Shree H. N. Shukla Institute of Pharmaceutical Education and Research, Rajkot

B. Pharm
Semester-2

STUDY MATERIAL

Subject Name: computer application in pharmacy
Subject Code: BP204TP

Application of computers in Pharmacy

CHAPTER 3 :

Contains – Drug information storage and retrieval, Pharmacokinetics, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, Diagnostic System, Lab-diagnostic System, Patient Monitoring System,

USE OF COMPUTERS IN COMMUNITY PHARMACY

Computers are now days used in pharmaceutical in industries, hospitals and in various departments for drug information, education, evaluation, analysis, medication history and for maintenance of financial records.

They have become indispensible in the development of clinical pharmacy and pharmaceutical management.

Computers are also useful for patient profile monitoring, medication, data base management and material management. Pharmaceutical research.

Applications:

• As more hospital pharmacies move in the direction of computer access, the profession must identify more clinical applications for computer Various hardware's and software's have developed to meet the needs of pharmaceutical industry and hospital pharmacy, community pharmacyprogramming.

• Various hardware's and software's have developed to meet the needs of pharmaceutical industry and hospital pharmacy, community pharmacy.

• Future development is still in progress which will make pharmacist job easier.

These are the following appilications of the computesrs in community pharmacy

1. communication.

2. prescription processing.

3. checking pharmaceutical care.

4. inventory control.

5. account.

Form the mail to other interned based system online communication allows the pharmacist and other pharmacy staff to keep in contact with their own organisation and also with the professional commitee

2. PRESCRIPTION PROCESSING

Its gives the information you need to find out if you're getting what the doctor ordered. It is a project of alliance for patient access, a non professional network of physicians who advocate the patient access to approved therapies appropriate clinical care.

1. COMMUINICATION:

3. Checking pharmaceutical care:

patient related data entering in the computer and analyse the disease conditions.

4. INVENTORY CONTROL:

pharmacy software's is so designed to give the accurate position at any point of time and also give the reward levels.

5. ACCOUNT:

finance nature. Because it is very essential to record, classify all transactions in a record and reader to know the profit and loss in then business.

USE OF COMPUTERS IN HEALTH CATRE.

In hospital settings we can find the use of computers for:

Clinical presentation.

Administration.

Research.

Education.

1. CLINICAL IMPLIMENTATION:

We can use computers for :

assessment.

patient monitoring.

documentation.

telemedicine.

electronic medical records.

2. ADMINISTRATION:

Define the cost of nursing services.

Evaluate quality assurance programme.

Demonstrate the cost effectiveness of hospitaling.

Facilitate nursing programme.

Justify the roles of each hospital employee.

3. RESEARCH:

Data gathering.

Computer assisted interactive.

Stimulation.

Tutorials for learning.

Use of computer in pharmacokinetics

Improvements in the quantitative analysis of drugs in biological tissues, such as plasma, and the increasing sophistication of computers and software along with access to the Internet have greatly accelerated the development of pharmacokinetics. Computer software programs now allow for the rapid solution of complicated pharmacokinetic equations and rapid modeling of pharmacokinetic processes. Computers simplify tedious calculations and allow more time for the development of new approaches to data analysis and pharmacokinetic modeling. In addition, computer software is used for the development of experimental study designs, statistical data treatment, data manipulation, graphical representation of data, pharmacokinetic model simulation, and projection or prediction of drug action. Furthermore, computers are used frequently for written reports, documentation, and archiving.

A variety of computers are now available. Personal computers (PCs) may be used independently or linked together into local networks (LANs) that share many application software packages. Each type of computer has an operating system (OS), which is a collection of programs that allocates resources and enables algorithms (well-defined rules or processes for solving a problem in a finite number of steps) to be processed. Windows, Mac OS, and more recently, LINUX, are examples of commonly used operating systems. Most PC users have access to the Internet via a modem or through wireless that allows PCs to access remote information at various sites on the Internet that provide a variety of free or commercial pharmacokinetic (PK) programs.

A computer package or software is a program of instructions written in a computer language. This software is needed to run the computer. The computer operating system must support the computer language of the software. In the past, computer users needed to be competent in computer programming and usually had knowledge of at least one computer language such as Pascal, C, or Basic. As a result of the availability of various commercial and noncommercial pharmacokinetic applications and spreadsheets, such as Excel, very little computer programming is required for many applications in pharmacokinetics. Some examples are given below.

Pharmacokinetic software consists of computer programs designed for computation and easy solution of pharmacokinetic problems. Not all computer programs satisfy the user's full requirements, but many provide the following.

1. *Fitting drug concentration–time data to a series of pharmacokinetic models, and choosing the one that best describes the data statistically*: Typically, a least-squares program is employed, in which the sum of squared differences between observed data points and theoretic prediction is minimized. Usually, a mathematical procedure is used iteratively (repetitively) to achieve a minimum in the sum of squares (convergence). Some data may allow easier convergence with one procedure rather than another. The mathematical method employed should be reviewed before use.
2. *Fitting data into a pharmacokinetic or pharmacodynamic model defined by the user*: This method is by far the most useful, because any list of prepared models is often limited. The flexibility of user-defined models allows continuous refinement of the model as new experimental ...

Role of computer in hospital and clinical pharmacy

Clinical pharmacy is the branch of Pharmacy where pharmacists provide patient care that optimizes the use of medication and promotes health, wellness, and

disease prevention. Clinical pharmacists often collaborate with physicians and other healthcare professionals. Drug information retrieval system and special therapeutic programs are available to further assist in patient care role

ROLES OF CLINICAL PHARMACIST

Prescription monitoring

• Prescribing advice to medical and nursing staff

• Medication errors and adverse drug reaction reporting

• History Taking

• Patient education and counseling

• Pharmacokinetics and therapeutic drug level monitoring

• Professional and Clinical Audit

ROLES OF CLINICAL PHARMACIST:

Computers have played a vital role in the development of clinical pharmacy practice and basic pharmacy research:-

• Patient record Management

• Entries of Medication Orders

• Patient Medication Profile

• Drug Therapy Monitoring & Problem Detection

• Record Drug-Drug Interactions & ADR'S

• Pharmacy Automated drug interaction screening (PADIS) system

• Teaching Techniques

• Building Data Base

• Inventory control

• Medical Research

• Computerizing Drug Information System

• Uses Of Computers In Other Fields Of Pharmacy

ROLE OF COMPUTERS IN CLINICAL PHARMACY

The Clinical computer system must assure the patients record database is continually updated to reflect the current status of all patients. This updating is done by assessing the database of admitting department to determine the information about recent admissions, discharges, patient transfers. Pharmacist should be present to check the details regularly.The computer system should be capable of producing other information such as

• Present diagnosis

• Allergies

• Weight

• Height

• Name of Attending physician

• And any special note about the patient.

Patient record management Medication orders should be entered regularly and the Pharmacist must be able to retrieve orders prior to administration to patient. Date must be entered by use of codes for drug names, dose scheduling. All drug orders should contain following :

• Drug Name

• Drug Generic Name & Strength

• Route of administration

• Dosage schedule

• Physician Data or Code

Preparations of Lists

Computer systems helps in diagnosing DRUG Interactions & warns potentially dangerous combinations of medications along with Drug-drug, Drug- lab, Drug-Allergy interactions & Wrong Diagnosis automatically.

RECORD DATA BASE MANAGEMENT

AUOMATED AMBULATORY MEDICAL RECORD SYSTEMS (AAMRS)-

• Billing,accounting,patient scheduling immunization etc. Identifying high risk conditions

• Providing patient with personal records

• MEDICATION ADMINISTRATON RECORD (MAR)-printed list of medication orders for each patient on nursing unit

e.g. name ,bed number, diagnosis, sex, weight, height ,allergies

• DRUG UTILIZATION REVIEW-monitoring of drug use & also cost.it is designed to investigate suspected problem

• DRUG THERAPY PROBLEM DETECTION-automatic screening of medication order for possible drug interaction for new or changed drug order is enteruinto patient profile

• DRUG THERAPY MONITORING-improves individualized dosing decision, allow multiple storage,precise dosing

• PATIENT BILLING

• MANAGEMENT REPORTS AND STATICS

• RATIONAL DRUG PRESCRIPTION-computer based consultation system assist in rational prescribing.one such system is MYCIN

ADMINISTRATIVE APPLICATIONS

• PATIENT BILLING-bills for no. of doses of each item is supplied

• DRUG UTILIZATION-monitor use of specific drug for cost analysis , budgeting, or quality assurance

• WORK LOAD ANALYSIS-frequency of specific activities, average time for specific function, determining staffing needs, productivity estimates are also possible

• COST AND REVENUE ANALYSIS-department costs, expected revenue,inventoryturn over,wastage,lost charges etc. Applicable in budget development,drug control,inventory management

• GROUP WORKING-accessible for multi users

• Schedualing,calculating quantity of additives and correct concentration,label,record maitenance,TPN ,sterile solution,radio pharmaceuticals

• STABILITY studies extrapolated stability curves for expiry date calculation,test schedule,shelf life calculation.serves as calender,data analyser,report writer.

SOFTWARE of PHARMACIST'S INTEREST

• Drug interaction

• Inventory management

• Decay calculator

• PK calculator-ADME studies,TDM,toxicity dose

• SPSS-for statistical evaluation

• Clinical pharmacist-for dose calculation

• Stability analyzer

• Population pharmacokinetics

• Trial managing

Software's & Programs For Clinical Monitoring

• HELP :

The Program HELP (Health Evaluation Through Logical Processing) is used to allow experts in a medical specialty for defining the criteria of medical decision

making. The broad base and flexibility of HELP permits complete drug monitoring. After receiving the Warning from computer the pharmacist contact the nursing staff and the physician. This system makes the pharmacist more efficient and accurate in monitoring patient drug therapy. The system issues warning more quickly than manual methods.

e-prescribing (electronic prescribing)

E-prescribing, or electronic prescribing is a technology framework that allows physicians and other medical practitioners to write and send prescriptions to a participating pharmacy electronically instead of using handwritten or faxed notes or calling in prescriptions.

At the most basic level, an e-prescribing system serves as an electronic reference handbook. More sophisticated e-prescribing systems act as stand-alone prescription writers. They can create and refill prescriptions for individual patients, manage medications and view patient history, connect to a pharmacy or other drug dispensing site, and integrate with an electronic medical record (EMR) system.

Use of a qualified e-prescribing system is required by the US government's Electronic Prescribing Incentive Program, which gives a medical practice up to a 2% reimbursement of its Medicare Part B charges. A qualified e-prescribing system must be able to transmit prescriptions electronically, warn prescribers about potential allergic reactions and inform physicians about generic alternatives, among other functionality. E-prescribing also reduces the number of prescription errors attributed to bad handwriting or illegible faxes.

Electronic Discharge

The PatientSource electronic discharge module tracks and manages a patients' journey through hospital, saving clinicians' time making discharge quicker and reducing the average length of patient stay.

How does it work?

The PatientSource electronic discharge module is a fully-auditable, user-friendly system that tracks patients, streamlines processes and helps manage hospital resources.

The intuitive, cost-effective platform works by autocompleting patient discharge letters with information from drug charts, investigations and case notes. It recommends appropriate medications and dosage, eliminating discharge medication errors and improving patient safety.

The electronic discharge module will also enable discharge letters to be instantly transmitted electronically to the GP from the PatientSource system, increasing efficiency, reducing administrative burden.

Due to these improved efficiencies, patients are proven to be discharged faster.

Benefits

Saving money, time and bed space:

It's not just health and care professionals that will save time with electronic discharging, patients will too. With its unique external pharmacy interface, the PatientSource electronic discharge module allows patients to pay for their medications and have them delivered to their home.

As a result, patients can save time usually spent waiting to pick up medications, while hospitals save money and bed space with patients leaving earlier without drawing from hospital stock.

The electronic discharge module works as a stand-alone module or as part of a wider PatientSource system.

Efficiency savings:

- Automatic filling in of diagnoses, medications, procedures, important results fields

- Fully-auditable, and can be used to display real-time bed occupancy status
- Customisable discharge letter templates, with instant electronic transmission to GPs plus the option of printing as PDF
- Proven to reduce the average length of stay

Cost savings:

- Discharge medications and doses checked against the British drug database, reducing litigation bills by eliminating medication errors
- Accurate and automatic coding (ICD10, OPCS4, HRG, custom codes)
- Itemised billing for private institutions

Barcode Medication Administration (BCMA)

The goal of BCMA is to help dispensemedications to patients safely while encompassing the "5 Rights" of medication administration

5 Rights of Medication Administration

Right Patient

Right Drug

Right Dose

Right Route

Right Time

BCMA

• Medication Error

• Defined by National Coordinating Council for Medication Error Reporting and Prevention (NCC, MERP)

• "Is any preventable event that may cause or lead to inappropriate medication use or patient harm…) Intended Benefits of BCMA

- Increased patient safety
- Positive I.D. of patient
- Decreased medication errors
- Improved inventory control
- Increased billing accuracy Potential Setbacks

No barcode on medication

Barcode unreadable

Poor quality wristband

Human Factors

- Resistance from nurses
- Learning curve
- False sense of security
- Creating workarounds
- Scanning the medication after giving it

Computer-aided diagnosis

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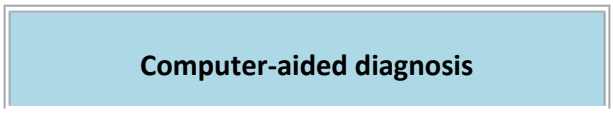

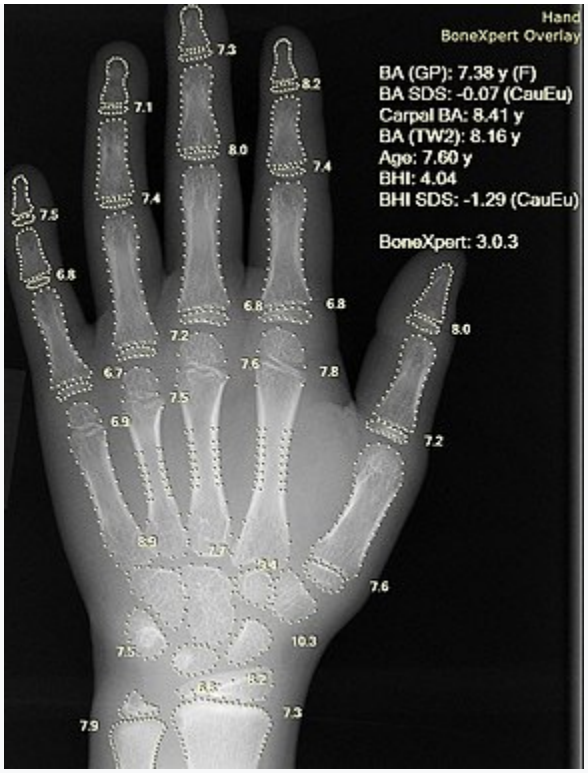

X-ray of a hand, with automatic calculation of bone age by a computer software.

Computer-aided detection (**CADe**), also called **computer-aided diagnosis** (**CADx**), are systems that assist doctors in the interpretation of medical images. Imaging techniques in X-ray, MRI, and ultrasound diagnostics yield a great deal of information that the radiologist or other medical professional has to analyze and evaluate comprehensively in a short time. CAD systems process digital images for typical appearances and to highlight conspicuous sections, such as possible diseases, in order to offer input to support a decision taken by the professional.

CAD also has potential future applications in digital pathology with the advent of whole-slide imaging and machine learning algorithms. So far its application has been limited to quantifying immunostaining but is also being investigated for the standard H&E stain.[1]

CAD is an interdisciplinary technology combining elements of artificial intelligence and computer vision with radiological and pathology image processing. A typical application is the detection of a tumor. For instance, some hospitals use CAD to support preventive medical check-ups in mammography (diagnosis of breast cancer), the detection of polyps in the colon, and lung cancer.

Computer-aided detection (CADe) systems are usually confined to marking conspicuous structures and sections. Computer-aided diagnosis (CADx) systems evaluate the conspicuous structures. For example, in mammography CAD highlights

microcalcification clusters and hyperdense structures in the soft tissue. This allows the radiologist to draw conclusions about the condition of the pathology. Another application is CADq, which quantifies, *e.g.*, the size of a tumor or the tumor's behavior in contrast medium uptake. Computer-aided simple triage (CAST) is another type of CAD, which performs a fully automatic initial interpretation and triage of studies into some meaningful categories (*e.g.* negative and positive). CAST is particularly applicable in emergency diagnostic imaging, where a prompt diagnosis of critical, life-threatening condition is required.

Although CAD has been used in clinical environments for over 40 years, CAD usually does not substitute the doctor or other professional, but rather plays a supporting role. The professional (generally a radiologist) is generally responsible for the final interpretation of a medical image.[2] However, the goal of some CAD systems is to detect earliest signs of abnormality in patients that human professionals cannot, as in diabetic retinopathy, architectural distortion in mammograms,[3][4] ground-glass nodules in thoracic CT,[5][6] and non-polypoid ("flat") lesions in CT colonography.[7]