

ABBREVIATIONS

SOP:	Standard Operating Procedures
CUDD:	Centralized unit-dose dispensing
DUDD:	De-centralized unit dose dispensing
PTC:	Pharmacy and therapeutic committee
DTC:	Drugs and Therapeutic committee
PPPA:	Poison Prevention Packaging Act
TDM:	Therapeutic drug monitoring
MEC:	Maximum effective concentration
ADME:	Absorption, Distribution, Metabolism, Excretion
HPLC:	High performance liquid chromatography
MTM:	Medication therapy management
OTC:	Over-the-counter
DPIN:	Drug programs information network

B.PHARM VIIth SEMESTER
PHARMACY PRACTICE (Theory)

Subject code- BP 703T

UNIT-II

A. DRUG DISTRIBUTION SYSTEM IN A HOSPITAL

- The drug distribution is defined as the physical transfer of drugs from storage area in the hospital to the patient's bedside.
- The overall drug distribution and utilization process in the hospital involves an infinite number of procedures, personnel, departments, equipments and storage facilities.
- It is based upon prescription practice of the physician, requisitioning by nursing station followed by transfers from stores for dispensing at pharmacy, prepackaging, labeling and final distribution from pharmacist stores through inpatients and out-patients window.
- The hospital pharmacy department to establish Standard Operating Procedures (SOP) for distribution of drugs within hospital and verify at various points to ensure safe distribution of quality drugs to all the patients.

1. DISPENSING OF DRUGS TO INPATIENTS:

- In-patients are those patients, who require hospitalization i.e get themselves admitted in the hospital, stay there for treatment till they are discharged. Medication is administered to patient only upon the written orders from the physician.
- The medication prescription originates in the patient's clinical records and is transmitted to the pharmacy by following ways
 - a) Prescription order is written in a separate form by physician.
 - b) Carbon copy of the prescription order is sent to the pharmacist.
 - c) Prescription order is copied by hospital personnel assigned to the nursing station [1].

2. TYPES OF DRUG DISTRIBUTION SYSTEMS:

- They are four systems in general use for dispensing drugs for inpatients. They may be classified as follows;
 - i. Individual prescription order system.
 - ii. Complete floor stock system
 - a) Charge floor stock drugs
 - Envelope method

- b) Non-charge floor stock drugs
 - Drug basket method
 - Mobile dispensing unit
- iii. Combination of individual & floor stock system
- iv. Unit dose dispensing system
 - a) Centralized unit-dose dispensing (CUDD)
 - b) De-centralized unit dose dispensing (DUDD) [2]

i. Individual prescription order system:

- It is a type of prescription system where the physician writes the prescription for individual patient who obtains the drug prescribed from any medical store or hospital dispensary by paying own charges.
- This system is mainly used in small or private hospitals because of its economic consideration and reduced manpower requirements.

Advantages:

- All medication orders are directly reviewed by pharmacists.
- It provides the interaction of pharmacist-doctor, nurse and the patient.
- It provides clear control of inventory.

Disadvantages:

- There may be possible delay in obtaining the required medications for administration to the patient.
- Increase in the cost to the patient.

ii. Complete floor stock system

- Drugs are stored at the nursing station and are administered by a nurse according to the chart order of the physician. This system is most often used in private hospitals in India.
- The drugs are stored in the pharmacy stores, supplied to the wards/rooms on order and kept under the supervision of registered nurse at nursing station.

Advantages:

- The drugs are readily available for administration.
- Minimum return of drugs.
- Reduced in-patient prescription orders.
- Reduction in number of pharmacy personnel required.

- Easy and prompt delivery of the required drug.

Disadvantages:

- Increase in chance of medication errors.
- Increase in drug inventory.
- Increase chances of drug deterioration due to lack of proper storage facilities and due to unnoticed drug degradation.
- Increased workload on nurses.

iii. Combination of individual & floor stock system

- Falling into this category are those hospitals which use the prescription order system as their primary means of dispensing and also utilize a limit floor stock [1].
- This combination system is most commonly used in hospitals today.
- Selection of charge floor stock drugs: The drugs should be placed under the category of 'charge' drugs depending on pharmacy and therapeutic committee (PTC). The committee will be concerned with the availability of therapeutically effective drugs and their immediate use for diagnosis or symptomatic treatment.
- Selection of Non-charge floor stock drugs: A list of non-charge floor stock is prepared on the basis of following criteria:
 - The cost of preparation
 - The frequency of use
 - The quantity use
 - The hospital budget

iv. Unit dose dispensing system:

- Unit dose packages are defined as those medications which are ordered, packaged, handled and administered and charged in the multiples of single dose units containing a predetermined amount of drug or supply sufficient for one regular dose, application or use.
- The pharmacist is held responsible for unit dose dispensing system.
- Example: Single dose disposable syringes of medications and single unit foil or cellophane wrapped capsules and tablets.
- Advantage of unit dose dispensing:
 - Better financial control.

- It prevents the loss of partially used medications.
- It does not require storage facilities at the nursing station.
- It eliminates labeling errors
- There is a accurate medication charge [1].

- Two methods of dispensing unit doses are:

a. Centralised unit-dose dose dispensing (CUDD):

- All in-patient drugs are dispensed in unit doses and all the drugs are stored in central area of the pharmacy and dispensed at the time the dose is due to be given to the patient.
- Drugs are transferred from the pharmacy to the indoor patient by medication cards.

b. Decentralized unit dose dispensing: (DUDD)

This operates through small satellite pharmacies located on each floor of the hospital.

Procedure:

- Patient profile card containing full date, disease, and diagnosis is prepared.
- Prescription is sent directly to the pharmacist who is then entered in the patient profile card.
- Pharmacist checks medication order.
- Patient profile card and prescription order is filled by pharmacy technicians.
- The nurses administer the drugs and make the entry in their records [3].

Advantages:

- Easy for the administration staff.
- Accounting becomes easier in certain cases.
- Better stability of the products
Ex-Eno-fruit salt in sachets.

Disadvantages:

- High cost.
- Consumes more time and doubtful.
- Occupy more space for storing.
- Ledger posting and inventory control problem [1].

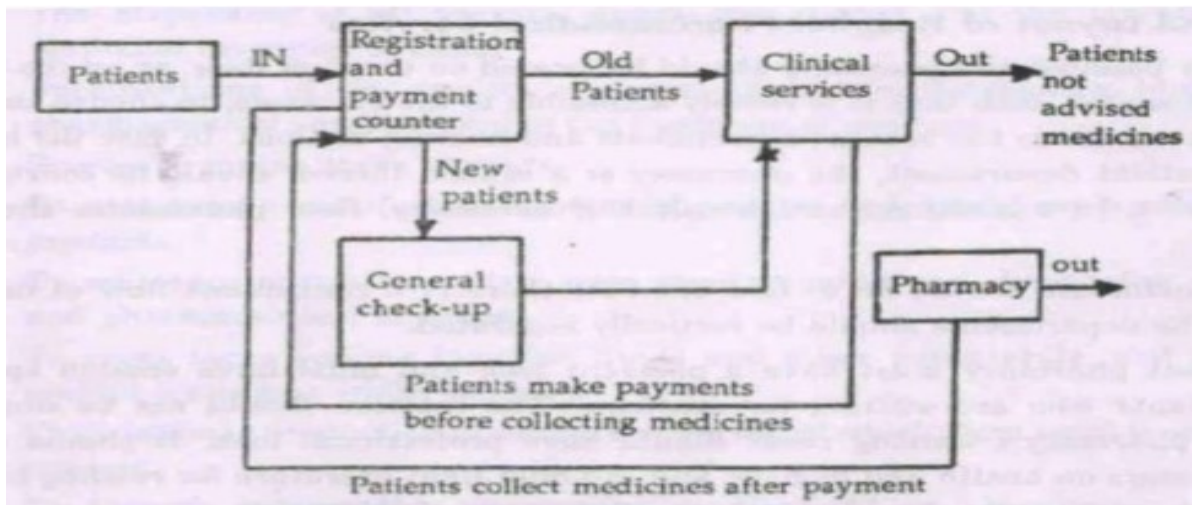


Figure-1: Flow chart of patients in hospital [2]

3. CHARGING POLICY AND LABELLING:

- It is necessary to charge from patients for dispensing of prescription in order to meet the expenses.
- Costing the prescription is a policy matter decided by hospital management in consultation with pharmacy incharge.
- Low income group patients are exempted from costing or they are charged at concessional rate.
- Prescription cost can be calculated by adding conversion cost into material cost.
- Conversion cost is worked out in accordance with an established procedure of costing. It also includes the element of profit, decided in consultation with the management.
- Material cost includes the cost of main medicament and other pharmaceutical ingredients e.g. overages and packing materials [3].

4. DISPENSING OF DRUGS TO AMBULATORY PATIENTS:

- The terms “Outpatients” or “Ambulatory patients” refers to the patients not admitted in the hospitals. In the modern era the ambulatory care or out patients setting has taken special important interest among the health care professionals. [2].
- **Labeling requirements for drugs dispensed to ambulatory patients (out-patients)**
Labels must contain:

- Name, address and telephone of the dispenser

- Full name of the patient
- Name of the drug, strength, and amount dispensed
- Directions to the patient regarding how to use the drug
- Name of the prescribing practitioner
- Name or initials of dispensing individual and date dispensed
- DEA caution labels and/or patient ancillary labels for safe use
- Pharmacy's identifying serial number will be affixed to containers of unit of use packaged drugs issued by the pharmacy, applies only to drugs dispensed from an outpatient pharmacy.
- All drugs dispensed to outpatients will be packaged to conform to the Poison Prevention Packaging Act PPPA (PL 91-601), December 30, 1970.

Categories of ambulatory patients:

- Emergency care, referral or tertiary care and primary care [2, 4, 5]

5. DISPENSING OF CONTROLLED DRUGS:

- These drugs should keep under lock and key.
- A separate register should be maintained to register the drugs.
- Procedure: Medical superintendent is overall responsible for handling of controlled drugs.
- Chief pharmacist procures, stores and dispense the drugs
- Prescription of narcotic drugs under Narcotics and psychotropic substances act 1985 must include following information a) Patients full name b) Address c) Date d) Name and strength of drug e) Quantity of drug f) Signature of prescriber g) Dose and route of administration
- If the required drug is not in the stock the complete controlled drug prescription must be written on hospital prescription blank form by registered medical practitioner and signed.
- Delivery of narcotic drugs from pharmacy to the wards should be carried out by reliable person
- After dispensing, nurses resume responsibility for administration, control and auditing of the inventory.
- If patient refuse or doctor cancels any dose, nurse should destroy the drug in to sink and record "Refused by patient" or "Cancelled by doctor" [4, 5].

B. HOSPITAL FORMULARY

1. DEFINITION

- The hospital formulary is a list of pharmaceutical agents with its important informations which reflects the current clinical views of the medical staff. The hospital formulary system is a method whereby the medical staff of a hospital with the help of pharmacy and therapeutic committee selects and evaluate medical agents and their dosage form which are considered to be most useful in the patient care. The hospital formulary system provides the information for procuring, prescribing, dispensing and administering of drugs under non- proprietary or proprietary (brands) names in instances where drugs have both names [6].

2. CONTENTS OF HOSPITAL FORMULARY

A typical formulary must have the following composition;

- 1) Title page
- 2) Names & titles of the members of the PTC
- 3) Table of contents
- 4) Information on hospital policies & procedures concerning drugs
 - a. The pharmacy and therapeutic committee of hospital
 - b. Objective and operation of the formulary systems
 - c. Hospital regulations and procedures for prescribing and dispensing drugs.
 - d. Hospital pharmacy services and procedures.
 - e. How to use the formulary
- 5) Products accepted for use at hospital
 - a. Items added and deleted from the previous edition.
 - b. Generic, Brand name cross reference list.
 - c. Pharmacologic/therapeutic index with relative cost codes.
 - d. Descriptions of formulary drug products by pharmacological therapeutic class.
- 6) Appendix
 - a. Central service equipment and supply list
 - b. Guidelines for calculating pediatrics doses
 - c. Schedule of standard drug administration [7].

3. DIFFERENTIATION OF HOSPITAL FORMULARY AND DRUG LIST

Hospital formulary:

- A hospital formulary manual contains summary drug information of a selected number of drugs. The manual is usually 'drug centered' and the information is usually arranged in therapeutic groups.
- In many countries, the hospital formulary is developed on the line of their National formulary which in turn relies heavily on the national essential drug list.
- A national formulary includes detailed and comprehensive therapeutic information of many drugs and may include guidelines on rational prescribing and dispensing of drug.
- In most developed countries the drug included in the national essential drug list are included in the formulary.
- Listing of drugs by their generic names followed by information on strength, form, posology, toxicology, use & recommended quantity to be dispensed. —
- Information provided is subject to local needs and desires.

Drug list:

- A good index greatly enhances the usefulness of the formulary and accessibility of its information. All information about the essential drugs are included in the hospital formulary manual such as,
- Basic information for each drug
 - Generic name, dosage forms, strength, disease condition, pharmacology, contraindication, precaution, side effects, dosage schedule, instruction and warning, drug interaction.
- Supplementary information on each drug
 - Price, level-of-use code, regulatory category, storage guidelines, patient counseling information, labeling information, National essential drugs list reference number, Brand name etc.
 - Prepared by country's outstanding clinicians, pharmacologists and pharmacists [8].

4. PREPARATION AND REVISION OF DRUG FROM HOSPITAL FORMULARY:

- Hospital formulary is an important written document which contains the list of preparations including important information's which reflects the current clinical views of medical staff.
- The Drugs and Therapeutic committee (DTC) known as formulary committee should include a clinical pharmacist or a clinical pharmacologist, a physician and additional prominent medical specialists from the hospital.
- The formulary committee should propose the content, structure, general agreement of the information and layout for approval by the DTC.
- An editor should include in the committee for understanding of the pharmaceuticals, pharmacological and clinical aspects of the necessary information required for drug.
- The first draft should be presented to the formulary committee for review. After accepting the first draft, the second draft will be prepared. This draft should be widely circulated among the members of the national formulary committee and other experts.
- A special meeting conducted among formulary committee, national experts and some prominent users of the formulary to discuss and give the final approval to the format and contents of the hospital formulary. It is important for the credibility and acceptability of the formulary.
- As therapeutic practices change and amendments are made to the national essential drug list, it became necessary to revise the existing formulary. Otherwise it becomes outdated. Once the sufficient number of revisions are made and accepted, it becomes necessary to develop a process to produce new edition. It is important that new editions are produced regularly to maintain the usefulness and credibility of the formulary.
- The formulary is very educative and useful to the members of "Health Care Team". Hence, copies of formulary should be placed at each patient care unit, including clinics, out-patient care areas and emergency room.
- Selected drugs are entered in the formulary but the entry of a new drug is a complex procedure, the members alone are not competent to evaluate each therapeutic agent. Committee take help from various experts for inclusion of specialized drug and any formulation whose formula is not disclosed cannot be entered in the formulary.

The PTC makes certain guidelines for inclusion or deletion of drug in the formulary with the consultation of medical staff.

5. ADDITION AND DELETION OF DRUG FROM HOSPITAL FORMULARY:

- Generally for addition, deletion, change in the drug products, removal of drug from the market, change in the hospital policies and procedures the formulary need revision annually.
- There are two methods for the revision of formulary. One method is to attach a separate sheet to the back cover of formulary books.
- Second method is by using a different color for the cover of each edition of the formulary which will help to reduce any confusion between present and past edition.
- Revision in the formulary should incorporate regular review of selected categories to ensure that only the most cost effective products are used. Such review may leads to the deletion of certain drugs.
- During revision and preparation of formulary system, cost effectiveness and cost benefit analysis methods are generally used [7].

C.THERAPEUTIC DRUG MONITORING

Definition:

- Therapeutic drug monitoring (TDM) refers to the measurement of drug concentrations in biological fluids with the purpose of optimizing a patient's drug therapy. During administration of a dosage regimen, the concentration should be maintained within the therapeutic window. TDM is an important tool utilized, to individualize dosage regimen by maintaining plasma or blood drug concentrations within the therapeutic range.
- In general TDM is not used if the response to drug therapy can be directly and easily measured.
- The main goal of TDM is to ensure that a given drug dosage produce
 - Maximum therapeutic benefit and minimum toxic effect.
 - Drug must have an appropriate concentration at site of action that produces benefits [8].

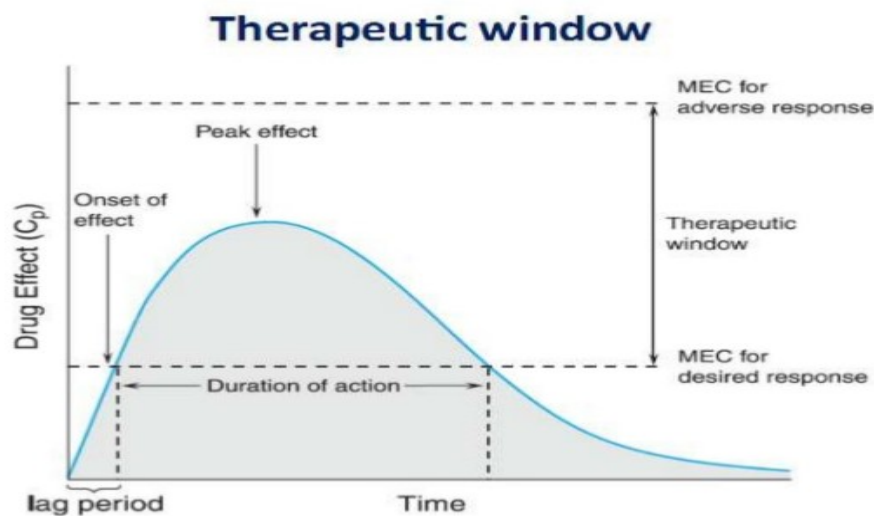


Figure-2: Patients studies have generated upper (MEC) and lower (MEC) plasma concentration ranges that are considered safe and effective in treatment of disease. This concentration is known as therapeutic range of the drug [9].

1. **NEED FOR THERAPEUTIC DRUG MONITORING:**
 - TDM can be an important tool in selected situation. Some criteria of drug in TDM are given below
 - Drug with narrow therapeutic index.

- Drug should exhibit non-linear pharmacokinetics.
- Should have a beneficial concentration response relationship between the blood drug conc. and pharmacological effects with respect to both efficacy and toxicity.
- There should be no easily measurable physiological parameter.
- TDM is used in two major situations
 - To assist the optimization of drug therapy, including minimizing the risk of drug toxicity.
 - To identify a drug or substance this may be contributing to the presentation of a medical emergency.
- There are some common clinical situations where therapeutic monitoring of drugs may be useful
 - To confirm adequate serum concentrations where clinical response is inadequate
 - TDM can be used to assess the appropriateness of dosing regimen to maintain the minimum concentration required to exhibit efficacy
 - To avoid drug toxicity: maintaining a drug within the therapeutic range can help to minimize the risk of toxicity
 - To individualize dosing of some drug with an unpredictable dose-response curve
 - To assess medication compliance
 - To help predict a patient's dose requirements.
 - To minimize the time period needed for dosage adjustment.
 - To identify poisons and to assess the severity of poisoning on an emergency basis in a poisoned patient.
 - To assist dose adjustment in various disease states where individual variations in drug ADME is important [8].

2. FACTORS TO BE CONSIDERED DURING THE THERAPEUTIC DRUG MONITORING

- A number of factors may affect serum drug concentrations and need to be considered when interpreting TDM results. Some of the factors explain below
- Patient demography: The patient's age, sex, body weight and ethnicity should be considered when interpreting TDM results.

- Dosage regimen and duration of therapy: For a drug, sufficient time should elapse to allow steady-state to be achieved before TDM is performed. If a loading dose has not been given, this means at least 5 half-lives of the drug should elapse.
- Sampling time: The serum concentration of a drug depends on the time when the blood drawn for a TDM assay was sampled in relation to the last dose.
- Patient compliance: If the concentration of the drug is lower than expected, The possibility of non-compliance should be considered before a dose increase.
- Individual capacity to distribute/ metabolise / excrete the drug: Patients with renal impairment have a reduced ability to excrete renally cleared drugs, and the interpretation of TDM for renally- cleared drugs such as digoxin and aminoglycosides should always be made in the context of the patient's renal function.
- Altered protein binding: Conditions such as malnutrition or nephropathy may reduce the concentration of plasma protein. The strongly plasma protein bound drugs such as phenytoin, a reduced albumin level may result in higher concentration of unbound (free) drug. The measurement of both total drug concentration and free drug concentration can be useful in that situation.
- Drug interaction: TDM results should be interpreted in the light of the patient's concomitant drug therapy. Example digoxin toxicity with drug amiodarone, quinidine or verapamil.
- Pathological factors: The patient's co-morbidities should be taken into consideration when interpreting TDM result.
- Alcohol and tobacco use: Chronic use of alcohol increased clearance and decreased serum concentrations of hepatic cleared drugs such as phenytoin Cigarette smoking increases the hepatic clearances of theophylline.
- Medication and sampling errors: If TDM result is incompatible with drug administration records, the possibility of a medication or sampling error should be considered.
- Laboratory errors: In a laboratory error is suspected, the laboratory should be contacted and asked to repeat the assay [8].

3. INDIAN SCENARIO FOR THERAPEUTIC DRUG MONITORING:

In India TDM is available in following two ways

1. Clinical pharmacological departments in large teaching hospitals

- Generally HPLC is used in teaching hospital

- Instrument available locally

- Cost effective for many patients

2. Private medical laboratories

- Private laboratories are use automated equipment and imported ready-to-use kits.

- More expensive

- It does not provide clinical interpretation of results.

- The final results are providing a therapeutic drug measuring service rather than therapeutic drug monitoring

There are a number of factors which influences the use of TDM in India.

- Cost: The widespread availability of TDM in India will need strong economic justifications but it's quite expensive for India.

- Alternative medical systems: Pharmacokinetic and pharmacodynamic interactions between various drugs which difficult to assess the outcome of drug therapy and the result of TDM assay.

- Malnutrition: Nutritional deficiencies are common and may affect drug pharmacokinetics

- Ethnic differences: Advanced research is needed to characterize possible variations in therapeutic ranges in various Indian subpopulations.

- Variations in bio-availability: Differences in formulation between brands of the same drug may results in variations in bioavailability.

- **Examples of drugs indicated for TDM**

- Bronchodilators: Theophylline

- Antibiotics: Aminoglycosides - Gentamicin, Amikacin , Vancomycin

- Immunosuppressants: Cyclosporine

- Anticancers: Methotrexate

- Antiepileptics: Phenobarbital, Phenytoin, Valproate

- Cardiac Drugs : Digoxin, Procainamide, Lidocaine

- Psychoactive Drugs: Lithium, TCA 4/4/2018 10KIRSHA [8].

D. MEDICATION ADHERENCE

- Medication adherence is the one of the most important factors that determines the therapeutic out comes, especially in a patient suffering from chronic diseases.
- Whatever the efficiency of the drug, it can't act unless the patient takes it positively.
- Adherence to treatment is the key link between treatment and outcome in medical care.
- Medication adherence demands a working relationship between a patient or caregiver and prescriber that values open, honest discussion about medications, i.e. the administration schedule, intended benefits, adverse effects and costs.[10]

1. CAUSES OF MEDICATION NON-ADHERENCE

- Non-adherence with medication is a complex and multidimensional health care problem.
- The causes may be related to the patient, treatment, and/or health care provider. The patients may not believe the treatment is necessary complex treatment plans may increase the risk of nonadherence and there may be insufficient communication between patient and provider [11]. As a consequence of nonadherence, substantial numbers of patients do not benefit optimally from medication, resulting in increased morbidity and mortality as well as increased societal costs [12].
- The elderly are a patient group that is vulnerable to negative health outcomes due to lack of adherence. Because older patients often use a variety of drugs for a number of chronic diseases, the consequences of nonadherence may be more serious, but nonadherence may be less easily detected and resolved than in younger age groups.
- Factors that may predict nonadherence include forgetfulness, illiteracy, inability to understand the purpose of treatment, not perceiving the treatment as necessary, a lack of trust in the treatment, and a lack of knowledge about the effects of treatment. In addition, psychiatric problems, including depression, cognitive limitations, missing visits, and a poor relationship with the health care provider have also been found to contribute to nonadherence. Some of these factors are associated with intentional nonadherence, while others are more likely to be correlated with unintentional nonadherence [13].
- The number of co-morbid conditions and presence of cognitive, vision and/or hearing impairment may predispose the patient to nonadherence. Similarly, medications

themselves may contribute to nonadherence secondary to adverse effects or costs. Especially worrisome is nonadherence to ‘less forgiving’ drugs that, when missed may lead to an adverse event (e.g. withdrawal symptoms) or disease exacerbation.

- Non-adherence was associated with higher health care costs for both in- and outpatient settings. Patients need educated regarding non-adherence and increased costs.
- Non-adherence also incurred more costs for outpatient services and office visits.
- Several interventions may contribute to improved adherence [12].

2. ROLE OF PHARMACIST IN THE MEDICATION ADHERENCE

- While medication dispensing is the best- known function of the pharmacist, pharmacists—through counseling, medication therapy management (MTM), disease-state management, and other means—can play a pivotal role in patient care.
- There are opportunities in every type of pharmacy practice to improve patients’ adherence and therapeutic outcomes, and pharmacists must embrace and act on them.
- Patient Education, dosing simplification and minimization of adverse effects are extremely successful strategies for improving adherence.
- Preparing a dosing card containing only the most essential elements of the patient’s medications can be highly beneficial.



Figure-3: (A) & (B) -Dosing cards

- It can be extremely helpful for patients who take many medications or who have cognitive barriers.
- Reminder calls, texts, or e-mails are helpful for many patients, especially those with busy lifestyles. Automatic refills are a useful strategy
- Whatever the barriers to adherence may be, the only way to assess them is to talk to the patient.

- The pharmacist needs to be diligent (pay attention) about including the patient in the treatment experience.
- The more trust the patient has in the pharmacist, the more he or she will open up and disclose any apprehensions or difficulties about taking his or her medication. Only then can the pharmacist play an integral role in improving a patient's adherence.
- Pharmacists are in unique position to improve medication adherence because they can actually show the medication to the patient and relate any information to the medication itself.
- Apart from patient education, a pharmacist may contribute towards improving medication adherence by other means including advice to prescribers on the simplification of drug regimens, providing patients with medication cards or medication aids such as a dosette, and by identifying the predisposing, enabling, and reinforcing factors which may contribute towards medication non-adherence.
- Though patient interviews, the pharmacists can assess the patient's knowledge of their drug therapy and usual medication habit [8].

3. MONITORING OF PATIENT MEDICATION ADHERENCE

- Medication non-adherence is a prevalent, complex problem. Failure to follow medication schedules may lead to major health complications, including death. Proper medication adherence is thus required in order to gain the greatest possible drug benefit during a patient's treatment. Interventions have been proven to improve medication adherence if deviations are detected.
- Full adherence to medication is required as the drug can be effective only when it is taken [13]. Nonetheless, maintaining strict medication adherence is required that deems maintaining administration timing, dosage quantity, and frequency.
- A wealth of reports revealed that up to 50% of the patients either never fill their medication prescriptions or do not use the medication as prescribed to them in medication regimens. Unfortunately, poor adherence is prevalent among populations with chronic illnesses, which leads to hospital admission.
- A number of approaches have been used for the aim of monitoring medication adherence because it has been shown that improving adherence to medical therapy would substantially lead to both health and economic benefits.

- In general, two key factors should be considered when discussing medication adherence. The first factor is monitoring, which is alternatively referred to as assessment, quantification, measurement, or evaluation. Medication monitoring means using some methods for observing if the patient has taken the medication or not. Hence, the effectiveness of the monitoring method plays a central role.
- The second factor is intervention. Interventions refer to the means that can be used for improving adherence to medication or correcting it once erroneous or drift is detected. Methods that have been utilized for measuring medication adherence so far can be broadly divided into two categories, direct and indirect. Direct methods of measurement of adherence include direct observation of the patient while taking the medication, laboratory detection of the drug in the biologic fluid of the patient (i.e., blood or urine), laboratory detection of the presence of nontoxic markers added to the medication in the biologic fluid of the patient, and laboratory detection of the presence of biomarkers in the dried blood spots. Meanwhile, the patient's self reporting, pill-counting, assessing pharmacy refill rates, and using electronic medication event tracking systems are examples of indirect methods of measuring adherence.
- Direct measures are accurate, but they may require invasiveness, and they are usually expensive. In comparison, indirect methods are less expensive and provide good estimation of the medication adherence. As such, these factors should be taken into consideration when selecting the adherence measurement methodology [14].

E. PATIENT MEDICATION HISTORY INTERVIEW

1. NEED FOR THE PATIENT MEDICATION HISTORY INTERVIEW

- A medication history is a detailed, accurate and complete account of all prescribed and non-prescribed medications that a patient had taken or is currently taking prior to a initially institutionalized or ambulatory care.
- It provides valuable information about the patient's allergic tendencies, adherence to pharmacological and non-pharmacological treatments and self medication with complementary and alternative medicines.
- Interviewing a patient in collecting the data medical history is called medication history interview.
- Importance of accurate drug history is needed for better treatment to a patient. It also
 - Preventing prescription errors and consequent risk to patients.
 - Useful in detecting drug –related pathology or changes in clinical signs that may be the result of drug therapy.
 - It should encompass all currently and recently prescribed drugs, previous adverse drug reactions including herbal or alternative medicines and adherence to therapy for better care plan.
- The goal of medication history interview is to obtain information on aspects of drug use that may assist in over all care of patient.
- The information collected can be utilized to:
 - Compare medication profile with the medication administration record and investigate the discrepancies.
 - Verify medication history taken by other staffs and provide additional information where appropriate.
- The following information is commonly recorded:
 - Currently or recently prescribed medicines
 - OTC medication
 - Vaccinations
 - Alternative or traditional remedies

- Description of reactions and allergies to medicine
- Medicines found to be ineffective
- Adherence to past treatment and the use of adherence aids
- Information sources
 - Patient
 - Family or caregiver
 - Medication vials / bubble packs
 - Medication list
 - Community pharmacy
 - DPIN (Drug programs information network) [2].

2. MEDICATION INTERVIEW FORMS: [2]

Following information are specified in a medication interview form:

MEDICATION INTERVIEW FORM

Patient Interview form

Patient information

First NameLast Name.....Date of Birth.....Today's Date

Email.....

Reminder Preference

Would like to receive preventive care and follow up care reminders.

.....Yes No

Allergies

Patient has no known allergies

.....LatexPenicillins..... Demerol

.....Other:

Past or Present Medical Conditions

.....None

Neurology:Stroke.....Seizures/Epilepsy.....Dementia

Cardiac:Heart attackAtrial fibrillationCongestive heart failure

Cancer:Cancer (type)

Any conditions not listed:

.....Other:

Diagnostic Studies/Tests

.....None

Colonoscopy Upper endoscopy ERCP EUS Ultrasound

When: _____ When: _____ When: _____ When: _____

Previous Procedures & Surgeries

.....None

.....Cataract surgery..... Tonsillectomy..... Thyroid surgery.....Heart valve

.....Other:

Social History

Occupation :Number of Children:.....

First NameLast Name.....Date of Birth.....Today's Date

Marital Status

.....Single.....Married.....Divorced.....Separated..... Widowed
.....Civil Union

Alcohol

.....None Quantity Number Frequency
.....Beer

Drug Use

.....None Quantity Number Frequency
.....IV Drugs
.....Other

Immunizations

.....None

Flu Shot Pneumonia Vaccine

When: _____ When: _____

Family Medical History

No family history ofColon cancerPolyps

Diagnoses Mother Father Sister Brother Son Grandfather Grand mother
Colon Cancer

Colon Polyps

Current Medications

.....None
Name Dose How Taken?

Pharmacy

Name: _____ Phone: _____

Address: _____ City: _____ Zip: _____

Consent to Import Medication History

First NameLast Name.....Date of Birth.....Today's Date

I consent to obtaining a history of my medications purchased at pharmacies.

.....YesNo

First NameLast Name.....Date of Birth.....Today's Date

Review of Systems (Please Select All Recent Symptoms)

Cardiovascular

.....Chest pain

.....Shortness of breath with exercise

Reviewed with

.....Patient.....Parent.....Guardian.....Not Present

F. COMMUNITY PHARMACY MANAGEMENT

Definition

The main responsibilities of a community pharmacy include compounding, counseling, and dispensing of drugs to the patients with care, accuracy, and legality along with the proper procurement, storage, dispensing and documentation of medicines. The community pharmacist must be a qualified and pertinent with sound education, skills and competence to deliver the professional service to the community [2].



Figure-4: Medical pharmacy shop

FINANCIAL, MATERIALS, STAFF, AND INFRASTRUCTURE REQUIREMENTS:

1. FINANCIAL

- Establishing and Financing a Community Pharmacy Financing is required to set up a new community pharmacy in order to maintain the medicines stock and cover the expenses.
- **Purpose of Finance:**
 - To purchase land, building, machinery and equipment.
 - To purchase raw materials and other materials.
 - To pay salaries, wages and incidental charges.
 - To maintain stock and supply products.
- **Types of finance:**
 - 1. Equity Finance/capital: Fixed/Tangible assets that are free from financial obligation or debts.
 - 2. Burrowed Finance/capital: Assets that are taken as loan from banks or other sources.
- **Sources of Finance:**

- Owned finance: The capital is generated by owner, partner or shareholders. As long as business run it remains and surplus is returned to the shareholders.
 - Loan (Burrowed) Finance: The capital is generated from bank or other financial institutions. Interest is paid periodically at a fixed rate and then payment of loan capital. Loan can be obtained against mortgage or pledge of the property.
2. **STAFF MANAGEMENT:** The right type of organization is selected, then it becomes necessary to fill in the various job positions with right kind of people, who can effectively performed their assigned activities. This is the management function of staffing.
- Definition:** The process of hiring and developing the required personnel to fill in various positions in the organization. It involves the scientific and systemic procurement, allocation, utilization, conversation and development of human resources.
- The main objective of the staffing is to ensure the optimum utilization of human resources as well as to provide personal and social satisfaction to the employees.
 - **Salient features of staffing:** Staffing is a function of management.
 - It is a continuous function.
 - It is a pervasive function.
 - It is an integral part of the management process
 - It is a difficult function because it deals with human beings who have their own needs, emotions and aspiration.
 - It is concerned with the human resources of an organization.
 - **Importance of staffing**
 - (i) Staffing helps to build up a healthy organization in which the job performance and satisfaction of every employee can be high.
 - (ii) Staffing injects life into the organization by providing right person for every job. The effectiveness of directing and control functions also depends upon staffing.
 - (iii) Employees in the organization are the most valuable asset of an organization. The quality of human assets largely determines the success and growth of the organization.

3. MATERIAL MANAGEMENT

Material Management is a basic function of the business that adds value directly to the product itself. Material Management is the planning, directing, controlling and coordinating the activities concerned with material and inventory requirements from the point of their inception to their introduction into the manufacturing process. The two important aspects of material management includes:

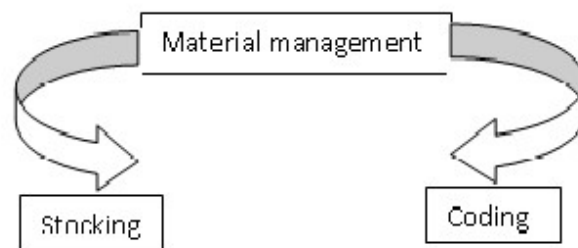


Figure-5: Types of material management

1. Stocking

The drug store should have adequate space for storage of drug with proper lighting, ventilation and temperature controls. Special locked storage space provided to meet the legal requirements for storage of narcotics, alcohol and prescribed drugs. The drugs are stored in such a way that they should not be damaged due to high temperature. It is a fact that more than 70% of the capital of an enterprise is invested in stores.

Objectives of stocking

- (a) Easy location of the items in store.
- (b) Proper identification of items.
- (c) Speedy issue of materials
- (d) Efficient utilization of space.
- (e) Reduction in needs of materials handling equipment.

Functions of stocking

- (a) Receiving, handling and speedy issue of material.
- (b) Custodian of goods in store against damage and pilferage.
- (c) To establish regular supply of materials.
- (d) Physical stocking and its checking.
- (e) Efficient utilization of store space.
- (f) To provide service to the organization in most economic way.

(g) Proper identification and easy location of items.

2. Coding or Codification

It is the process of assigning a code number or code symbol to a particular material for easy identification. Usually manufacturers, distributors and wholesalers have large merchandise in the stores. It is difficult to locate the items in the store unless some system is evolved to store them. There should be place for everything and it should be place at their right place. Therefore code numbers are allocated to various items to facilitate easy identification.

Advantages of codification

- (a) It helps in easy identification of items.
- (b) It helps in grouping the similar items together.
- (c) The ambiguity in description of the materials can be avoided.
- (d) The detailed description of the materials is minimized.
- (e) It helps in avoiding duplication of items.
- (f) It helps in physical counting.
- (g) It helps in inspection of the materials.
- (h) The coding helps in maintaining the secrecy of the items.

4. INFRASTRUCTURE REQUIREMENTS:

- List of minimum requirements for a pharmacy infrastructure: Premises:
- The word Pharmacy shall be displayed in white writing on green coloured sign boarded having minimum length of 5 feet and width of 2.5 feet.
- The premises of a pharmacy shall be separated from room for private use.
- The premises shall be built dry, well lit and ventilated and shall be of sufficient dimensions to allow the goods in stock, especially drugs and poisons to be kept in a clearly visible and appropriate manner.
- The area of the section to be used at dispensing department should not be less than 6 sq meters for each additional person.
- The height of the premises shall at least be 2.5 sq Meters.
- The floor of the pharmacy should be smooth and washable
- The walls shall be plastered or tiled or oil painted so as to maintain smooth, durable and washable surface devoid of holes, cracks or any damage.

- The dispensing department shall be separated by a barrier to prevent the entry of the public.
 - Location of any item inside the store rooms can also be done in the following manner-
 - **(a) Fixed location**
In this method each and every group of items is allotted a fixed place inside the store according to either-
 - Supplier wise
 - Item wise
 - According to the utility of the item.
 - **(b) Random location**
This is most widely used method in almost all kinds of retail shops but each group items are stored, in a particular shelf for its easy location.
 - **(c) Zonal location**
According to this system, available space is divided into different zones and each zone is allotted to different kinds of items. The zones can be named as-
 - Bulk Zone
 - Reserve Stock Zone
 - Spare part Zone
 - Consumable Item zone [2]

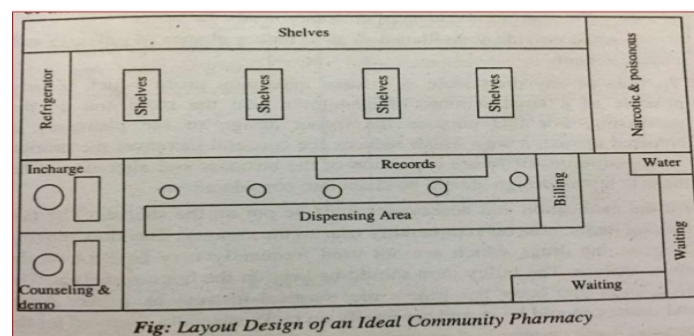


Figure-6: Layout design of an ideal community pharmacy

REFERENCES

1. H.P. Tipnis, Amrita Bajaj, text book of hospital pharmacy, Career publication, Chapter-5, 1st edition, 2007. p. 89-96.
2. www.google.com
3. Anees Ahmad Siddiqui and Mohammed Ali, text book of hospital and clinical pharmacy. Chapter-4, 1st Edition, 2003. p. 36-44.
4. Goyal RK, Parikh RK, Patel MM. A Text book of Hospital Pharmacy.13th edition. Ahmedabad: BS Shah Prakashan; 2015. p. 101-123.
5. Nand P, Khar RK. A Textbook of Hospital and Clinical Pharmacy. Delhi: Birla publishers; 2009. 53-70.
6. William JR, E. Hassan. A text book of Hospital pharmacy. 5th edition. p. 124-153.
7. Knowledge of Pharma Pharma Field knowledge, Preparation of hospital formulary, 2019 10th March.
8. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills. Chapter-19, 1st ed. Chennai: Orient Longman Private Limited; 2004. p. 325-343
9. P.L. Madan. A text book of Biopharmaceutics and Pharmacokinetics. p. 399 to 407
10. Eric J. MacLaughlin, Cynthia L. Raehl, Angela K. Treadway, et.al. Drugs & Aging volume 22, 2005. p. 231–255
11. Clifford S, Barber N, Horne R. Understanding different beliefs held by adherers, unintentional nonadherers, and intentional nonadherers: application of the Necessity-Concerns Framework. J Psychosom Res. 64(1): 2008. p. 41–46.
12. Van Heuckelum, M.; van den Ende, C.H.; Houterman, A.E et.al. The effect of electronic monitoring feedback on medication adherence and clinical outcomes: A systematic review. 2017, 12.
13. . MacLaughlin, E.J.; Raehl, C.L.; Treadway, et.al. Assessing medication adherence in the elderly. Drugs Aging, 22, 2005, p. 231–255.
14. Alvarez, P.M.; Martínez, L.D.C.N.; Ucha, S.M.; Martín, V.A.; Vázquez, L.C.; Piñeiro, C.G. Medication non-adherence as a cause of hospital admissions. Farm. Hosp. 38, 2014. p. 328–333.