

UNIT-III

APPLICATION OF COMPUTERS IN PHARMACY

Points to be covered in this topic

□ INTRODUCTION

- ❖ Data storage and retrieval
- ❖ Pharmacokinetics
- ❖ Mathematical model in drug design
- ❖ Hospital and clinical pharmacy
- ❖ Electronic prescribing and discharge systems
- ❖ Barcode medicine identification
- ❖ Automated dispensing of drugs
- ❖ Mobile technology and adherence monitoring

□ DIAGNOSTIC SYSTEM

- ❖ Lab-diagnostic system
- ❖ Patient monitoring system
- ❖ Pharma information system

APPLICATION OF COMPUTERS IN PHARMACY

❑ INTRODUCTION

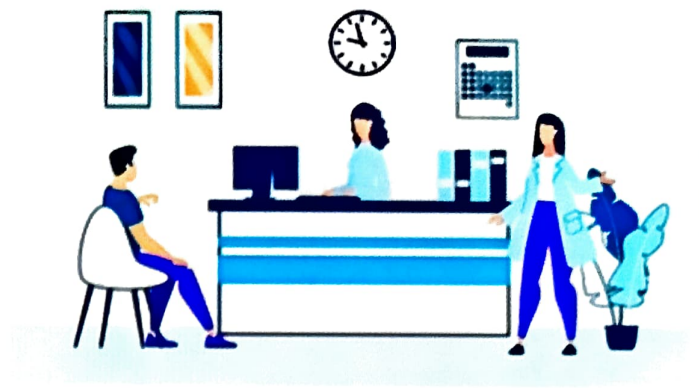
- Computers in pharmacy are used for the **information of drug data, records and files, drug management** (creating, modifying, adding and deleting data in patient files to generate reports), business details.
- The field of pharmacy is awe fully **benefitted by use of computers** getting and **comparing the information to yield an accurate study**.
- In field of operation like **new drug discovery, drug design analysis, and manufacturing of drugs** and in hospital pharmacy computers are widely used.
- The **drug discovery, designing, manufacturing and analysis** have become virtually possible only through the development of upcoming various hard wares and softwares.
- **Receiving the details, storing it and processing it and its dissemination** is the main role of computers and this continuous flow of information shows effective functioning of any system.



❖ DATA STORAGE AND RETRIEVAL

- **Hospital administration** computers help in **storage of data and recovery of data (retrieval)** as there would be persistent changes coming up.

- It is frequently observed in the **process of admission of patient** their clinical and nursing staff, bed, operation theatre, intensive care unit, pharmacy department, radiological services, etc.



- As soon as the patient gets admitted **computer records and reserves information like diagnosis, medication, demography, clinical information etc.**

➤ **Identification of information storage**

- ✓ It can refer to a place like a storage room where paper records are kept.
- ✓ It can also refer to a storage device such as a **computer hard disk, CD, DVD or similar device which can hold data.**

➤ **Types of storage**

- ✓ **CD/DVD, Hard drive, Pen drive, Floppy disk**

➤ **Identification of information retrieval**

- ✓ Information retrieval (IR) is the process of **obtaining information system resources that are relevant to an information need** from a collection of those resources.
- ✓ In simple words **"the tracing and recovery of specific information from stored data."**

➤ **Components of information retrieval (IR)**

The main IR components are given below.

- Database
- Search engine
- Language
- Interface

DATABASE:

- ✓ A database is **systematic collection of data**.
- ✓ They support **electronic storage and manipulation of data**. Database make data management easy.

SEARCH ENGINE:

- ✓ A program that **searches and identifies item in database** that correspond to keywords or characters specified by the user.
- ✓ Search procedure can be categorised as **basic or advance search procedure**.

LANGUAGE:

- ✓ Information relies on language when being **processed, transferred or communicated**.

Language can be of two types.

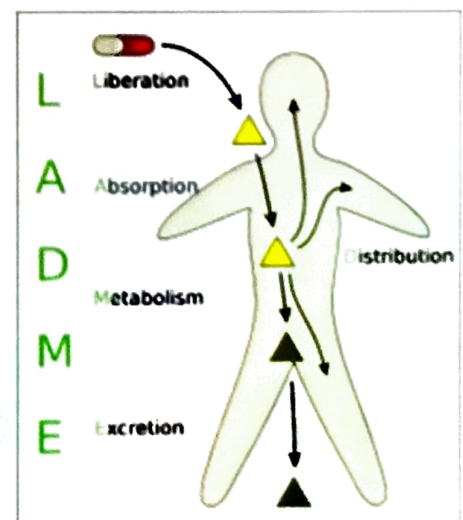
1. **NATURAL:** These languages can be easily understood and created by any user.
2. **CONTROLLED:** Controlled languages are such vocabulary languages that are typically created and maintained by a particular organization.

INTERFACE:

- ✓ In computing, **An interface is shared boundary across which two or more sperate components** of a computer system exchange information.

❖ PHARMACOKINETICS

- Pharmacokinetics is defined as the study of the **time course of drug absorption, distribution, metabolism, and excretion**.
- Clinical pharmacokinetics is the **application of pharmacokinetic principles** to the safe and effective therapeutic management of drugs.



- Computers have been used extensively in the field of pharmacokinetics as **instructional tool, in addition to simulations, data analysis, and dosage calculation.**
 - Pharmacokinetic classes are **ideal for computer-based instruction** because the **different pharmacokinetic parameters** that govern the **drug concentration-time play role in the body** can be related together.
 - This makes **graphical presentation of the drug concentration-time** play role very useful for presenting the interplay between the different pharmacokinetic parameters.
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- Computer-based pharmacokinetic simulations can be used for **educational as well as research purposes.**
 - Pharmacokinetic simulations can be used to **visualize how the change in any of the pharmacokinetic parameters can affect the drug concentration-time in the body**, which can be useful for understanding the basic pharmacokinetic concepts.
 - For research, **simulations of the gastrointestinal tract (GIT) factors that can affect drug absorption have been used to predict the absorption** of compounds with different properties.
 - Besides, simulation of the drug concentration-time in different body organs based on in vitro tissue distribution information have been used for **developing physiologically based pharmacokinetic (PBPK) models.**
 - Furthermore, simulation of the **expected drug pharmacokinetic and pharmacodynamic behaviour under different drug administration conditions** is used for guiding the design of clinical studies.

❖ MATHEMATICAL MODEL IN DRUG DESIGN

- Mathematical modelling and computer simulations are emerging technologies in **drug discovery, development and drug assessment for short- and long-term biological effects.**



- They promise to be **cheap, practical, sensitive and specific, and capture real aspects of the disease phenotype** that is accepted as clinically and biologically meaningful.
- However, existing **computer-based platforms are not capable of integrating complex nonlinear interactions of molecular, cellular, tissue, organ and system activities** that are required in drug discovery.

❖ HOSPITAL AND CLINICAL PHARMACY

- Hospital pharmacy is division of hospital which monitors on the **receiving and allotment of drugs and medicines and professional supplies, stores them and dispenses to inpatient, outpatient** and may have a manufacturing extension to manufacture pharmaceuticals and parenteral in bulk.
- Clinical pharmacy is the branch of Pharmacy where **pharmacists and pharmaconomists** provide patient care that optimizes the use of **medication and promotes health, wellness, and disease prevention.**
- **Patient record maintenance is vital job** in hospitals but with the help of computers, data can be maintained easily and also updated time to time.
- **Maintenance of stock means inventory control** can be achieved very well by using computers. For this purpose, periodic or perpetual inventory control systems maybe adapted.

Computers can play role like,

- ✓ To **detect the items** which have reached minimum order level.
- ✓ To **prepare list of items** to be purchased and their quantities.
- ✓ To **prepare purchase orders** for vendors and to avoid duplication.
- ✓ To **detect the infrequently purchased items** for possible return or elimination from pharmacy's drug supply.
- ✓ To **produce periodic summary** and purchasing and inventory control statistics.
- ✓ **Maintaining patient medical record.**
- ✓ **Drug information services.**
- ✓ **Patient monitoring.**

❖ **ELECTRONIC PRESCRIBING AND DISCHARGE (EP) SYSTEMS**

- Electronic prescribing (e-prescribing or e-Rx) is the **computer-based electronic generation, transmission, and filling of a medical prescription**, taking the place of paper and faxed prescriptions.
- E-prescribing allows a physician, pharmacist, nurse practitioner, or physician assistant **to use digital prescription software to electronically transmit a new prescription or renewal** authorization to a community or mail-order pharmacy.
- It outlines the ability to **send error-free, accurate, and understandable prescriptions** electronically from the healthcare provider to the pharmacy.
- E-prescribing is meant to **reduce the risks** associated with traditional prescription script writing.
- It is also one of the major reasons for the push for electronic medical records.



- By sharing medical prescription information, e-prescribing seeks to connect the patient's team of **healthcare providers to facilitate knowledgeable decision making.**

❖ **BARCODE MEDICINE IDENTIFICATION**

- Bar code medication administration (BCMA) is a bar code system designed by Glenna Sue Kinnick to **prevent medication errors in healthcare settings and to improve the quality and safety of medication administration.**
 - The overall goals of BCMA are to **improve accuracy, prevent errors, and generate online records of medication** administration.
 - When a nurse gives medication to a patient in a healthcare setting, the nurse can **scan the barcode on the patient's wristband on the patient to verify the patient's identity.**
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- The implementation of BCMA has shown a **decrease in medication administration errors** in the healthcare setting.
 - The nurse can then scan the bar code on medication and use software to verify that he/she is administering the **right medication to the right patient at the right dose, through the right route, and at the right time.**

❖ **AUTOMATED DISPENSING OF DRUGS**

- Automated dispensing is a pharmacy practice in which a **device dispenses medications and fills prescriptions.** The most important thing a hospital pharmacy should enforce is **patient safety.**
- **Wrong drug and wrong dose errors** are the most common errors associated with ADC use.

- Automated dispensing machines-decentralized medication distribution systems that provide **computer-controlled storage, dispensing, and tracking of medications**-have been **recommended** as one potential mechanism to improve efficiency and patient safety, and they are now widely used in many hospitals.



❖ MOBILE TECHNOLOGY AND ADHERENCE MONITORING

- Medication adherence, or taking medications correctly, is generally defined as the **extent to which patients take medication as prescribed by their doctors**.
- This involves factors such as **getting prescriptions filled, remembering to take medication on time**, and understanding the directions.
- Pharmacists have a major role in improving medication adherence in patients.
- They can confirm that patients are on the **correct medications and are not taking any other treatments/drugs that may undermine the effectiveness of important therapies**.



❑ DIAGNOSTIC SYSTEM

- Systems is a global leader of products and instruments used for diagnosing infectious diseases.
- In the industrial market, Diagnostic Systems' products are used for the testing of sterile and non-sterile pharmaceuticals and medical devices, for environmental monitoring and to detect food pathogens.



❖ LAB-DIAGNOSTIC SYSTEM

- A medical laboratory or clinical laboratory is a laboratory where clinical pathology tests are carried out on clinical specimens to **obtain information about the health of a patient to aid in diagnosis, treatment, and prevention of disease.**
- Clinical Medical laboratories are an **example of applied science**, as opposed to **research laboratories that focus on basic science**, such as found in some academic institutions.
- Medical laboratories vary in size and complexity and so offer a variety of testing services.
- More comprehensive services can be found in **acute-care hospitals and medical centres**, where 70% of clinical decisions are based on laboratory testing.
- Commercial medical laboratories operate as **independent businesses and provide testing** that is otherwise not provided in other settings due to low test volume or complexity.

❖ PATIENT MONITORING SYSTEM

- The Patient Monitoring System (PMS) is a very critical monitoring systems, it is used for monitoring physiological signals including Electrocardiograph (ECG), Respiration, Blood Pressure, Oxygen Saturation in Human Blood (SpO2), Body Temperature and other etc.
- In PMS, the **multiple sensor and electrodes** is used for receiving **physiological signals** like as ECG Electrodes, SpO2 Finger Sensor, Blood Pressure Cuff and Temperature Probe to measure the physiological signals.
- During treatment, it is highly important to **continuously monitor** the vital physiological signs of the patient. Therefore, **patient monitoring systems** has always been occupying a very important position in the field of medical devices.



➤ Classes of patient monitoring system

In the past, the dominant products manufactured by medical device manufacturers are mainly those for single parameter measurement. Nowadays however, a multi-parameter patient monitor is commonly used.

- ✓ Single-Parameters Monitoring Systems
- ✓ Multi-Parameter Patient Monitoring Systems

❖ PHARMA INFORMATION SYSTEM

- The PMIS(pharmaceutical management information system) integrates pharmaceutical **data collection, processing, and presentation of information that helps staff at all levels of a country's health system make evidence-based decisions** to manage pharmaceutical services.



➤ **Function**

- An effective PMIS is able to synthesize the large volume of **data generated by pharmaceutical management operations**.
- It then processes the **data into information** for use in **planning activities**, estimating demand, allocating resources, and monitoring and evaluating pharmaceutical management operations.
- This information is often in the form of a few key indicators. Indicators should be targeted toward staff at all levels so that they can monitor both their own performance and that of the units for which they are responsible.
- Another important function of a PMIS is **to improve accountability**.
- Much of the recording and reporting in a PMIS is intended to **create an audit trail for products as they enter or leave a pharmaceutical supply system**.

➤ **Importance of a pharmaceutical management information system**

- A good PMIS provides the **necessary information** to make sound decisions in the pharmaceutical sector.
- Effective pharmaceutical management requires **policymakers, program managers, and health care providers to monitor information related to patient adherence, drug resistance, availability of medicines** and laboratory supplies, patient safety, post market intelligence, product registration, product quality, financing and program management, among other issues.