Q1. Define Hospital Pharmacy. Explain its scope, organisation, responsibilities of hospital pharmacist, GPP and hospital pharmacy standards.

Hospital Pharmacy: Hospital pharmacy is the department responsible for procurement, storage, preparation, dispensing and safe use of medicines in a hospital.

Scope:

- Drug procurement and inventory control.
- Drug dispensing and distribution.
- Preparation of sterile and non-sterile products.
- Drug information and patient counselling.
- Adverse Drug Reaction (ADR) monitoring.
- Participation in clinical and therapeutic activities.

Organisation:

- Usually works under the hospital administration/Medical Superintendent.
- Head/Chief Pharmacist manages the department.
- Main sections include procurement and stores, dispensing, distribution, compounding, clinical pharmacy and drug information.

Professional responsibilities:

- Procurement, storage and accurate dispensing of medicines.
- Maintaining drug and inventory records.
- Checking prescriptions, doses and interactions.
- Providing drug information and patient counselling.
- Monitoring and reporting ADRs.
- Participating in clinical activities and maintaining professional ethics.

Qualification and experience:

- Required pharmacy qualification recognised by the competent authority.
- Registration with the State Pharmacy Council, wherever required.
- Knowledge of drug handling, dispensing, hospital procedures, drug safety and counselling.
- Hospital/clinical pharmacy experience is useful for senior positions.

Good Pharmacy Practice (GPP):

GPP means providing high-quality, safe and patient-centred pharmacy services.

- Correct dispensing and proper storage.
- Patient counselling and record maintenance.
- Prevention of medication errors.
- Drug safety monitoring and professional ethics.

FIP Basel Statements: Recommendations for improving hospital pharmacy practice and patient care, including medicine selection, procurement, storage, distribution, rational medicine use, clinical pharmacy and patient safety.

American Society of Health-System Pharmacists (ASHP): Provides professional standards and guidance for health-system pharmacy practice, promoting safe medication use, clinical pharmacy, patient-centred care and quality improvement.

NQAS: National Quality Assurance Standards promote quality and safety in public healthcare through patient care, infection control, medicine availability, cleanliness, patient rights and quality improvement.

DRx Forum

NABH: National Accreditation Board for Hospitals & Healthcare Providers provides accreditation to healthcare organisations meeting prescribed quality and safety standards. It promotes patient safety, quality healthcare, documentation, infection control and patient rights.

Q2. Explain the Pharmacy and Therapeutics Committee, Hospital Formulary and Infection Control Committee.
Pharmacy and Therapeutics Committee (PTC): A hospital committee responsible for safe, effective and economical use of medicines.

Objectives:

- Select suitable medicines.
- Promote rational drug use.
- Develop and maintain the hospital formulary.
- Monitor ADRs and medication-use problems.

Functions:

- Evaluate medicines.
- Prepare drug-use policies.
- Monitor prescribing and drug utilisation.
- Recommend suitable therapeutic alternatives.

Composition: Usually includes a senior doctor/Medical Superintendent as chairperson, pharmacist as secretary, physicians, surgeons, pharmacists, nurses and hospital administration; other experts may be included when required.

Hospital Formulary: An approved list of medicines selected for use in a particular hospital.

- PTC evaluates medicines based on safety, efficacy, quality and cost.
- The approved list is regularly updated.
- It guides prescribing, promotes rational drug use and controls unnecessary expenditure.

Infection Control Committee: Responsible for preventing and controlling hospital infections.

Role of pharmacist:

- Promote rational antibiotic use.
- Monitor antibiotic consumption.
- Help prevent Antimicrobial Resistance (AMR).
- Participate in infection-control policies.
- Provide antimicrobial information.

Q3. Explain the preparation of drug lists in a hospital. Define high-risk medicines, emergency drugs, Schedule H1 drugs, Narcotic Drugs and Psychotropic Substances (NDPS) and reserved antibiotics.
Drug list: A hospital drug list is a selected list of medicines required for routine, emergency and specialised patient care.

High-risk medicines: Medicines that can cause serious harm if used incorrectly.

- Examples: Insulin, warfarin and morphine.

Emergency drugs: Medicines required immediately in life-threatening conditions.

- Examples: Adrenaline, atropine and diazepam.

Schedule H1 drugs: Prescription medicines subject to additional controls under the Drugs and Cosmetics Rules. They require prescription-based dispensing and specified record-keeping and labelling requirements.

DRx Forum

NDPS drugs: Narcotic and psychotropic medicines subject to strict legal control to prevent misuse and diversion.

Reserved antibiotics: Important antibiotics kept mainly for serious infections where their use should be carefully controlled to reduce antimicrobial resistance.

Q4. Explain the procedure for procurement of drugs through tender.
Drug procurement is the systematic process of selecting and purchasing medicines required by a hospital.

Steps:

1. **Requirement estimation** – Prepare the medicine list according to demand, consumption and stock.
2. **Drug selection** – Select medicines based on quality, efficacy, safety, cost and hospital requirements.
3. **Tender/e-tender or quotation** – Invite suppliers to submit offers.
4. **Bid evaluation** – Compare price, quality, supplier credentials and past performance.
5. **Supplier selection** – Select the suitable supplier according to hospital rules.
6. **Purchase order/contract** – Mention quantity, price, delivery and payment terms.
7. **Receipt and inspection** – Check quantity, quality, batch number, expiry and packaging.
8. **Documentation** – Enter received medicines into purchase and inventory records.

Q5. Explain inventory control techniques: EOQ, reorder level, reorder quantity, inventory turnover, ABC and VED analysis.
Inventory control means maintaining medicines in sufficient quantity while avoiding overstocking and unnecessary expenditure.

Economic Order Quantity (EOQ): The quantity that should be ordered at one time to minimise ordering and holding costs.

Formula:
$EOQ = \sqrt{(2DS/H)}$

Where D = annual demand, S = ordering cost/order and H = holding cost/unit/year.

Reorder Level: Stock level at which a new order should be placed. It considers consumption, lead time and safety stock.

Reorder Quantity: Quantity ordered when stock reaches the reorder level to restore the required stock.

Inventory Turnover: Shows how many times average stock is consumed/replaced during a period.

Inventory Turnover = Cost of drugs consumed ÷ Average inventory.

ABC Analysis:

- **A:** Few items with very high annual expenditure → strict control.
- **B:** Moderate number/value → moderate control.
- **C:** Many items with low annual expenditure → simple control.

VED Analysis:

- **V – Vital:** Stock-out may seriously affect life.
- **E – Essential:** Important for routine patient care.
- **D – Desirable:** Useful but temporary shortage can be tolerated.

Q6. Explain Central Drug Store, storage conditions, FEFO/FIFO, cold chain and disposal of expired medicines.
Central Drug Store: The central area where medicines and pharmaceutical supplies are received, stored and issued to different hospital departments.

DRx Forum

Functions:

- Receive and inspect medicines.
- Check quantity, quality and expiry.
- Store under suitable conditions.
- Maintain stock records.
- Issue medicines to departments.
- Monitor stock and expiry.

Storage conditions:

- Maintain recommended temperature and humidity.
- Protect medicines from heat, moisture, sunlight and contamination.
- Separate different categories of medicines.
- Keep controlled drugs in secure areas.
- Maintain cleanliness and ventilation.

FIFO: First In, First Out – older stock is issued first.

FEFO: First Expiry, First Out – medicines with the earliest expiry are issued first.

Cold Chain: System of storing and transporting temperature-sensitive medicines, vaccines and biological products under controlled temperature. Many vaccines are generally stored at 2–8°C.

ILR: Ice-Lined Refrigerator is used for vaccine storage and helps maintain 2–8°C even during short power interruptions.

Disposal of expired medicines:

- Identify and separate expired medicines.
- Keep them in a labelled separate area.
- Do not mix with usable stock.
- Maintain records.
- Dispose according to applicable legal and biomedical-waste procedures.
- Narcotic, cytotoxic and other hazardous medicines require special procedures.

Q7. Explain the different methods of drug distribution in a hospital.
Individual Prescription Order System: Medicines are supplied according to each patient's prescription.

Floor Stock System: Commonly required medicines are kept in the ward for immediate use.

Unit Dose System: Medicines are supplied in individually packed doses for individual patients.

Drug Basket Method: Patient-specific medicines are collected and supplied together in a labelled basket/container for the concerned patient or ward.

Combination System: Combination of individual prescription and floor-stock systems.

Unit Dose – advantages:

- Reduces medication errors.
- Improves dose accuracy.
- Reduces wastage.
- Improves patient safety.
- Makes record keeping easier.

Charge Floor Stock: Medicines kept in wards for immediate use and charged to the patient's account when used.

DRx Forum

Advantages: Quick availability, saves time and reduces repeated small dispensing.

Disadvantages: Requires storage space, regular checking and may increase risk of wastage or misuse.

Q8. Explain drug distribution to special wards, satellite pharmacy, automated dispensing and narcotic/psychotropic drug distribution.
ICU/CCU/NICU/Emergency: These areas require rapid and continuous availability of medicines.

- Emergency and commonly required medicines should be readily available.
- Stock, expiry and storage conditions should be regularly checked.
- High-risk and emergency medicines require special attention.

Satellite Pharmacy: A small pharmacy located near patient-care areas such as ICU, emergency or operation theatre and functioning under the main hospital pharmacy.

- Provides faster medicine availability.
- Reduces workload of the main pharmacy.
- Improves medicine distribution and patient care.

Automated Drug Dispensing System: A computer-controlled system for storing and dispensing medicines.

- Reduces dispensing errors.
- Provides quick access.
- Improves inventory control and security.
- Maintains electronic records.

Narcotic and psychotropic drugs:

- Require authorised prescription and controlled dispensing.
- Maintain required records.
- Store securely with restricted access.
- Dispense only the prescribed quantity.
- Loss/theft must be handled according to applicable legal requirements.

Q9. Explain bulk compounding, Intravenous (IV) admixture and Total Parenteral Nutrition (TPN).
Bulk Compounding: Preparation of large quantities of pharmaceutical products in advance for hospital use.

IV Admixture: Preparation of medicines by mixing appropriate drugs with a suitable intravenous fluid.

General requirements:

- Clean/controlled preparation area.
- Aseptic technique.
- Correct drug, diluent and strength.
- Proper labelling.
- Compatibility checking.
- Appropriate storage and use within the recommended period.

IV incompatibility: An undesirable physical or chemical reaction between drugs or between a drug and IV fluid that may cause precipitation, colour change, degradation or loss of therapeutic activity.

TPN: Total Parenteral Nutrition is the administration of essential nutrients intravenously when adequate nutrition cannot be given through the gastrointestinal tract.

Main components: Carbohydrates, amino acids, lipids, electrolytes, vitamins, trace elements and water.

Q10. Write a note on radiopharmaceuticals and their storage and disposal.
Radiopharmaceuticals: Medicinal preparations containing radioactive substances used for diagnosis or treatment.

DRx Forum

Storage:

- Store in designated, shielded areas.
- Use proper labels and radiation warnings.
- Restrict access to authorised personnel.

Dispensing:

- Handle using appropriate radiation-safety precautions.
- Maintain proper identification and records.

Disposal:

- Radioactive waste must be handled according to radiation-safety regulations.
- Use appropriate shielding and containers.
- Disposal should be performed by authorised personnel.

Q11. Explain the applications of computers, Electronic Health Record and software in Hospital Pharmacy.
Applications of computers:

- Drug procurement and inventory management.
- Prescription processing.
- Patient medication records.
- Drug-interaction checking.
- Billing and accounting.
- ADR recording.
- Drug information services.

Electronic Health Record (EHR): A digital record containing important patient health and treatment information.

Contents: Patient history, diagnosis, prescriptions, laboratory reports, medication records and allergies.

Advantages:

- Quick access to patient information.
- Reduces documentation errors.
- Improves communication.
- Supports clinical decision-making.

Hospital pharmacy software may support inventory, purchasing, dispensing, billing, patient medication records, interaction checking and reporting.

Q12. Define Clinical Pharmacy. Explain its scope, development and daily activities of a Clinical Pharmacist.
Clinical Pharmacy: A branch of pharmacy concerned with the safe, effective and rational use of medicines in individual patients.

Scope:

- Patient counselling.
- Medication review.
- Drug information.
- ADR monitoring.
- Drug-interaction checking.
- Therapeutic Drug Monitoring.
- Pharmaceutical care.

DRx Forum

Development: Clinical pharmacy has developed from mainly product-oriented dispensing towards patient-oriented pharmaceutical care and active participation in the healthcare team.

Daily activities:

- Ward rounds.
- Treatment-chart review.
- ADR monitoring.
- Drug information services.
- Medication-history collection.
- Patient counselling.
- Collaboration with doctors, nurses and other healthcare professionals.

Important terms:

- **Paediatric:** Related to children.
- **Geriatric:** Related to elderly people.
- **Antenatal:** Care during pregnancy before delivery.
- **Postnatal:** Care of mother and baby after delivery.

Q13. Explain Pharmaceutical Care, Drug-Related Problems, Medication Therapy Management and Home Medication Review.
Pharmaceutical Care: Responsible provision of drug therapy to achieve specific outcomes that improve a patient's quality of life.

Principles:

- Identify medication-related needs.
- Ensure appropriate drug therapy.
- Identify and prevent Drug-Related Problems (DRPs).
- Monitor treatment outcomes.
- Educate and counsel the patient.
- Follow up regularly.

Drug-Related Problems (DRPs):

- Unnecessary drug therapy.
- Wrong drug selection.
- Ineffective drug therapy.
- Dose too low.
- Dose too high.
- ADR.
- Drug interaction.
- Non-adherence.

Medication Therapy Management (MTM):

- Review all medicines.
- Identify DRPs.
- Check interactions and duplication.
- Assess safety and effectiveness.
- Educate the patient.
- Prepare a medication care plan.
- Follow up and monitor.

Home Medication Review: Systematic review of medicines used by a patient at home to check correct use, dose, storage, interactions, duplication and adherence. It helps detect medication problems and improve safety.

DRx Forum

Q14. Explain Drug Information Centre and Poison Information Centre.
Drug Information Centre (DIC): A centre that provides accurate and updated medicine-related information to healthcare professionals and patients.

Activities:

- Provide information on dose, adverse effects, interactions and precautions.
- Support ADR monitoring.
- Provide patient counselling.
- Support poisoning and toxicology information.
- Assist clinical decisions.
- Update healthcare professionals.
- Maintain drug information databases.

Advantages:

- Provides reliable drug information.
- Supports clinical decisions.
- Helps reduce medication errors.
- Supports counselling and ADR/poisoning management.

Limitations: Requires trained personnel and updated references; maintaining information resources can be costly.

Poison Information Centre (PIC): Provides information on identification, clinical effects, management and prevention of poisoning and assists healthcare professionals in selecting appropriate treatment.

Q15. Explain the important clinical laboratory tests and their significance.
Haematological tests:

- **Haemoglobin (Hb):** Helps detect anaemia.
- **Red Blood Cell (RBC) count:** Assesses red-cell status.
- **White Blood Cell (WBC) count:** May indicate infection or inflammation.
- **Platelet count:** Helps assess bleeding/clotting problems.
- **Erythrocyte Sedimentation Rate (ESR):** May indicate inflammation.

Liver Function Tests (LFT):

- **Bilirubin:** Increased levels may indicate impaired bilirubin handling or liver/biliary disease.
- **Alanine Aminotransferase (ALT) / Aspartate Aminotransferase (AST):** Increased levels may indicate liver-cell injury.
- **Alkaline Phosphatase (ALP):** Useful in assessment of cholestatic/biliary disorders.
- **Total protein/albumin:** Help assess protein-synthetic function and nutritional status.

Kidney Function Tests (KFT):

- **Serum creatinine, urea and estimated Glomerular Filtration Rate (eGFR):** Assess kidney function and help in dose adjustment.

Thyroid Function Tests (TFT):

- **Thyroid-Stimulating Hormone (TSH), Triiodothyronine (T3), Thyroxine (T4).**
- Abnormal results help identify hypothyroidism or hyperthyroidism.

Cardiac tests:

- **Troponin:** Indicates myocardial injury.
- **Creatine Kinase-MB (CK-MB):** Helps assess myocardial injury.
- **Lipid profile:** Assesses cardiovascular risk.

DRx Forum

- **Electrocardiogram (ECG):** Records electrical activity of the heart.

Fluid and electrolyte tests:

- Sodium (Na^+), potassium (K^+), chloride (Cl^-) and bicarbonate (HCO_3^-).
- Help assess fluid and electrolyte balance in dehydration, kidney disease, vomiting, diarrhoea and metabolic disorders.

Pulmonary Function Tests (PFTs):

- **Forced Vital Capacity (FVC).**
- **Forced Expiratory Volume in 1 second (FEV_1).**
- **FEV_1/FVC ratio.**
- Used in assessment of asthma, Chronic Obstructive Pulmonary Disease (COPD) and other respiratory disorders.

Q16. What is poisoning? Explain its types, clinical manifestations, general treatment and antidotes.
Poisoning: A harmful condition produced when a poisonous substance enters the body in a sufficient amount.

Types:

- **Acute poisoning:** Large exposure over a short period.
- **Chronic poisoning:** Repeated or long-term exposure.

Clinical manifestations:

- Nausea, vomiting and abdominal pain.
- Dizziness and weakness.
- Breathing difficulty.
- Convulsions or unconsciousness in severe cases.

General treatment:

- Stop further exposure.
- Maintain airway, breathing and circulation.
- Remove the poison when appropriate.
- Give a specific antidote when available.
- Provide supportive treatment.

Antidotes: Substances that prevent or reduce the harmful effects of poisons.

Classification:

- **Physical:** Prevent absorption — activated charcoal.
- **Chemical:** React with the poison — chelating agents.
- **Pharmacological:** Produce an opposite pharmacological effect — naloxone in opioid poisoning.

Arsenic poisoning:

- Acute exposure may cause severe abdominal symptoms, vomiting, diarrhoea, dehydration, weakness and neurological effects.
- Chronic exposure may cause skin changes, peripheral neuropathy and increased long-term health risks.
- Treatment mainly involves removal from exposure, appropriate chelation such as dimercaprol or DMSA, and supportive care.

DRx Forum

Q17. Define Pharmacovigilance. Explain its aims and scope. Also discuss Type-A ADR.
Pharmacovigilance: The science and activities concerned with detecting, assessing, understanding and preventing adverse effects or other medicine-related problems.

Aims:

- Detects previously unknown or unexpected ADRs.
- Improve medicine safety.
- Promote safe and effective use of medicines.
- Identify safety problems and support appropriate regulatory action.

Scope:

- ADR monitoring and reporting.
- Medicine safety in special populations such as children, elderly and pregnant women.
- Monitoring medication errors.
- Supporting medicine quality and safety.

Type-A ADR (Augmented):

- Predictable and related to the known pharmacological action of the drug.
- Usually dose-dependent.
- Examples: hypoglycaemia with insulin, bleeding with warfarin and drowsiness with sedating antihistamines.

Q18. Explain medication errors, LASA medicines, drug interactions and the role of pharmacists in preventing antimicrobial resistance.
Medication Error: A preventable mistake occurring during prescribing, dispensing, administration or monitoring of medicines.

Types:

- Prescribing error.
- Dispensing error.
- Administration error.
- Monitoring error.
- Omission error.
- Wrong-time error.
- Drug-interaction error.

Consequences:

- ADRs and toxicity.
- Treatment failure.
- Prolonged hospital stay.
- Increased healthcare cost.
- Legal and ethical problems.

Prevention:

- Clear prescriptions/e-prescribing.
- Double-check medicines and doses.
- Verify patient, drug, dose, route and time.
- Use medication checklists and electronic/barcode systems.
- Monitor patients and check interactions.

LASA medicines: Look-Alike Sound-Alike medicines are medicines whose appearance or names may cause confusion and medication errors.

DRX Forum

Prevention:

- Tall-Man Lettering.
- Separate storage.
- Careful prescription and dispensing checks.

Drug Interaction: A change in the effect of one drug caused by another drug, food or other substance.

Types:

- **Pharmacokinetic:** Affects absorption, distribution, metabolism or excretion.
- **Pharmacodynamic:** One drug alters the effect of another at its site of action.

Clinical significance: May increase toxicity, reduce therapeutic effect or cause treatment failure. Example: warfarin with aspirin may increase bleeding risk.

Role of pharmacist in preventing Antimicrobial Resistance (AMR):

- Ensure appropriate antibiotic dispensing.
- Educate patients about correct antibiotic use.
- Discourage unnecessary use, especially for viral infections.
- Promote rational antibiotic selection.
- Monitor antibiotic use and resistance.
- Support infection-control practices.

DRx Forum