CHAPTER 23

Applications of Computers in
Pharmaceutical and Clinical Studies

23.1 Introduction

Now-a-days computers are used in pharmaceutical industries, hospitals and in various departments for drug information, education, evaluation, analysis and medication history and for maintenance of financial records etc. They have become indispensable in the development of clinical pharmacy, hospital pharmacy and in pharmaceutical research. They co-ordinate effective communication and support clinical and *financial* management functions

Effective functioning of *any* organization largely depends upon continuous flow or information, i.e., receiving the Information, storing it, processing it and disseminating it. An effective management information system always provides the needed information in the right form, at the right time and at the right place. Actually each information of organization is connected with other informations, through communication channels, thus making organizational entity a decision—making point. Computers play an effective role for retrieval of information. *In* hospitals, data management involves creating, modifying, adding and deleting data in patient flies to generate reports. Now many doctors for further investigation as they are connected through various personal computers share these reports. Some popular Data Base Management System (DBMS) packages for personal Computer are: Dbase III+ and Fox Base + Hence, computer help in maintaining overall health care system and this can be best illustrated by enlisting its applications

23.2 Patient Monitoring

Patients monitoring incudes monitoring of physiological processes in patients such as blood pressure, pulse rate, temperature, etc. This information plays special role in detection and prevention of critical condioons in patients, It helps in giving warning of critical conditions for immediate nursing attention and enables medical staff to make accurate judgments of patients progress It further provides data for research purpose to monitor patients under intensive care.

Hence computers play an important role in communication by acquiring the data about patient's metabolism and then communicating the same to medical staff by displaying graphs Detecting critical conditions and generating alarms involve both numerical and logical data processing. This processing helps in giving warning of cnbcal conditions, enabling the medical staff for proper judgment of patients progress, and in the long-term provides data for medical research.

Actually computers controls number of equipments simultaneously to obtain samples of body fluids and then get them analyzed through auto-analyser for their physical and chemical parameters.

After analysis of parameters "AND or OR" statements indicate logical relationship where as IF....THEN mark a conditional computation. This combination of logical and conditional data processing enables the patient monitoring system as a decision making instrument for interpretation of results.

23.3 Medication Monitoring

To meet the goal of optimum drug therapy, medication is very essential In this case, prescription of the patient received over a period of time is entered into the computer data which serves as a chronological drug file of the patient. It helps in suggesting number of drugs along with their dosage schedule. Computers provide two types of information.

(a) Pharmacokinetic   (b) Non-Pharmacokinetic

Pharmacokinetic Information :

"NONLIN" is a computer program which can predict pharmacokinetic parameters very easily. These parameters include volume of distribution, bioavailability, rate of clearance etc It helps in maintaining dosage schedule of various drugs like antibiotics, aminoglysosides etc.

Non-Pharmacokinetic Information

It includes various allergic reactions, drug interactions, adverse drug reactions etc. For such information two computer programmes are available.

1. MEDIPHOR (Monitoring and evaluation of drug interactions by a pharmacy oriented reporting)
2. PAD (Pharmacy Automated drug interaction screening)

The developments of powerful computers offer opportunity for improved viewing and interpretation in radiology department. In this many of the latest imaging techniques such as Computerized Tomography (CT) and Magnetic Resonance Imaging (MR1) are inherently digital. In this, computer creates a "functional image" by performing complex calculations on measured data

23.8 Pharmaceutical Education

Computer-aided instructions help in improving the shortcomings of traditional teaching methods. They provide a medium for interactive learning offer immediate student-specific feedback. Support individuals tailored instructions finally form a basis for objective testing.

23.9 Hospital Pharmacy and Retail Pharmacy

Computers are used in pharmacies to maintain accessible, legible and up-to-date medication records. They help in keeping overall patient care by maintaining their records, consumption of drugs, registration numbers and detailed records of accounts and purchase section. Even for retail pharmacist, computers have been of valuable assistance in the prescription processing, It includes display of computer information about patient and drug, its adverse drug reaction, causation, duplication of orders, labeling conditions etc.

Following are the other applications in hospital and retail pharmacy

- Calculation of monthly gross income
- Generating pay slips
- Updating the employee information
- Placement of supply order
- Keeping track of total payment and amount due to supplier
- Checking the quality and quantity of hospital supplies recorded and identifying any discrepancies
- Recording purchases for accounting purposes.

A number of computer programs have been developed to assist physicians in dosing and scheduling drug. But there are certain drugs, which are extremely sensitive to certain patients. For such patient's physicians use computer programs tti forecast drug levels and to choose the amounts and schedule of drug doses that Will achieve target level. Similarly 'HELP' is a system, which identifies abnormal chemistry levels, concurrent diseases and other related patient conditions.

23.10 Hospital Setting

Duties of the pharmacist have been changing tremendously and hence it has become impossible to remember and to recheck everything. Therefore, computer

manages the hospital systems and allows the pharmacists to check the work Software is available for the pharmacist to provide professional services and to automate the technical staff This will ultimately result in efficient and cost effective operation and will further maximize clinical and patient oriented functions of pharmacists

23.11 Patient Counselling

Computers play an important role in in-patient counseling. Sophisticated software is available to educate patients by giving patient education leaflets. These leaflets provide information about name of medication, its uses, side-effects, precautions, drug interactions, missed dose, storage, how to take the medication etc.

It should always be kept in mind that computer program should be an intelligent one so that it should not affect adversely by giving too much or too less of the information to patnt

23.12 Drug Interactions

Pharmacists cannot remember each and every medication, its therapeutic usage, its effects and drug interactions_ Therefore computers offer knowledge base systems to extend our professional services. Computerized pharmacy can alert physician(pharmacist for serious drug-drug, drug-food and drug-disease interactions, which are likely to occur in prescription. Examples of such database and online services are MEDLINE, IDIS and pharmline.

23.13 Community Pharmacy

- Computers help in streamlining refilling of prescriptions. It has terminated the long-standing problem and waiting in a queue for refilling of prescription It has been becoming popular because it reminds the patient for refilling and compliance of medication These systems not only help in filling of individual prescriptions but in processing the prescription in a right manner. It also enables to manage inventory, sales, accounts, etc., in community pharmacy,

23.14 Drug Information Services

Various software, Internet. Intranet and online services are available for the pharmacist to provide drug information service to medical, paramedical professional and patients Computer—aided drug design helps the chemist to formulate a new drug molecule possessing desired therapeutic action. These new drug entities can be generated through graphics and by changing molecular configuration'. CD-ROM technology has helped a lot in the evolution of compact electronic libraries. Various software programs of different companies are listed here.

23.4 Maintenance of Records

Venous records like patient's medication history. current treatment and fin3ncial records *etc ,* are maintained in computers by feeding accurate data as 'DATA' is a collection of facts and computer works as a DATA BASE' manager MEDLINIE is a data base package used for such purpose It gives the current information of pa- bents regarding their name, age. sex, room number, weight, allergic reaction etc "Itese records are stored in a 'FILE like "Physician name" file, "Direction" file, 'Drug Interaction" file etc *Now* these files contain specific information like physman's name, registration number, phone number, address, etc. and provide such informaton whenever required

23.5 Materials Management

Computers play vdal role in material planning, purchasing, inventory control and forecasting pnces. Inventory control is very essential because it maintains the balance between stock-in-hand and excessive capital investment. Techniques such as ABC analysis and EDO can be easily programmed It will eliminate the tedious and time-consuming task of calculations. Computers are used to detect the items, which had attained minimum order level It then prepares a list and purchase orders for further supplies Generally there are Iwo systems for inventory control.

For Penodic inventory control

(b) Perpetual system

(a) *Periodic Inventory Control System :* In this system stock levels are clocked manually and the amount of inventory in hand is compared with minimur6 and maximum stock maintained in the computers. Computers help in placemcnt of order to different suppliers after checking their terms and conditions because all the entries of stocks are present in iL

(b) *Perpetual System :* In this system computer tells about the present position of all the drugs because when they are received, they are entered in the initial stocks to get the current stocks When the drugs are delivered to values departments the quantities are subtracted accordingly Such type of add.;ionS and deletions from inventory balance is done with the help of "data t ase" package

The information as output from the computer may be obtained *in* venous brms like.

- Planning of material
- Drugs formulary
- Vendor detail for procurement
- Tender rate and analysis
- Determination of 500Pending supply orders

- Inventory analysis
- Records points
- Safety stocks
- Ledger for narcotics

- Over/under stocking
- Slow moving/Fast moving items
- Expired drugs

23.6 Data Storage and Retrieval

Hospital administration computer helps in rapid data storage and retrieval, particularly when the data stored is subjected Infrequent changes and when group of items based on the stored data need to be retneved. Admission of M-patients and their discharge from a hospital require data, which gets changed every minute, e g., admission of in-patient ties up resources like clinical and nursing staff, a bed, operation theatre, Intensive care unit, pharmacy department, radiological services etc.

Hence decision to admit a new patient is not a simple one. Even the availability of a suitable bed is difficult to determine in male and female ward, isolation ward etc A prediction must be made that a suitable bed will be available at future date because d the estimation is over optimistic, then patients who are called in, may be tumed away at the last minute. If the prediction is over pessimist c expensive resources lie idle and the waiting period for treatment is extended.

Once the patient gets admitted, computer records and stores information like clinical information, catering information, diagnosis, sex, medication etc. It helps in providing detailed information about medical and paramedical staff including their duty chart It helps the senior personnel to keep a check on ward-by-ward loading of nursing staff and to allocate additional help whenever required

23.7 Diagnostic Laboratories

Computers meet the growing demand for testing laboratories as manual procedures were lengthy and time consuming whereas automated computerized instruments perform a number of tasks with accuracy in diagnostic laboratories. Generally LIS (Laboratory Information System) is used to manage large amount of data_ In this, instruments Contain preprocessors, which convert raw data into digital format and help in transmitting numerical values for report generation. LIS also performs administrative and managerial function, including specimen tracking, product analysis and quality control. Similarly many instruments have microprocessors that facilitate all phases of testing processes, including calibration of instrument till reporting of reSults.