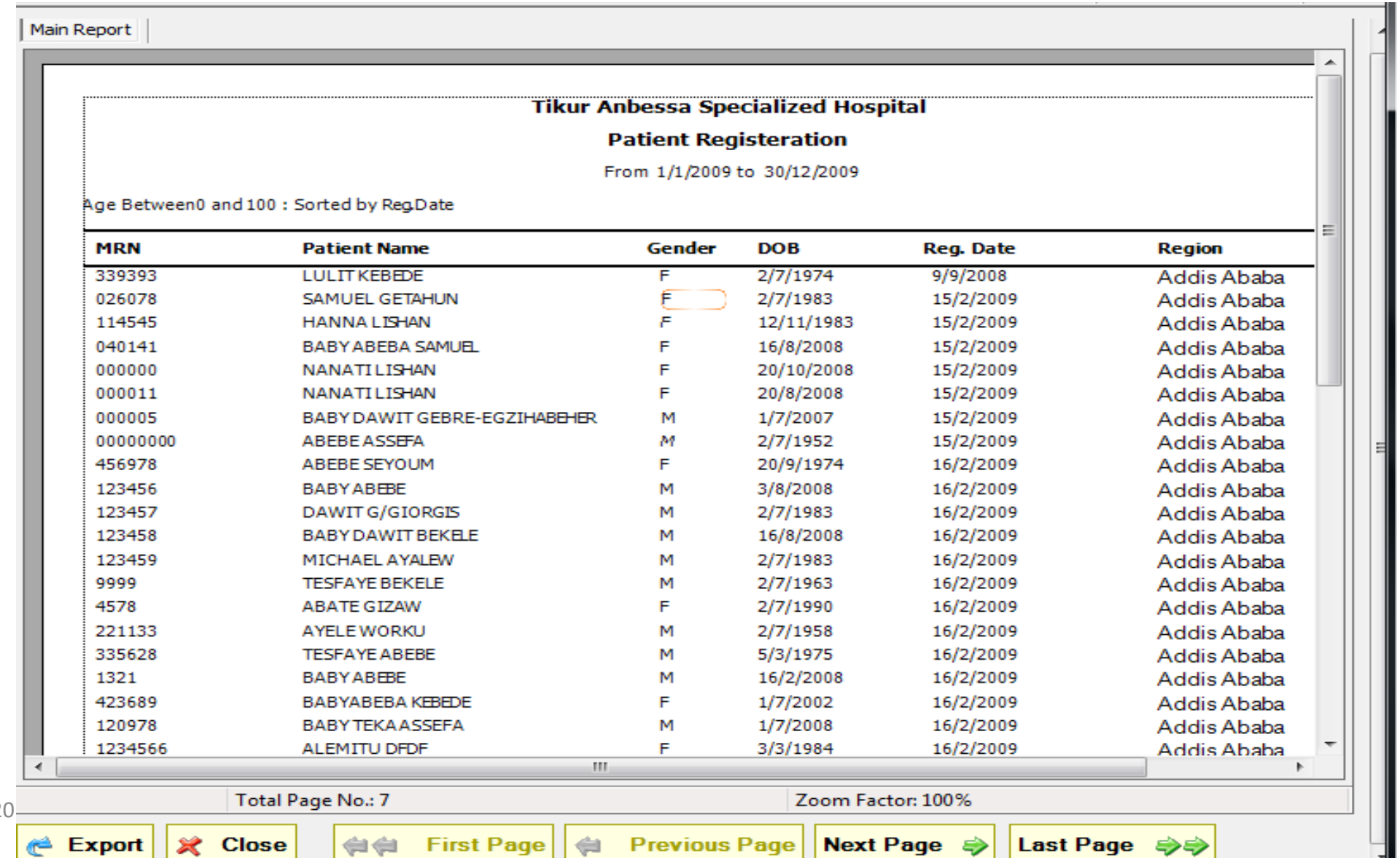
Data Transport

Data Entry

Data Storage

Data Use and Reporting

Patient Registration (Sample Data)



Sample Patients Diagnosis Information (Exported into Excel)

Tikur Anbessa Specialized Hospital

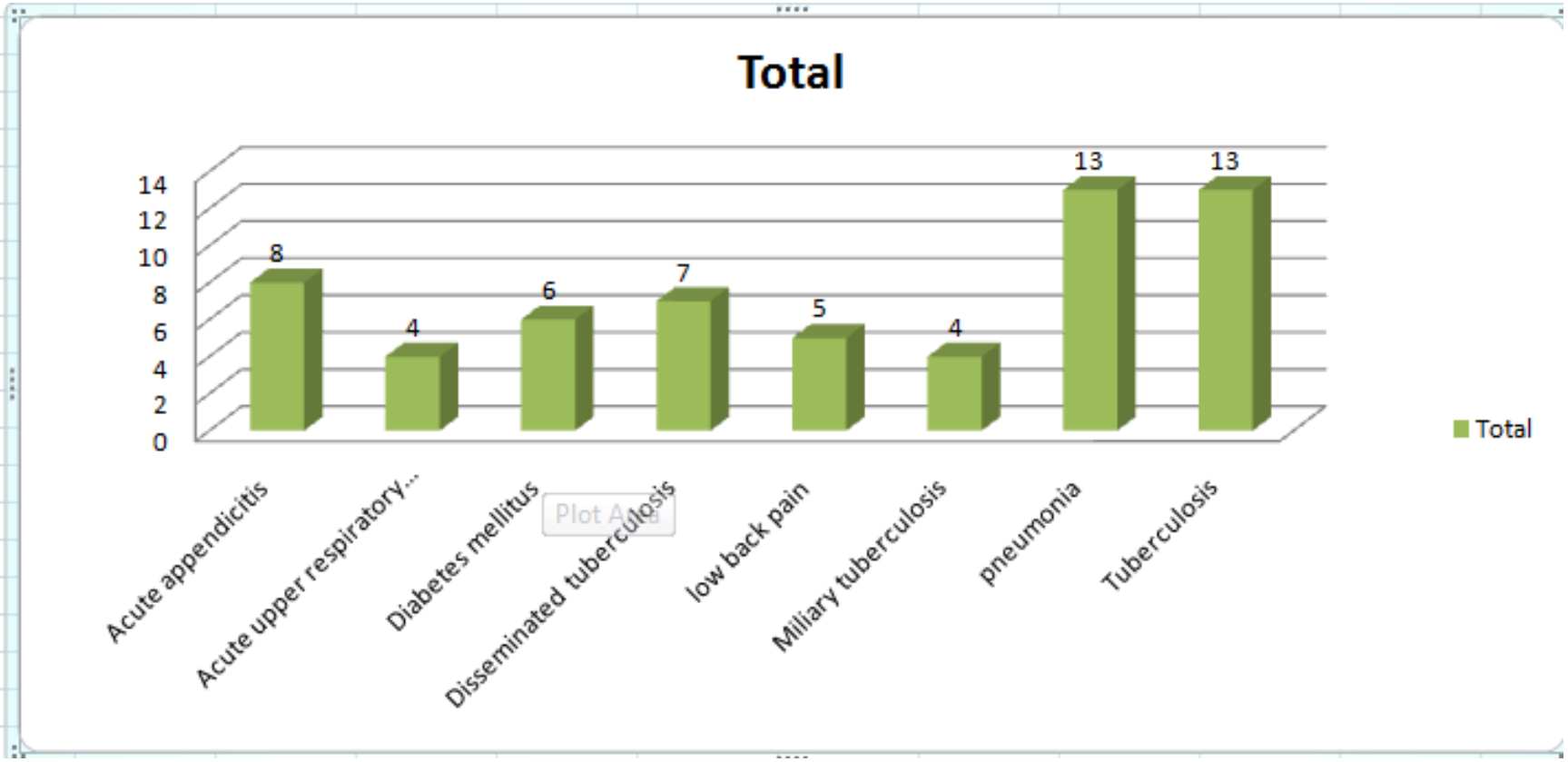
OPD Visit

From 1/1/2009 to 30/12/2009

Age Between 0 and 100 : Sorted by MRN

MRN	Patient Name	Visit Date	Primary	Secondary Diagnosis	Region
00	BELAY BEKLE	17/2/2009	Viral hepatitis		Addis Ababa
000000	NANATI LISHAN	16/2/2009			Addis Ababa
000000	NANATI LISHAN	15/2/2009	Acute bronchiolitis		Addis Ababa
00000000	ABEBE ASSEFA	15/2/2009			Addis Ababa
000007	EMEBET ADDIS	22/2/2009	[redacted]		Addis Ababa
000100	KEBEDE TESEMA	22/2/2009	pneumonia		Addis Ababa
000101	KEDIJA JEMAL	1/3/2009			Addis Ababa
000123	GETACHEW ABERA	12/3/2009			Addis Ababa
000123	GETACHEW ABERA	12/3/2009	Cardiac, heart or myocardial failure NOS		Addis Ababa
000124	MISS X ABEBE	12/3/2009			Addis Ababa
000124	MISS X ABEBE	12/3/2009			Addis Ababa
0002000	ABEBE BALCHA	22/2/2009	Acute appendicitis		Addis Ababa
0002000	ABEBE BALCHA	22/2/2009			Addis Ababa
000212	ASRADE ABATE	23/2/2009	Pneumonia		Addis Ababa
000212	ASRADE ABATE	23/2/2009	Pneumonia		Addis Ababa
000212	ASRADE ABATE	23/2/2009	Nondisplaced fracture of anterior column [iliopubic] of unspecified acetabulum	Electrical burn	Addis Ababa
000213	ASRADE ABATE	23/2/2009	Pneumonia		Addis Ababa
00025	BEWKETU DESALEGN	23/2/2009	Acute appendicitis		Addis Ababa
000453	ASRADE ABATE	22/2/2009	Pneumonia		Addis Ababa
001234	RAHMA JEMAL	21/2/2009	Tuberculosis		Addis Ababa

Sample Patients Diagnosis Information



OPD Register

OPD ABSTRACT REGISTER FOR HEALTH CENTERS / CLINICS / HOSPITALS

Identification						Diagnosis				Provider Initiated HIV Counselling and Testing		
Serial No. (1)	Service Date (DD/MM/YY) (2)	MRN (3)	Age - In months (M) if under 1 year or in days (D), if under 1 month (4)	Sex (M/F) (5)	Woreda (6)	Primary Diagnosis	New (8)	Repeat (9)	Referral to (10)	HIV Test Offered (11)	HIV Test Performed (12)	HIV Test result (13)
1	11/14/2016	7147	70	M		Urban yellow fever	New			Yes	Yes	N
2	11/2/2016	00025	30	M		Acute appendicitis	New			Yes	Yes	I
3	11/8/2016	061221	28	F			New			Yes	Yes	I
4	11/3/2016	001270	35	M		Pneumonia	New			Yes	Yes	I
5	10/29/2016	998818	30	F			New			Yes	Yes	I
6	10/29/2016	998818	30	F			New			Yes	Yes	I
7	11/9/2016	622886	36	M		Atopic dermatitis	New			Yes	Yes	N
8	11/21/2016	808081	30	F			New			Yes	Yes	I
9	11/9/2016	333517	25	M			New			Yes	Yes	N
10	11/8/2016	455781	30	M			New			Yes	Yes	I
11	11/21/2016	018500	29	M		low back pain	New			Yes	Yes	N
12	11/21/2016	018500	29	M		Cardiac infarction	New			Yes	Yes	I
13	11/8/2016	101011	28	F			New			Yes	Yes	I
14	11/8/2016	122106	30	F			New			Yes	Yes	I
15	11/24/2016	589635	34	M		Status asthmaticus	New			Yes	Yes	N
16	11/23/2016	589635	34	M		BPH (Benign prostatic	New			Yes	Yes	N
17	11/14/2016	151525	65	M			New			Yes	Yes	I
18	11/5/2016	445	25	F			New			Yes	Yes	I
19	11/14/2016	707396	28	M		Acute appendicitis	New			Yes	Yes	N
20	10/26/2016	4578	18	F		Pneumonia	New			Yes	Yes	I

Morbidity Summary

Tikur Anbessa Specialized Hospital

Morbidity Summary

From 1/1/2009 to 30/12/2009

PRIMARY DIAGNOSIS	COUNT
Pneumonia	13
Tuberculosis	13
Acute appendicitis	8
Disseminated tuberculosis	6
Low back pain	5
Miliary tuberculosis	4
Benign intracranial hypertension	2
Cardiac infarction	2
Chronic obstructive pulmonary disease (COPD)	2
Diabetes mellitus	2
Acute miliary tuberculosis of a single specified site	2
Urinary tract infection (UTI)	2
Viral hepatitis	2
Yellow fever	2

Selam Health Center

Chapter 8. Clinical Information System

Patient Monitoring systems

- It is a continuous measurement of patient parameters such as heart rate and rhythm, respiratory rate, blood pressure, blood-oxygen saturation, and many other parameters have become a common feature of the care of critically ill patients.
- it is used for monitoring physiological signals including Electrocardiograph (ECG), Respiration , Invasive and Non-Invasive Blood Pressure, Oxygen Saturation in Human Blood (SpO2), Body Temperature, ...

Chapter 8. Clinical Information System

Clinical Decision Support System (CDSS)

- It is an application that analyzes data to help healthcare providers make decisions and improve patient care.
- It is any computer program designed to help health professionals make clinical decisions
- Categories:
  - Generating alerts and reminders
  - Diagnostic assistance
  - Therapy critiquing and planning
  - Image recognition and interpretation

Chapter 8. Clinical Information System

Functions of CDSS

- **Administrative** - it must be able to support clinical coding and documentation, procedures and referrals of the medical center
- **Managing clinical complexity and details** - It keeps patients on research and chemotherapy protocols as clinical experts always did. It tracks patient orders, referrals follow-up the status of patient and preventive care after prescription.
- **Cost control** - by avoiding any duplication of process, document or any unnecessary lab test and to monitor medication orders to confirm any incorrect places which might be a direct harm to particular medical center's financial.
- **Decision support** - mean to support clinical diagnosis and treatment plan processes and promoting use of best practices, condition-specific guidelines, and population-based management

Chapter 9. Information retrieval & EBM

- Info is the foundation for:
  - Research,
  - Knowledge, and
  - Clinical practice
- Search tools
  - **Search engines**: a web search engine is a software system that is designed to search for info on the www.
  - It is important to filter info from over 8 billion web pages available within seconds.
    - ❖Google, Yahoo,
    - ❖Google scholar,
  - **Databases**
    - ❖PubMed,
    - ❖Gateway,
    - ❖HINARI,
    - ❖Scopus,
    - ❖SCIMAGO,..

Chapter 9. Information retrieval & EBM

Search Engine

- A program that searches documents for specified keywords and returns a list of documents where the keywords were found
- On the WWW, utilizes automated robotics to gather and index information
- Examples
  - ❖Google: www.google.com
  - ❖Google Scholar (more academic): www.scholar.google.com
  - ❖Yahoo: www.yahoo.com
  - ❖Bing: www.bing.com

Chapter 9. Information retrieval & EBM

Searching techniques

- In order to conduct a thorough search, you may need to use a combination of operators and terms
- Researching within databases is an interactive process that is part art and science
- Use of operators e.g. quotation mark[“…”] for matching of text, Booleans [and, not, or], search terms and keywords results in highly efficient research
- This research guide will help you construct search queries in the following databases:
  - ✓Medline
  - ✓PumMed
  - ✓Web of science
  - ✓….

Chapter 9. Information retrieval & EBM

During search formulation think of:

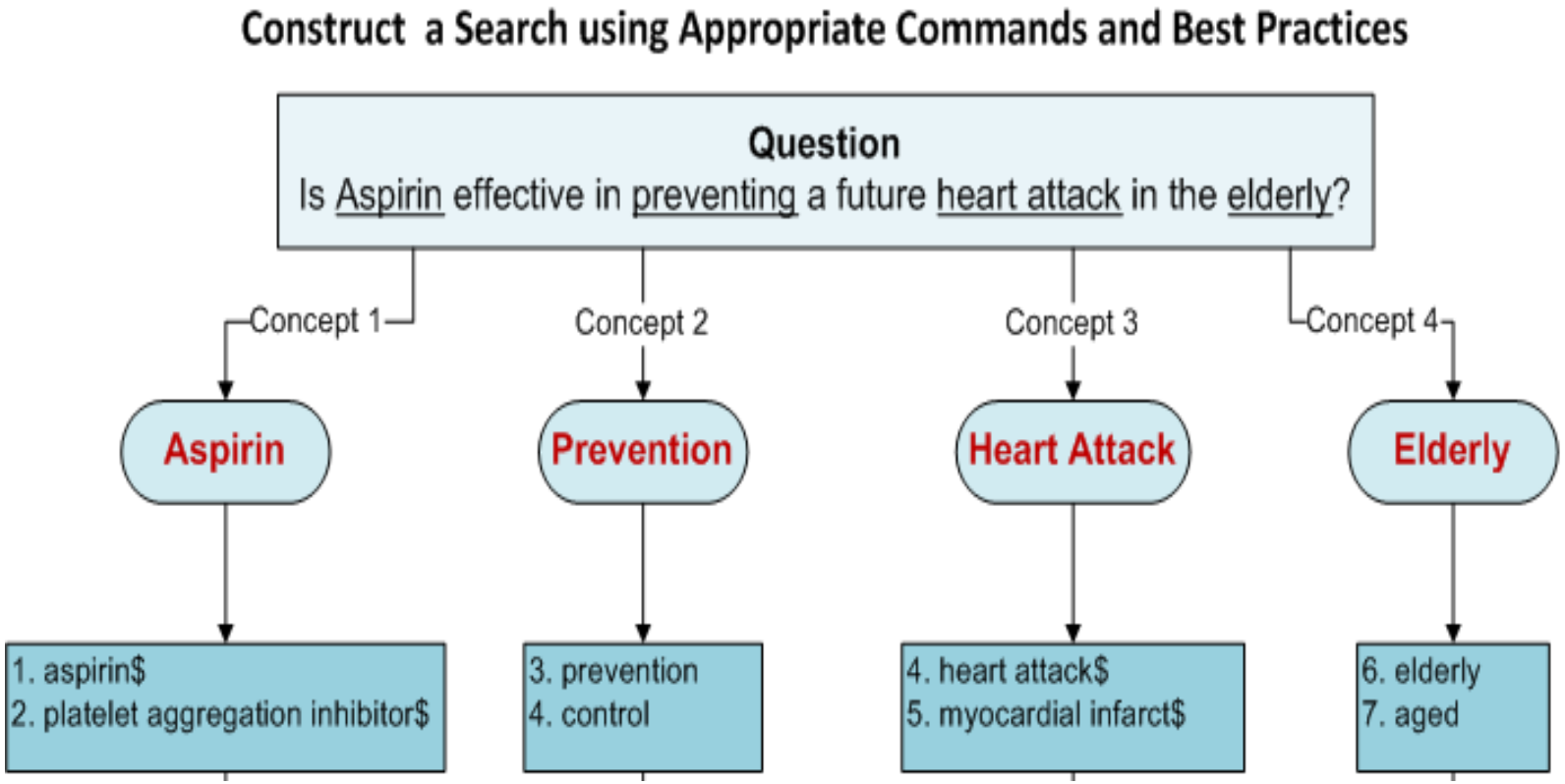
- Synonyms - appearance/morphology
- Phrases – “soft drink ”
- Acronyms
- Broader, narrower and related terms
- Scientific Vs common names
- spelling differences in UK English and US English words?

Chapter 9. Information retrieval & EBM

Use search tools: Electronic search tools all function slightly differently and may use:

- Boolean operators- using OR, AND, NOT
- Truncation - an asterisk * or a dollar sign $ to expand the search. Ex. exercis* → exercise OR exercising OR exercises
- wildcard functions- (a ?) allow you to include both British English spelling and American English spelling. Ex. P?diatric, colo?r,
- Phrase searching- “soft drink”

Chapter 9. Information retrieval & EBM



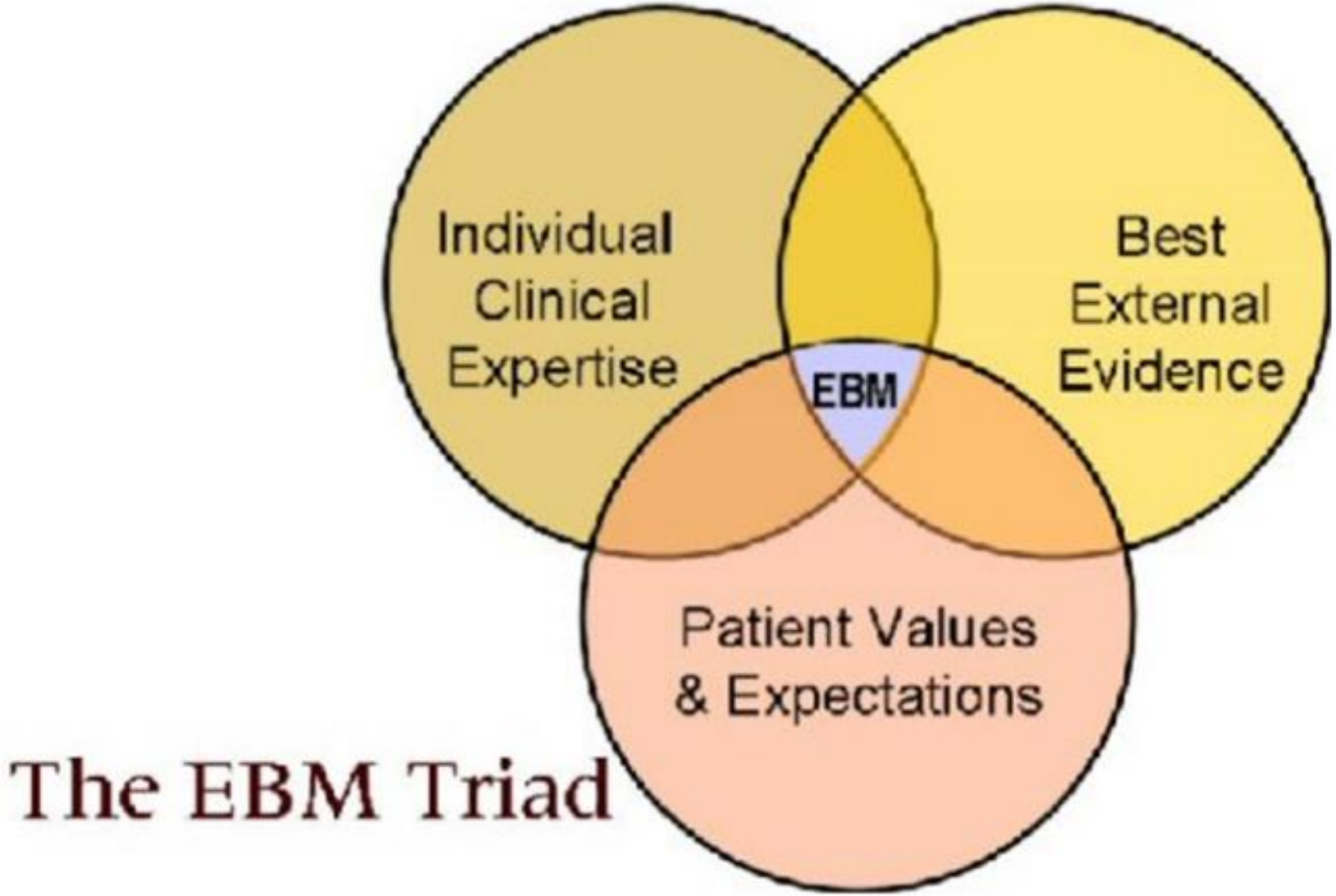
(asprin$ OR platelet aggregation inhibitor$) AND (prevention OR contr0l) AND (heart attack$ OR myocardial infarct$) AND (elderly OR aged)

Chapter 9. Information retrieval & EBM

Evidence-based Medicine (EBM)

- EBM is the process of systematically reviewing, appraising and using clinical research findings to aid the delivery of optimum clinical care to patients.
- “The conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients” (Sackett et al., 1996).
- The practice of EBM is the integration of individual clinical expertise with the best available external clinical evidence from systematic research (Sackett et al., 1996).

Chapter 9. Information retrieval & EBM

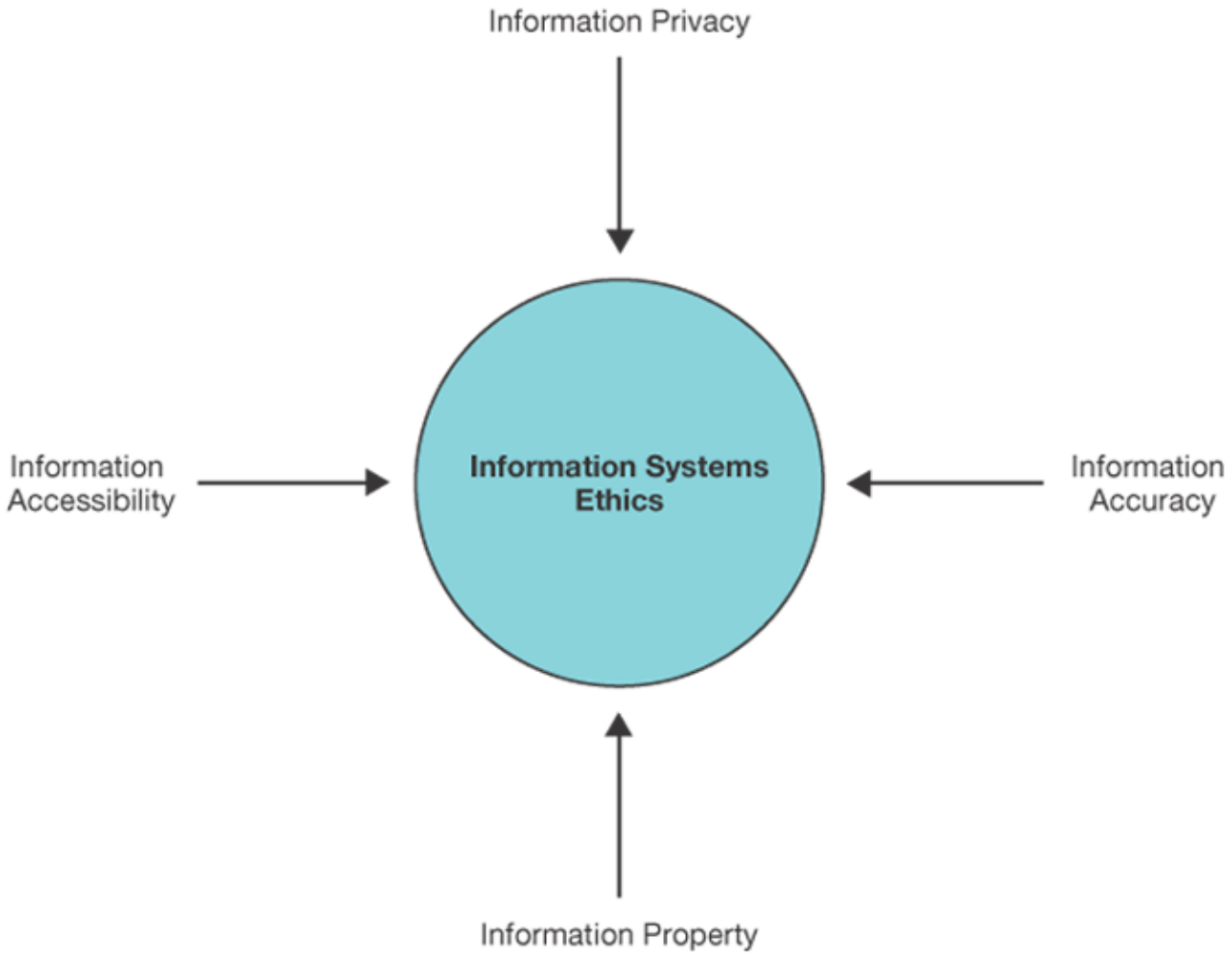


Chapter 10. Information and Computer ethics

- **Computer Literacy -** Knowing how to use a computer
- **Digital Divide -** That gap between those with computer access and those who don’t have it
- **Computer Ethics -** Standards of conduct as they pertain to the use of information systems
- **Privacy -** Protecting one’s personal information
- **Identity theft -** Stealing of another’s social security number, credit card number, or other personal information
- **Information accuracy** - Deals with authentication and fidelity of information
- **Information property** - Deals with who owns information about individuals and how information can be sold and exchanged
- **Information accessibility** - Deals with what information a person has the right to obtain about others and how the information can be used

Chapter 10. Information and Computer ethics

Figure 9.5 Information privacy, accuracy, property, and accessibility are central to most ethical concerns about information technology.



Chapter 10. Information and Computer ethics

Computer Crime

- It is the act of using a computer to commit an illegal act on authorized and unauthorized computer access
- Examples
  - Stealing or compromising data
  - Gaining unauthorized computer access
  - Violating data belonging to banks
  - Intercepting communications
  - Threatening to damage computer systems
  - Disseminating viruses

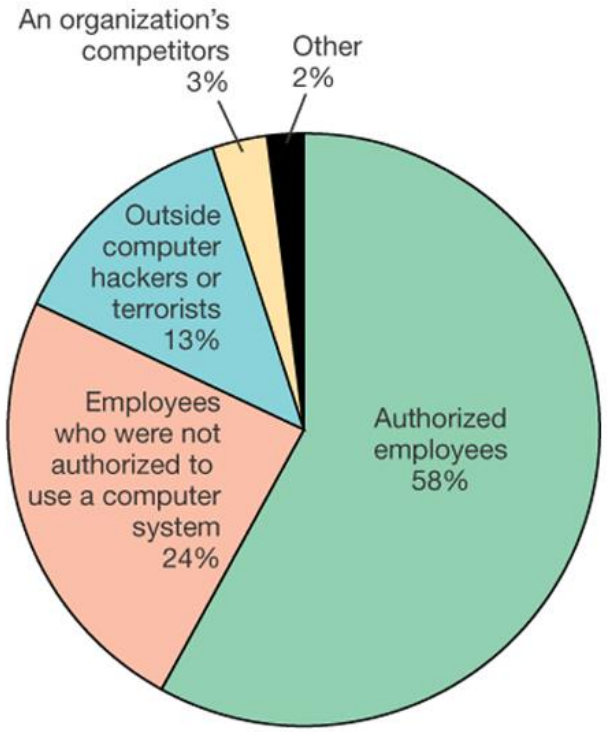
Chapter 10. Information and Computer ethics

Hacking and Cracking

- Hacker – one who gains unauthorized computer access, but without doing damage
- Cracker – one who breaks into computer systems for the purpose of doing damage

Who commits computer crime?

Figure 9.10 Who makes unlawful intrusions into computer systems.



Chapter 10. Information and Computer ethics

Types of computer crime

- Data diddling: modifying data
- Salami slicing: skimming small amounts of money
- Phreaking: making free long distance calls
- Cloning: cellular phone fraud using scanners
- Carding: stealing credit card numbers online
- Piggybacking: stealing credit card numbers by spying
- Social engineering: tricking employees to gain access
- Dumpster diving: finding private info in garbage cans
- Spoofing: stealing passwords through a false login page

Chapter 10. Information and Computer ethics

Software piracy

- **North America – 25%**
- **Western Europe – 34%**
- **Asia / Pacific – 51%**
- **Mid East / Africa – 55%**
- **Latin America – 58%**
- **Eastern Europe – 63%**

Chapter 10. Information and Computer ethics

Computer viruses and destructive code

- Virus – a destructive program that disrupts the normal functioning of computer systems
- Types:
  - Worm: usually does not destroy files; copies itself
  - Trojan horses: Activates without being detected; does not copy itself
  - Logic or time bombs: A type of Trojan horse that stays dormant for a period of time before activating
- Computer Security – precautions taken to keep computers and the information they contain safe from unauthorized access

Chapter 10. Information and Computer ethics

Computer Security…

Recommended Safeguards

- Make backups!
- Only allow access to key employees
- Change passwords frequently
- Keep stored information secure
- Use antivirus software
- Hire trustworthy employees

Chapter 10. Information and Computer ethics

- **Encryption** – the process of encoding messages before they enter the network or airwaves, then decoding them at the receiving end of the transfer
- **Internet Security** - Firewall – hardware and software designed to keep unauthorized users out of network systems
- **Virus prevention -**
  - Install antivirus software
  - Make backups
  - Avoid unknown sources of shareware
  - Delete e-mails from unknown sources
  - If your computer gets a virus…

Chapter 10. Information and Computer ethics

How to maintain your privacy online

- Choose Web sites monitored by privacy advocates
- Avoid “cookies”
- Visit sites anonymously
- Use caution when requesting confirming e-mail

Thank You For Your Attention!