HOSPITAL PHARMACY

INTRODUCTION-

- The hospital pharmacy is one of the key departments in hospitals that deals with procurement, storage, compounding, dispensing, manufacturing, testing, packaging, and distribution of drugs.
- The research in pharmaceutical science and education is also the responsibility of this department; it is carried out under professional and competent pharmacists.
- The hospital pharmacy has a high impact on the economics of health costs.
- Today, drug monitoring services and drug information services are integrated in the hospital pharmacy.
- The hospital pharmacist is capable of purchasing, storing, handling, pricing, and dispensing medications.
- Furthermore, pharmacists provide drug information to all health care professionals and the public and act as a connection between the patient and the physician.
- Hospital pharmacists provide specifications for purchasing drugs, chemical and biological medications, etc.
- They are further responsible for the manufacturing and distributing of medicaments such as transfusion fluids, parenteral products, tablets, capsules, ointments, stock mixtures, and proper storing of drugs.
- Hospital pharmacists can sterilize and dispense parenteral medications manufactured in hospitals.
- They fill and label all drug containers and dispense them.
- The purchase of drugs, proper conditions for drug storage, maintaining records, and supplying of drugs to the outpatient department are the responsibilities of hospital pharmacists.
- The functions of hospital pharmacists further include medication monitoring services for inpatients and cooperation in the research program of hospitals.

DEFINITION-

The practice of pharmacy within the hospital under the supervision of a professional pharmacist is known as hospital pharmacy.

HOSPITAL PHARMACY-NATIONAL SCENARIO

- Pharmacists comprise the third largest healthcare professionals in the world and pharmacy profession has been evolving steadily over the last decade in India.
- Today, pharmacists have expanded their role from dispensing to pharmaceutical care by maximizing the benefits of medications and their safety.
- With the increase in work related activities, it has directly or indirectly influence the quality of work delivery and job satisfaction in pharmacists.
- The general public also regards community pharmacists working in medical stores as the first choice to seek medical counsel for minor ailments but unfortunately pharmacists are not available at all times due to higher workload, increased volume of prescriptions and the number of interactions with patients.
- Developed nations have clearly established the role of community pharmacists by providing them with knowledge and techniques to counsel patients, provide information about medicines and disease conditions or advice about life style modifications, drug administration, dosage, side effects, storage of drugs, and drug-drug and drug-food interactions.
- Many developed nations such as Australia, United Kingdom, and United States have also given prescription rights to pharmacists and nurses to reduce burden on physicians and improve quality of care.
- However, in India, compared to the western world, the role of the community pharmacist is limited.
- The health care system in India is going through dramatic changes due to growth in the demand for health care and patient needs.
- The educational and professional responsibilities of pharmacists are being constantly redefined.
- The neglected role of clinical pharmacy in India has started to undergo promising changes, enhancing the profile of pharmacists and enabling them to be an integral part of the health care system.

HOSPITAL PHARMACY-INTERNATIONAL SCENARIO

- The pharmacy profession has undergone tremendous changes over the past few decades that have led to an expansion in the breadth of professional practice.
- Pharmacists' roles are no longer limited to the conventional services of drug preparation and distribution; they have extended their boundaries to encompass more patient-centered services to ensure an optimal therapeutic outcome.
- These include educating and counseling patients, promoting health and preventing disease, managing different disease states, and providing specialized clinical recommendations to other healthcare professionals.
- The practice of pharmaceutical care in Qatar, reflected pharmacists' involvement in the recognition of drug-related problems and medication counselling.
- The area of parenteral nutrition in Kuwait also observed mainly preparation and dispensing rather than direct patient interaction. A limited number of pharmacists had ward-related activities, including participation in patient assessment and monitoring as well as the design of total parenteral nutrition regimens.
- The pharmaceutical care practice in NICU in Australia was more progressive, involving the provision of drug recommendations, resolution of drug-related problems, and medication review encompassing both clinical and dispensing services.
- In Iowa and North Dakota, pharmacists generally played a vital role in disease state management, medication therapy management, care transition from inpatient to outpatient, prescription medication take-back, smoking cessation, and vaccination.
- Essential public health services—like the enforcement of health protection related laws and regulations, patient education on health-related issues, and participation in training outside the scope of continuing education requirements were seen in Iowa, North Dakota, and Manitoba.

HOSPITAL PHARMACY STANDARDS

FIP BASEL STATEMENTS

- FIP is the global federation of national associations of pharmacists and pharmaceutical scientists.
- It is active across all areas of pharmacy practice, pharmaceutical science and education, primarily through the work of member associations and dedicated volunteers.
- It initiates and implements numerous projects and programs to improve the responsible use of medicines.
- Hospital pharmacists from around the world met in Basel, Switzerland in 2008 to discuss the future of hospital pharmacy hosted by FIP (International Pharmaceutical Federation).
- In 2014 they again gathered in Bangkok and launched an updated version of Basel statement with 65 statements. These statements cover following six main areas of hospital pharmacy (FIP Basel statement)
    1. Procurement
    2. Influences on prescribing
    3. Preparation and delivery of medications
    4. Medication administration
    5. Monitoring medication
    6. Human resources and training

ASHP (AMERICAN SOCIETY OF HEALTH-SYSTEM PHARMACISTS)

- American Society of Health-System Pharmacists has been formerly called as American Society of Hospital Pharmacist.
- It is a professional organization that represents pharmacists who serve as patient care providers in hospitals and other health care settings.
- It is a professional organization that demonstrates the description of minimum standards competencies of pharmacists in health care settings.
- Following are the minimum standards required to the pharmacist demonstrated by ASHP:

1. Proper knowledge and understanding of the health care institution and pharmacy department
2. A complete knowledge and understanding of the duties and responsibilities of his position
3. A working knowledge of the pharmaceutical medical terms, abbreviations and symbols regularly used in prescribing and dispensing.
4. A working knowledge of the general chemical and physical properties of all drugs handled in manufacturing and packaging operation in the pharmacy department.
5. A working knowledge of commonly used weight and volume equivalents and an ability to carry out the arithmetic calculations essential for the usual dosage determinations and solution preparation.
6. The ability to perform the important functions relating to drug purchasing and inventory control.
7. A working knowledge of drug dosage, routes of administration and dosage forms.
8. A working knowledge of the procedures and operations associated with the manufacturing, packaging, and labeling of drug products.
9. A working knowledge of the procedures and techniques associated with the sterile manufacturing and parenteral admixture preparation.
10. The ability to perform the functions relating to a unit dose drug dispensing system.
11. The ability to perform the manipulative and record keeping functions relating to the dispensing of prescriptions.

NABH ACCREDITATION AND ROLE OF PHARMACIST

The National Accreditation Board for Hospital and Healthcare (NABH) was started in the year 2005.
It is developed by the quality council of India (QIC).
The accreditation program was started with the intent to improve the standards of health care organizations.
It is the highest benchmark for quality of hospitals in India.

QUALITY INDICATORS

- These are the set of functional parameters which have been selected across different departments of the hospitals.
- NABH provides guidelines to setup patient and hospital management centered standards. NABH provides guidelines for the benefits of patients, employees, and hospitals.
- NABH also provides guidelines in training of hand hygiene, fire safety, biomedical waste management and BLS (Basic Life Support)

BENEFITS OF ACCREDITATION

1. Patients are the largest beneficiary as the implementation of accreditation standards assures patient safety.
2. Accreditation standards assure commitment to quality care associated with good clinical outcomes.
3. Enhances patient satisfaction and increases community confidence as services are provided by medical staff.
4. Accreditation status delivers a promising marketing advantage in competitive healthcare.

QUALITY INDICATORS FOR PHARMACY AND ROLE OF PHARMACIST IN NABH ACCREDITATION

1. Incidence of dispensing errors.
2. Percentage of wastage of drugs.
3. Percentage of medicine expiring in a period.
4. Percentage of out-of-stock medicines along with emergency medicines.
5. Percentage of drugs rejected before preparation of goods receipt note.
6. Percentage of medicines procured through local purchase.

All the above data of quality indicators is collected by the pharmacists from the pharmacy every month and analyze it. He always keeps watch and control on the major deviation in any of the above data.

DRUG DISTRIBUTION

Definition: Physical transfer of drugs from storage area of hospital to the patient's bedside.

Types of drug distribution system:

- Drug distribution to inpatients
- Drug distribution to outpatient

DRUG DISTRIBUTION- INPATIENT SERVICES

In-patient: In-patient is the patient those are admitted in the hospital for diagnosis, treatment. Drugs are distributed to in-patients in a typical hospital.

Distribution of drug to inpatient:

Functional flow chart for distribution of drug to In-patients:
(1) Physician prescribe drug to inpatient.
(2) Nurse Prepare requisition of drug & send towards pharmacy department.
(3) Pharmacist distributes a drug to nursing unit as per requisition slip.
(4) Nurse brings these drugs to in-patient & administers them.
(5) Record keeping for administered drug.

DIFFERENT DRUG DISTRIBUTION SYSTEM TO INPATIENT

Different systems are used to distribute drugs to inpatient

1. Individual prescription medication for each patient
2. Floor stock system
3. Combination of (1) & (2) Method
4. Unit dose dispensing

1. INDIVIDUAL IN-PATIENT PRESCRIPTION ORDER METHOD

In this method physician prescribes the drug for individual patients, who obtains the prescribed drug from any medical store or hospital dispensary by paying his own charges.
This system is generally used by the small &/or private hospital due to reduced manpower requirement and desirability to provide individualized services.

Advantages of individual medication system

1. Close control on stock of medicine is possible.
2. Medication error can easily find out.
3. All medication orders are directly received by the pharmacist
4. This system provides for better interaction amongst the pharmacist, doctor, nurse and patient.

Disadvantages

1. This method cannot be practiced in big hospitals.
2. Possibility of delay in obtaining medication.
3. High cost may be passed on to the patients.

2. COMPLETE FLOOR STOCK SYSTEM

Under this system drugs are given to the patients through the nursing station. Pharmacy supplies the drugs to the nursing station through the drug store. This system is used in very big hospitals.

In this system drugs are classified as:

a. Free floor stock drugs &

b. Charge floor stock drugs

When nursing station has both the charge & free floor stock drugs then the system is known as complete floor stock system.

Advantages

1. Ready availability of medicines.
2. No return of drugs to the pharmacy.
3. Reduction in drug order transcriptions for pharmacy.
4. Reduction in pharmacy personnel requirement.

Disadvantages

1. No review of prescription order by pharmacist & therefore increased risk of medication errors.
2. Increased drug inventory.
3. Drug deterioration hazards..
4. Greater demand on nurses time.
5. Extra capital is required for making storage facilities at each nursing point.
6. As nurse dispenses the drugs it infringes the professional duty of pharmacist & may also have legal implications.

Free floor stocks drugs (non-charge floor stock drugs)

- It is an inventory of routinely required medicines as per the predetermined list and is given as a part of hospitalization. These are not separately charged to the patient account.
- Usually, non expensive drugs which are routinely required in affordable quantity are selected as free floor stock drugs.
- The list is short & varies from hospital to hospital.
  Ex. Saline solution, Dextrose injection, Absorbent cotton, Paracetamol, Aspirin, Dettol, Savlon etc

Selection of free floor stock drugs

The list of these drugs is prepared by PTC Selection is done on following criteria's-

i) Cost of drugs.
ii) Frequency of drug use.
ii) Quantity of drug use.
iv) Effect on the hospital budget.

Dispensing non-charge floor stock drugs:

Distribution depends upon a printed list which contains name & strength of drug, location of ward & size of unit. This list is known as master check list. Commonly used methods are:

i) Drug basket method.
ii) Mobile dispensing unit.

i. Drug basket method:

- In this method nurse of night duty checks the drug inventory in the medicine cabinet, utility room & refrigerator.
- This check is done against the master check list given by the pharmacy.
- Nurse ticks the quantity required for each drug on the requisition for supply.
- Empty containers along with requisition are placed in basket & it is sent to the pharmacy.
- In the morning just after opening the pharmacy, pharmacist fills up empty containers & keeps them in basket.
- These are then sent to the nursing station.
- Nurse administers drug to the inpatient & keeps the record of administered drug.

ii. Mobile dispensing unit:

- In this method, a trolley with swivel wheels is used to carry the drugs to the wards.
- It is a specially constructed stainless steel trolley measuring 60 inches high, 48 inches wide and 25 inches deep.
- Here, nurse of night duty is relieved of checking the inventory & transporting the empty containers.
- Pharmacist or his assistant checks the nursing station for drug inventory.
- Pharmacist restocks the ward with necessary drugs & leaves requisitions carbon copy at the ward as a proof of delivery.
- Original requisition is sent back to the pharmacy for filling of mobile dispensing unit.

Advantages

1. Pharmacist visits the nursing station, so expired, deteriorated drugs are identified& removed.
2. Pharmacist is available for spot consultation by clinical staff.
3. Ready availability of medicines.

Disadvantages

1. Less involvement of nursing staff.
2. Increased work load on pharmacist.
3. Trolley with storage facility is required.

Charge floor stock

- It is an inventory of expensive drugs for which patients are charged on the basis of dosages given.
- It is the responsibility of pharmacist working in co-operation with nursing station to make these
- drugs always available.
- Pharmacist should periodically inspect the drugs stored at nursing station.
- List is prepared by PTC which may differ from hospital to hospital.

Selection of charge floor stock drugs

Hospital pharmacy confirms to the norms laid down by PTC & makes available requisite drugs.
The selected list is constantly reviewed by the committee for necessary revisions.
Selection of drugs is need based & generally vital lifesaving drugs are included in this category.
Ex. Cardiovascular drugs, Antihypertensives, Diuretics, Antibiotics. Antihistaminic, etc.

Dispensing of charge floor stock drug:

Envelope Method

- In this method Envelopes are used to dispense drugs to the wards & also used as charge ticket.
- Pre-labeled envelopes containing name & strength of drug are filled with the specific drug.
- While administering the drug to the patient, nurse puts details of patients name and room number on the envelope & keeps it in the out-basket. Then same is sent to the pharmacy for pricing.

3. COMBINATION OF INDIVIDUAL DRUG ORDER AND FLOOR STOCK SYSTEM

- This system is used in those hospitals where patients pay for their hospitalization and the hospitals use the individual prescription order system as their primary means of dispensing but have several drugs in the floor stock.
- This combination system is most commonly used in hospital today and also modified to include the use of unit dose medication.

UNIT DOSE DISPENSING

Definition:

- These are the medications which are ordered, packaged, handled & charged in multiples of single dose units, containing a pre-determined amount of drug.
- In this method the pharmacist makes each & every dose of medication ready for administration.
- Solid medicaments are prepacked, liquids are premeasured & parenteral are premeasured & filled in sterile syringes. Strip packed tablets are common example of unit dose medication
- Drug supplies are received in bulk quantity by the pharmacy & making unit doses out of bulk is an important function carried out in the hospital pharmacy.
- Such unit dosages are useful for in-patients & out-patients.
- Unit dose dispensing is carried out in centralized way at the level of pharmacy or in decentralized way at the level of Satellite pharmacy on the floor.
- Once a unit dose container is opened pharmacy will not accept it back.

Centralized Unit Dose Dispensing (CUDD)	**Decentralized Unit Dose Dispensing (DUDDI Satellite Pharmacy**
In this type of dispensing, medicines are stored in the centrally located pharmacy from where it is distributed to the patients through medication carts or dumb waiters as per the physician's prescription	-This system is generally used where hospital has several buildings or floors -This system consists of small satellite pharmacies located on each floor of the hospital -Medication carts are used for the delivery of drugs to nursing station.

Advantages

1. No pilferage & wastage.
2. Operational automation is possible.
3. Accounting becomes easier
4. Patients are charged only for the dose of drug they receive.
5. Medication errors are reduced.
6. Paperwork is less at the nursing unit as well as pharmacy.
7. Service round the clock becomes possible.

Disadvantages

1. Cost of medicine may increase.
2. Need more staff to prepared unit dosage.
3. Extra space and facilities are required.

SATELLITE PHARMACY

- Satellite pharmacy concept is adopted in very big hospitals, which have multistoried separate buildings in single premises.
- Big hospitals everyday faces more problems during distribution of drugs to all the wards. Hence big hospitals are running satellite pharmacies in the form of mini-pharmacies.
- Satellite pharmacies (Floor pharmacies) are the branches of pharmacy located on each floor of the hospital.
- The main pharmacy serves as a feeder serving to all the satellites.
- Main pharmacy procures stores, manufactures & packages the drugs. These drugs are then dispensed in ready to use form through carts to satellites Stock for 24 hours is maintained in satellite pharmacy.

In satellite pharmacy following procedure is adopted for dispensing:

1. Pharmacist prepares Patient profile card, containing personal data & disease parameters of the patient.

2 Physicians prescription is sent to the pharmacy, Pharmacist reviews it & enters it on profile card.

3. Dosage schedule is then communicated to the nurse.
4. Junior pharmacist then dispenses the drugs in the bins & keeps them in carts for transportation.
5. Nurse administers the drug to the patient & makes entry in patients medical record.
6. The cart is then returned to the pharmacy, which is then re-checked by the pharmacist.

Advantages

1. Efficiently drug can be distributed.
2. Time of drug dispensing could be reduced.
3. Errors in drug distribution could be stopped.

Disadvantages

1. Overall hospital budget may affect.
2. Additional manpower is required

BED SIDE PHARMACY

- Pharmacist responsibilities are not only drug dispensing but participate in activities going on around the patients. In this case, pharmacist provides service to the patients at their bed.
- Lifesaving drugs like nitroglycerine tablet may keep at the bed side, if so ordered by the physician.
- The nurse should count the number of tablets daily in the morning and evening. Add the tablets to maintain the supply of ten tablets.

Pharmacist's role:

1. Ward visit

Daily in the morning, he visits the wards and enquires about progress of health.

2. Alloying anxiety and fright

He shall reduce such problems by briefing the patient about the diseases, medicine, treatment etc.

3. Interaction with physician and nurse:

He interacts with the physician about the medicines and types of dosage forms to be prescribed. He guides to the nursing staff regarding storage, handling and safe use of medicine.

4. Detailing

He can educate the patient as well as his relatives during his ward visit on epidemics, family planning, communicable diseases, like HIV, TB, Leprosy AIDS, SARS etc.

Importance:

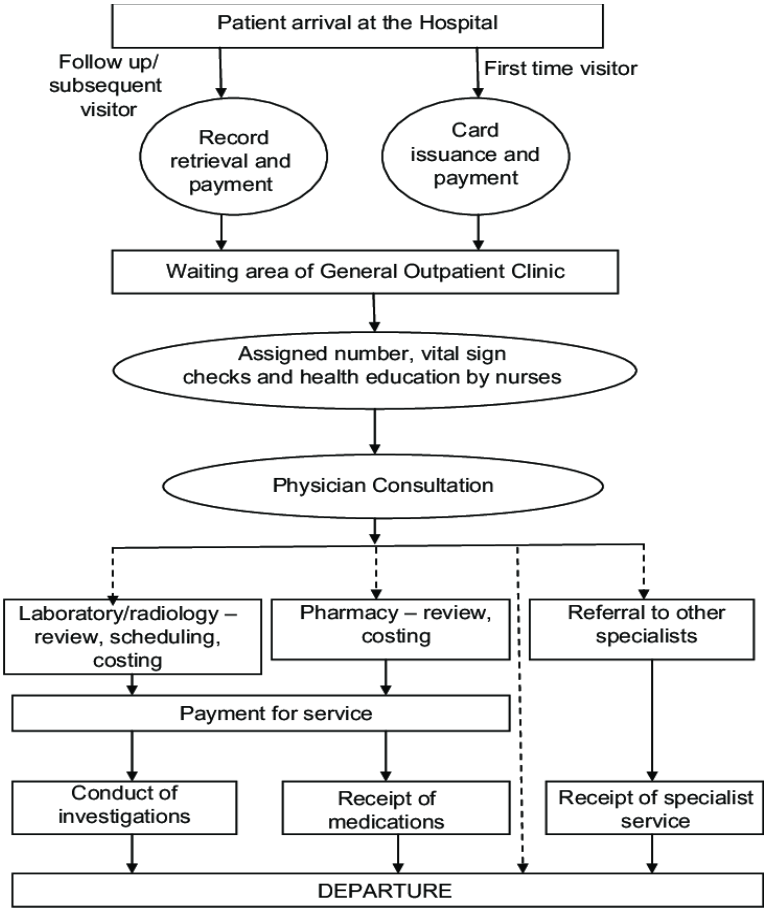
Bed side pharmacy shows that pharmacy is expanding its role beyond compounding & dispensing.
Bed side pharmacist interacts with patients, nursing & medical staff.
He provides information about actions & uses of frequently used drugs.
During his ward visits, he checks the physicians order & gives his own expert evaluation on prescribed drugs. He becomes an important member of inter-professional team of physician, pharmacist & nurse.
He tries for safe & rational use of drugs.

DRUG DISTRIBUTION: OUTPATIENT SERVICES

DEFINITION

Outpatient/ Ambulatory Patient: These are the patients who receive general or emergency treatment which could be diagnostic, therapeutic or preventive, without being admitted as an These are also known as Ambulatory Patients as these patients are able to walk i.e, they are not bedridden.

GENERAL FLOW CHART FOR PATIENT



TYPES OF OUT-PATIENTS

Following are the types of outpatients:

1. General out-patient
2. Referred
3. Emergency
4. Special

1. General Out-patient

These are the patients, given treatment on outpatient basis for the conditions other than emergency condition & are not referred cases.

2. Referred Out-patient

These are the patients referred directly to the OPD by their attending medical or dental practitioner for specific treatment other than an emergency treatment & who latter returns to their practitioner for further care.

3. Emergency Out-patient

These are the patients, given emergency or accident care for the conditions which require immediate medical attention.

4. Special outpatient

After completion of the general checkup, the patients are asked to go for clinical, pathological or radiological examinations for accurate diagnosis.

Ambulatory Patients:

Patients who are able to walk are known as ambulatory patients. This term is used as synonym for out-patients as they receive primary care & walk off. But it is wrong to use this word as synonym for out-

patients because although majority of out-patients are able to walk, all of them are not & against this some in-patients may be able to walk.

LOCATION AND LAYOUT OF OPD

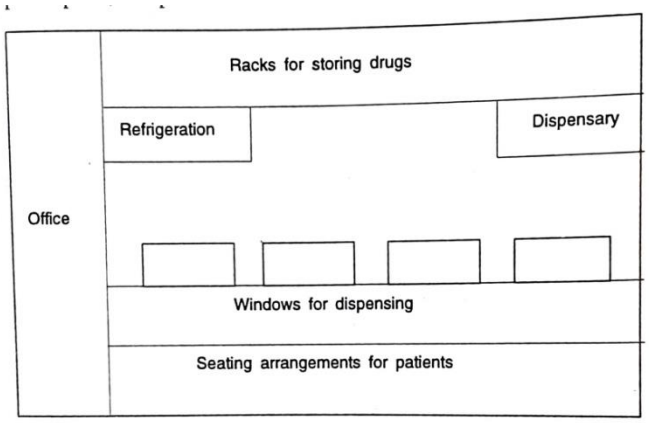
Location of out-patient dispensing

- There is no hard & fast rule about its location. Wherever located it should not cause any disturbance to inpatients & should be easily accessible to outpatients.
- Whenever possible there should be a separate independent outpatient dispensary. If it is not possible then combined unit is used for dispensing to outpatients as well as inpatients.
- Here dispensing is done from separate windows.
- The outpatient dispensary should have two separate prescription presenting windows one for men & another for women. Same windows dispense drugs.
- If needed window points can be raised to avoid overcrowding, but this also increases the manpower requirement & cost of the service.
- The medical store of hospital pharmacy provides stock of at least 8 days to the dispensary & emergency supplies at any time. During dispensing total elimination of waiting time is not possible so outpatient dispensary should have well-furnished waiting room.
- An out-patient receives general or emergency treatment which could be diagnostic, therapeutic or preventive without being admitted in hospital.
- An out-patient department is a potent force that keeps a check on patients who need only diagnostic and
- therapeutic services and not bed.
- Out-patient department reflects the image of hospital.
- Now-a-days out patient department is made well organized to attract more and more patient in private
- hospitals.
- It is advantageous to have a separate independent out- patient pharmacy for better service.
- When it is not practicable especially in small hospital, a combined out-patient and in-patient service can be at keeps a provided from the same pharmacy.
- Sometimes hospital has combined in-patient and out- patient unit but service is provided from the separate windows.
- Out-patient department and pharmacy are present together in the same building. In some hospitals, they are separated geographically.
- The out-patients dispensing is done from the same pharmacy where the stock preparations are made together for in-patients and out-patients department.
- There are two prescription presenting windows one for men another for women.
- The pharmacy receives its supplies from medical stores weekly but emergency supplies can be obtained at any time.

Layout of outpatient department

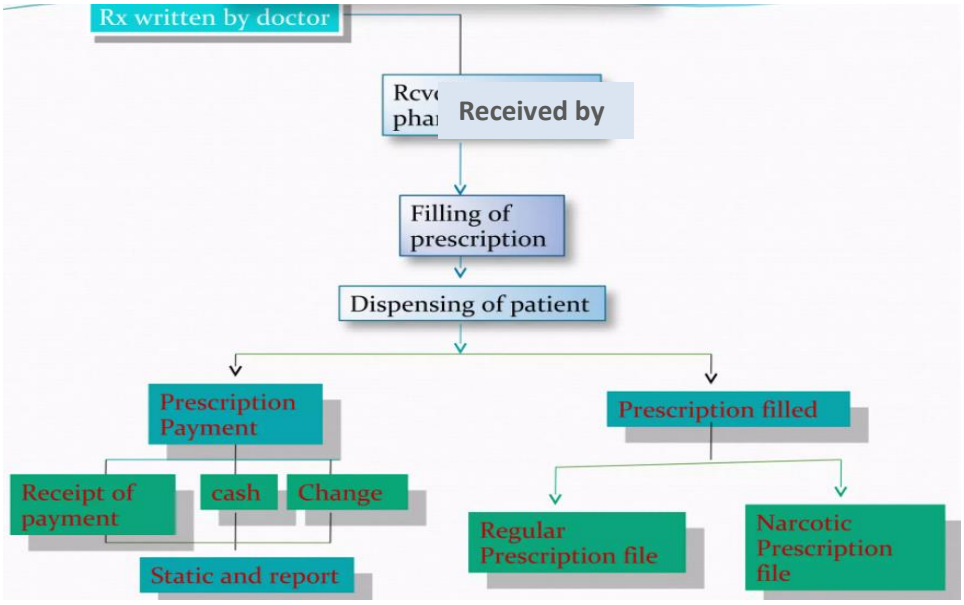
- Adequate no. of window for receiving & filling up prescription.
- Waiting room should be well furnished. There should be minimum waiting period for the patients. It can be reduced by providing sufficient space for receiving and filling up prescription.
- Sufficient reading material like newspaper, magazine etc available for patient leisure.
- Educative posters also available in outpatient department. Waiting rooms should be well furnished with sufficient furniture, reading materials and informative posters.

- If more crowd in out-patient department then department should provide more no. of windows and man power. If there is a waiting period, the pharmacist gives the token on which basis the patient can be identified.



Typical layout of Out-patient department

Process of Dispensing drugs to outpatient



1. New patients who are visiting the hospital for the first time go towards the registration counter.
2. At the registration counter patient registers his name & take registration number.
3. Depending on the nature of illness he is directed to a particular medical department or registered medical practitioner.
4. Medical practitioner diagnoses the disease & makes the prescription on case paper which bears particulars of name, age, registration number & tentative diagnosis of disease.
5. This case paper prescription is presented to pharmacist.
6. Pharmacist checks the prescription & fills it up. He maintains record of all medicines dispensed except for stock preparations.
7. While handing over filled in prescriptions correct delivery is ensured by Call check system or Token system
8. Along with the drugs patient may be given prescription case paper back to be brought on next call or alternatively only registration number & identity slip is given to the patient.
9. Pharmacist has to satisfy the necessary requirements in case of schedule H, G & X drugs.

DISTRIBUTION OF DRUGS TO ICCU/ICU/NICU/EMERGENCY WARDS

In hospital specialized units are dedicated for the patients who have life threatening illness or injuries and need intensive care and constant observation.
Following are the specialized units:

- **ICU (Intensive Care Unit),** is also known as an intensive therapy unit or intensive treatment unit or critical care unit, is a special department for critical patients who needs intensive treatment and continuous observation.
- **ICCU Intensive Coronary Care Unit),** is also known as an intensive Cardiac Care unit, is a unit which focused on intensive treatment for heart issues such as coronary heart disease, cardiac dysrhythmia, heart attack, heart failure and other cardiac conditions.
- **NICU (A neonatal or newborn intensive care unit)** also known as an intensive care nursery (ICN), is an intensive care unit (ICU) specializing in the care of ill or premature newborn infants.
- **EMERGENCY WARD** also known as an accident & emergency department, emergency room or casualty department, is a medical treatment facility specializing in emergency medicine, the acute care of patients who present without prior appointment; either by their own means or by that of an ambulance

- Patients receive prescriptions in the ward while receiving treatment in the specialized ward.
- Specialized drug dispensing system is developed to emergency patients in which uses a special cabinet having medication bins that store selected and limited quantities of medications packaged in single unit containers.
- Also, intravenous solution, irrigating solutions, eye tray medications, drugs for cardiopulmonary resuscitation and refrigerated drugs are kept in areas of ready access.
- The system provides for punched cards containing information on the drug. These cards are stored with medication and are used for billing and reordering purposes. A 24 hr supply of medications is required for the specialized unit, so, that may be dispersed after pharmacy hours are packaged in prelabeled, zipper locked plastic bags.

AUTOMATED DRUG DISPENSING SYSTEM

Today automation in drug dispensing includes:

- Computer-assisted physician order entry
- Robotic handling, packaging and sorting of drugs in the pharmacy
- Stand-alone nursing unit based cabinets
- The automated generation of customizable reports and forms

- Each system and each cabinet is configured slightly different, but all operate on the same basic principle: typically installed in nursing wards, and often in the emergency departments and operating rooms of hospitals and other healthcare facilities. The cabinets look and function much like an automated teller machine (ATM).
- The user inputs their confidential ID, selects a patient profile from a list of options and chooses the appropriate medication to be administered.
- The dispensing cabinet then unlocks a specified drawer containing the medication allowing the user access for a limited amount of time.

AUTOMATED DRUG DISPENSING DEVICES

AUTOMATED DISPENSING CABINET

- Automated dispensing cabinet is a computerized drug storage device or cabinet designed for hospitals.
- The ADM provides proper storage, inventory control and security for pharmaceuticals at the point of care.
- It can be used only by authorized users who are authenticated by password. It is placed in wards, ICU rather than in central pharmacy.

Advantages

1. The commonly needed pharmaceuticals are at the point of care. This will reduce the workload of nurses.
2. Controlled substances remain in secure lock box until needed and access is secured by multifactor authentication.
3. ADM can improve patient safety by providing drug allergy alerts, drug-drug interaction and advice on high-risk medication.

ROBOTIC DRUG DISPENSING

- The robot can store upto 35000 medicines and dispense around 12 prescriptions in less than a minute. So, the patient's waiting time is significantly reduced.
- The dispensing process will be paper free as the robot will store the prescription as soon doctor documents it electronically.
- This also allows the pharmacist to focus on giving the customers the right instruction regarding administration of medication.

STORAGE AND DISTRIBUTION OF NARCOTICS & PSYCHOTROPIC SUBSTANCES

- Narcotics & psychotropic substances is a drug or chemical which ownership, manufacture, or use is absolutely regulated by a respective government of country such as illegally used drugs or prescription medications.
- These laws enforcement leads to prevention in the unauthorized use of such substances/drugs such as central analgesics (opioids), anesthetics, steroids, etc.

These controlled substances are listed under following schedules.

Schedule 1: The drugs under this schedule have high potential for abuse and have no accepted medical use in treatment (eg. Marijuana, raw opium).

Schedule 2: The drugs under this schedule have high potentials for abuse but accepted for medical use (e.g. Cocaine, morphine).

Schedule 3: The drugs under these schedules have less as compare to above potentials for abuse, accepted for medical treatment and have less physical dependence and psychological dependence (eg, benzodiazepine and painkiller, phenobarbitone, low strength codeine, steroids etc.

STORAGE

- Narcotics & psychotropic substances must be stored in separate cupboard with double lock and key. The key of the locks should be kept in hand of two different people.
- Other than narcotics drug no items are permitted to be stored in the narcotic drug cupboard.
- A separate register should be maintained to register them.
- Narcotics drugs & psychotropic substances must be procured & stored in such a manner so as to prevent their falling into the hands of unauthorized persons.
- The storage area for the narcotics & psychotropic substances may be opened and accessed by specific pharmacist In-charge and specific nursing In charge of respective department.

DISPENSING OF NARCOTICS & PSYCHOTROPIC SUBSTANCES

1. A separate register should be maintained to record dispensing and a controlled procedure is used to issue or receive NDPS drugs.

2. Following persons are involved in dispensing:
   - **Medical superintendent** is overall responsible for the proper safeguarding & handling of narcotics & psychotropic substances.
   - **Chief pharmacist** responsible for the purchase, storage, accountability and appropriate dispensing of the narcotics & psychotropic substances within the hospital.
   - **Head nurse:** Responsible for the record of proper storage

3. Prescription order of the narcotics & psychotropic substances should be made by using ink or indelible pencil, typing and duly sign by the respective doctor.

4. Prescription for Narcotic & psychotropic substances must include the following information, i.e, Patient's full name. Address, Date, Name and strength of the drug, Quantity of drug, Signature of prescriber, Dose and route of administration.

5. If the required drug is not in stock in the ward, the complete controlled drug prescription must be written on a hospital prescription blank form by registered medical practitioner and then it is signed and sent to the hospital pharmacy. Abbreviation like p.r.n (Pro Re Nata) or SOS (Si Opus Sit) must be discouraged for such drugs.

6. The completed form along with the empty containers and nurses inventory sheet is sent to the pharmacy for dispensing. The prescription signed by Registered Medical Practitioner will also permit the patient to purchase drug from outside pharmacy.

7. The delivery of narcotic drugs from the pharmacy to the wards and nursing stations must be carried out through some reliable persons.

8. Charges for Narcotic and Psychotropic Substances depend upon the policy of hospital. It could be like the charges may be made for individual dose received or flat charges for all narcotics and hypnotics.

9. After the dispensing of narcotics by the pharmacy, Nurse in charge must prepare special form in duplicate entries to cover incidence of every dose of narcotics & psychotropic substances given/administered to patient or drug is lost or wasted on ward. Such accountability of control substances needs to furnish to pharmacy department while request for new supply of drugs Original is filled in pharmacy and duplicate copy is kept for record to nursing office.

10. While administering a dose, if patient refuses or doctor cancels any dose, it is the responsibility of the nurse to destroy the drug into sink and record "Refused by patient" or "order cancelled by doctor Nurses should always preserve a proper record in case of destruction/ wastage/contamination.

11. Pharmacist need to preserve the records of the receipt and return of narcotics & psychotropic substances for disposal. Documentation of the return of narcotics & psychotropic substances for demolition by the pharmacist from the respective ward of hospital is considered as good practice of record.

GOOD PHARMACY PRACTICE IN HOSPITAL (GPP)

International pharmaceutical federation (FIP) developed standard for pharmacy services under the heading of "Good Pharmacy Practices" in community and hospital pharmacy settings.

MISSION OF GOOD PHARMACY PRACTICE

The mission of good pharmacy practice is to provide medication and health care products and services to people and society to achieve good outcomes from treatment.

REQUIREMENTS OF GOOD PHARMACY PRACTICE

Following are some of the important requirements of good pharmacy practice:

1. A pharmacist first priority must be the welfare of the patient
2. A pharmacy service must supply medication and health care products of assure quality and must monitor the effects of their use.
3. A pharmacy services must contribute in the promotion of rational and economical prescription and appropriate use of medicines.
4. Each element of pharmacy services must be relevant to the patient, is dearly defined and is effectively communicated to all those involved.

ROLE OF PHARMACIST IN SATISFYING GOOD PHARMACY PRACTICE REQUIREMENT

Pharmacist is the key person in the health care setting who has to implement good pharmacy practice so he must understand following points:

1. He must establish and maintain relationship particularly with physician as a therapeutic collaborative partnership which involves mutual trust and confidence in all matters relating to pharmacotherapeutics.
2. All the colleagues pharmacist must work together to improve pharmacy services.
3. In hospital, pharmacy manager should accept a share of responsibility for the selection, evaluation and improvement of quality of drugs used.
4. Pharmacist must update the information about therapeutics and medicines in use.
5. Pharmacist must ensure the integrity of supply chain and quality of medicines.
6. Pharmacist should accept personal responsibility for maintaining and accessing their own competence throughout their professional working lives.
7. Pharmacist must prepare, store, secure distribute and dispose of medical products.
8. Pharmacist must prepare extemporaneous medicines and medical products.
9. Pharmacist must provide effective medication therapy management to access patient health status and needs.
10. Pharmacist must provide information about medicines and health related issues.
11. Pharmacist must monitor patient progress and outcomes.
12. Pharmacist must contribute to improve effectiveness of health care system and public health.
13. Pharmacist must engage in preventive care activates and services.
14. Pharmacist must support national policy that promotes improved health outcomes.
15. Pharmacist must comply with national professional obligation guidelines and legislations.

ELEMENTS OF GOOD PHARMACY PRACTICE

1. Promotion of health and ill health and prevention.
2. Supply of prescribe medicine and other healthcare products.
3. Ensure that the patients receive and understand sufficient or written and oral information to derive maximum benefit from treatment.
4. Follow up care must be provided to patient to know outcomes of treatment.
5. Contribute to improve effectiveness of the health care system and public health.
6. Engage in preventive care activities and care service.

APPLICATION OF COMPUTER IN HOSPITAL PHARMACY PRACTICE

There is a great demand of computers used in pharmacy field. Currently they are used for their accuracy, multitasking, huge data storage, reduction in time, manpower etc.

1. MAINTENANCE OF PATIENT RECORDS IN HOSPITAL PHARMACY

Patient record maintenance is important job in hospitals but with the support of computers, data can be preserved easily and also updated time to time.

1) Because the work of hospital pharmacy revolves around patient care in the hospital the patient record should consist of

i) Personal information of the patients:

Name	Ward No.
Age	Bed No.
Sex	Date of admission
Occupation	Date of transfer
Address	Date of discharge

ii) Record relating to individual drug prescribe to the drug administration, change in dose of drug, changes in drug selection for the patients.

iii) Record relating to charges or bill to the patient for charge floor drugs

iv) Entry of medication errors

v) Patient medication profile

2. MAINTENANCE OF RECORDS RELATED TO PATIENT MONITORING

i. Record relating to different physiological parameters like blood pressure, temperature, pulse rate, blood oxygen level etc. are monitored during therapy.

ii. Record relating to ADR if seen.

iii. Date on known drug interaction.

3. PURCHASE AND INVENTORY CONTROL RECORD

Computer can be used efficiently for achieving inventory control. Hospital pharmacist initially follows periodic control system & then convert to perpetual system.

1) Periodic inventory control system

- In periodic inventory system, inventory levels are manually checked and entered into the database.

-The amount of inventory on hand is compared with minimum & maximum stock is entered.

- Computer will help in placement of order to each supplier by determining usual or minimal order quantities for supplier.

-Purchase order will be generated after checking terms and conditions and forwarded to the supplier.

2) Perpetual inventory control system

-In perpetual system computer maintains the running balance of the entire drug in stock.

-All drugs are entered into the database when they are received in the pharmacy, they are added to the initial stock so as to get the current stock levels of each drug.

-The quantities of all drugs leaving the pharmacy are subtracted from the inventory balance.

-This will occur whenever the drug order of the patient is processed.

-Any time if checked the stock will be compared against the minimum order quantity.

-Computer prepares a list of drugs to be ordered. It will also prepare a purchase order forwarded to the supplier.

4. THERAPEUTIC DRUG MONITORING

-To maximize the therapeutic action of medicines, avoiding any toxic effects pharmacist has started taking assistance of some pharmacokinetic & non-pharmacokinetic parameters.

-Therapeutic drug monitoring (TDM) is most important in geriatric, pediatric patients and drugs having high tendency for interactions.

-TDM aims to improve treatments by personalizing dosage treatments based on the measurement of blood concentrations. Clinical pharmacist may use computers for therapeutic drug monitoring: in which drugs are very potent and have a very narrow therapeutic index like cardiac glycosides, anti-epileptics. Computer program are intended to calculate drug dosage to suit individual patients need

a) Pharmacokinetic applications

Estimation of pharmacokinetic parameters includes statistical calculation & graphical interpretations. It needs frequent blood samples to be collected. By using the pharmacokinetic parameters, drug dose, time of administration can be predicted by computers. Computer programs like WinNONLIN, USC Pack are used to predict the pharmacokinetic parameters.

b) Non pharmacokinetic applications

It includes detection of drug-drug, drug- laboratory, drug allergy, ADR & drug-disease interaction detected by computer software. The computer system enables detection of potential ADR and notification to the patient's physician prior to administration of the prescribed drug. Example: Software used for drug interaction screening are MEDIPHOR (Monitoring & Evaluation of Drug Interactions by a Pharmacy Oriented Reporting), PAD (Pharmacy Automated Drug Interaction Screening).

5. DRUG INFORMATION RETRIEVAL

A broad search of the drug information is required for the pharmacist so as to satisfy the queries about pharmacology, toxicology, drug interaction, adverse drug reaction etc. Search of drug information can be simplified by the use of computers. In 1964, National library of medicine has made a computerized biomedical information retrieval system, MEDLARS (Medical Literature Analysis and Retrieval System). In 1971, they developed a fast-working system MEDLINE (Medlars On-Line)/ PubMed. It provides free online biomedical literature database.

The computerized information retrieval has following advantages over the manual search:

1. It is time saving & pleasant.
2. It is more thorough & timely than manual search.

6. DRUG DISPENSING

- The computer system is accepted to decrease the time spent by pharmacists on routine distribution tasks and leave time for other necessary pharmacy functions.
- The system appears to improve efficiency pharmacist, accuracy, control of drugs and capabilities for patient monitoring.
- Computerization of narcotic drugs and controlled substances may help in avoiding excessive supplies and unauthorized distribution of such drugs.

  Eg. DAWN (Drug Abuse Warning Network) program is used for dispensing controlled substances.

7. AVOIDING MEDICATION ERROR

Computers play a vital role in preventing medication errors. Several approaches have been shown to decrease medication errors. Computerized physician order entry (CPOE) has been shown to decrease medication errors by

55-80% CPOE is the process which contains placing clinical order like prescription, laboratory test request and result using a computerized system by health care providers Computer applications allow pharmacists to easily analyze orders and detect DRPS (Drug Related Problems)

8. RECORD PERTAINING TO DRUGS IN HOSPITAL FORMULARY

The computer is useful for data storage, search and update of formulary. Computers are capable of maintaining and displaying all drugs by descriptor's code, therapeutic category or generic name.

SOFTWARE USED IN HOSPITAL PHARMACY

1. Electronic Health Record (EHR) Software

EHR programming is one of the most popular type of software used by hospitals and clinics. EHR software collects data on patients. Examples: eClinicalWorks, Allscripts, Nextgenclinic

2. Medical billing software

This software supports hospital accounting departments in maintaining track of patient bills, payments and also in other financial functions. Example: Epic Care

3. Hospital management software

Hospital management software helps hospital administration in day-to-day functions. These types of programs usually help with the automation of accounting, medical billing, claims, out-patient management, inventory, bed management, and others. Hospital management software often combines with EHR software to help at the same time maintain track of patient records. Example. Availity

4. Medical equipment management software

The purpose of this type of software is to relieve hospitals from manual stock taking and equipment maintenance. Medical equipment management software supports the smooth functioning of hospitals with features like automatic maintenance of inventory alerts and scheduling of medical equipment. Example: Sortly

5. Medical research software

Medical research software is used for the purposes of education and sharing research with the health care community. This type of software is generally used to train medical personnel and to help diagnose if no similar clinical cases among the patients. Example: PubMed.gov

6. E-prescribing software

Most of the countries around the world are shifted to electronic prescriptions, which also suggests e-prescribing software is becoming essential for doctors. The software allows medical professionals to track, renew, and cancel prescriptions for their patients. It's also merged with national drug reference databases. Example: MediTab, ScriptSure

7. Telemedicine software

Telemedicine software permits healthcare professionals to carry out appointments with patients online using web browser or a mobile application. In some software, the video conferencing feature is provided with e-prescriptions and a billing module.

8. Therapeutic drug monitoring

TDM program are proposed to calculate drug dosage to suit individual patients need.
Example: WinNONLIN, USC Pack

9. Personal Health Record software (medical diaries)

It helps for maintaining healthy lifestyle and monitoring diseases. It performs as medical diaries and can be either held on the patient's device or merged with the hospital's software.
Example Tulipa app software created for patients suffering from Parkinson's disease. In the app the patient's record of any symptoms, medication, or treatment, and can generate a health report before their next doctor's visit. This type of software can assist the patient in the direction of recovery or aware medical staff on the worsening disease of a patient immediately the first symptoms occur.