BP706T · B.Pharm Semester VII · Theory Notes

# Pharmacy Practice

Unit III — Clinical Pharmacy Services (9 hours)

Unit III (9 hours)

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# CHAPTER 8: Clinical Pharmacy Services — Drug Therapy Monitoring

## 8.1 Learning Objectives

By the end of this chapter, the student will be able to:

1 Define clinical pharmacy and describe its scope.

2 Explain drug therapy monitoring and its purpose.

3 Describe medication chart review and clinical review.

4 Explain what a pharmacist's clinical intervention is and when it is made.

5 Describe ward round participation by the pharmacist.

6 Explain how a medication history is taken.

7 Define pharmaceutical care and explain the pharmacist's responsibility in it.

8 Draw the textual flowchart of the drug therapy monitoring/intervention process.

## 8.2 Definitions

**Clinical pharmacy:** The branch of pharmacy in which the pharmacist works directly with doctors, nurses and patients — usually in a hospital — to make sure each patient gets the right medicine, in the right dose, at the right time, with the best possible outcome.

**Drug therapy monitoring:** The continuous process of checking a patient's medicines while treatment is going on, to confirm the treatment is working, safe, and being taken correctly — and correcting it when it is not.

**Medication chart review:** A systematic check of the patient's medication chart (the written record of all medicines ordered for the patient) by the pharmacist to detect errors, duplications, interactions, or inappropriate therapy.

**Clinical review:** A broader review of the patient's clinical condition, laboratory results, and response to treatment, together with the medicines, to judge whether the therapy is appropriate.

**Pharmacist intervention (clinical intervention):** An action taken by the pharmacist to change or improve a patient's drug therapy — for example, recommending a dose change, stopping a duplicated drug, or alerting the doctor to an interaction.

**Ward round:** A visit by the healthcare team (doctors, nurses, pharmacist) to each patient's bedside in the hospital ward to review the patient's condition and treatment plan.

**Medication history:** A complete, accurate record of all medicines a patient is currently taking or has recently taken — including prescription medicines, OTC products, herbal/traditional remedies, and allergies — collected by interviewing the patient.

**Pharmaceutical care:** The pharmacist's professional responsibility for a patient's drug therapy outcomes — the pharmacist takes ownership for ensuring the therapy is effective and safe, in cooperation with the

patient and other healthcare providers.

## 8.3 Terminology Table

| Term | Meaning |
|---|---|
| Medication chart | The hospital record listing every medicine ordered for an admitted patient, with doses and timings |
| Drug-related problem | Any undesirable event or risk connected with drug therapy that prevents the desired treatment goal |
| Adherence | The extent to which the patient takes medicines as prescribed |
| Polypharmacy | The use of many medicines at the same time by one patient (common in elderly patients) |
| Drug interaction | A change in the effect of one drug caused by another drug, food, or disease |
| Therapeutic outcome | The intended health result of the treatment (e.g., blood pressure controlled) |
| Adverse drug reaction (ADR) | A harmful, unintended response to a medicine at normal doses |
| Intervention record | The written documentation of a pharmacist's intervention and its outcome |
| Treatment plan | The agreed plan of medicines and care decided for the patient |
| Reconciliation | Comparing lists of medicines (e.g., home medicines vs hospital orders) to remove errors and duplications |

## 8.4 Simple Explanations

### Concept 1: Clinical pharmacy — from dispenser to care provider

- **Simple explanation:** A clinical pharmacist does not sit only in the dispensary. He goes to the wards, reads patients' charts, joins doctors on rounds, and advises on medicines — he is part of the treatment team.
- **Example:** In a medical ward, the clinical pharmacist notices that a patient with kidney problems is receiving a normal dose of a drug that needs dose reduction in kidney disease, and advises the doctor to reduce it.
- **Textual diagram:**

```
Traditional role: Pharmacist ── supplies medicines ──> Ward
Clinical role:    Pharmacist ── joins team ──> checks therapy ──> advises ──> follows up
```

- **Key takeaway:** Clinical pharmacy = pharmacist as an active member of the patient-care team, responsible for medicine outcomes.

### Concept 2: Drug therapy monitoring — watching the treatment work

- **Simple explanation:** Monitoring means the pharmacist keeps checking: Is the right drug given? Is the dose right for this patient (age, weight, kidney/liver function)? Is it working (symptoms, lab tests)? Is it causing harm? Is the patient actually taking it?

- **Example:** A patient on a blood-thinning medicine has regular blood tests; the pharmacist reviews the test results and the dose together and suggests adjustment when the value drifts out of range.
- **Textual diagram:**

```
Start therapy
    |
    v
Monitor: drug choice → dose → response → side effects → adherence
    |
    v
Problem found? ── YES ──> Intervene (recommend change) ──> Re-monitor
    | NO
    v
Continue therapy; document
```

- **Key takeaway:** Monitoring is a loop — check, act, re-check — not a one-time event.

## Concept 3: Medication chart review

- **Simple explanation:** The pharmacist reads the patient's medication chart line by line and asks: Is every drug needed? Is any drug missing that the patient needs? Are doses correct? Are there duplications (two drugs doing the same job)? Are there dangerous interactions or allergies ignored?
- **Example:** The chart shows two different brands of the same painkiller prescribed together — the pharmacist flags the duplication for the doctor.
- **Key takeaway:** Chart review catches prescribing and transcription errors before they reach the patient.

## Concept 4: Clinical review

- **Simple explanation:** Clinical review goes beyond the chart: the pharmacist also looks at the patient's diagnosis, lab reports, vital signs, and how the patient feels, then judges whether the medicines match the clinical picture.
- **Example:** A diabetic patient's blood sugar remains high despite tablets; on clinical review the pharmacist finds the patient skips the evening dose, and the issue is adherence, not the drug.
- **Key takeaway:** Clinical review connects the medicines to the patient's actual condition and response.

## Concept 5: Pharmacist intervention

- **Simple explanation:** An intervention is the pharmacist formally telling the prescriber (or patient): "I found this problem; I suggest this solution." It is recorded, and the outcome (accepted/rejected, patient result) is documented.
- **Example:** The pharmacist intervenes to stop an antibiotic that has already completed its recommended course (automatic stop-order concept), preventing unnecessary drug exposure.
- **Textual diagram:**

```
Detect problem (chart/clinical review)
        |
Assess seriousness + gather evidence
        |
Communicate recommendation to prescriber (polite, evidence-based)
        |
Prescriber accepts? ── YES ──> Therapy changed ──> Follow up outcome
        | NO
        v
Document; respect prescriber's decision; continue monitoring
```

- **Key takeaway:** Interventions must be evidence-based, polite, timely, and documented.

### Concept 6: Ward round participation

- **Simple explanation:** The pharmacist joins the doctors' bedside rounds, listens to each case, and contributes medicine-related advice on the spot — dose adjustments, interactions, cheaper alternatives, counselling needs.
- **Example:** During rounds, the team discusses an elderly patient on eight medicines; the pharmacist suggests stopping two that are no longer needed, reducing polypharmacy risk.
- **Key takeaway:** On rounds, the pharmacist's medicine expertise is available at the exact moment decisions are made.

### Concept 7: Medication history taking

- **Simple explanation:** On admission, the pharmacist interviews the patient (or family) to build a complete list: every medicine, dose, timing, OTC and herbal products, allergies, and past bad reactions. This list is compared with hospital orders to catch omissions and duplications.
- **Example:** A patient forgets to mention a blood thinner taken at home; the history interview reveals it, and the surgeon is alerted before an operation.
- **Key takeaway:** A good medication history prevents "invisible" medicines from causing harm in hospital.

### Concept 8: Pharmaceutical care

- **Simple explanation:** Pharmaceutical care means the pharmacist accepts personal responsibility for the patient's medicine outcomes — not just supplying tablets, but making sure the therapy actually helps and does not harm, working with the patient and the team.
- **Example:** The pharmacist follows a heart-failure patient from admission to discharge: checks therapy, counsels on salt restriction and daily weight monitoring, and reviews medicines at discharge.
- **Key takeaway:** Pharmaceutical care = responsibility for outcomes, from admission to discharge and beyond.

## 8.5 Classifications

**Scope of clinical pharmacy services:**

1 Drug therapy monitoring (chart review, clinical review, intervention).

2 Ward round participation.

3 Medication history taking and reconciliation.

4 Drug information services (covered in Chapter 9).

5 Patient counselling and discharge counselling.

6 Adverse drug reaction monitoring and reporting.

**Types of pharmacist interventions (by purpose):**

1 Dose-related — dose too high/low; adjustment for age, weight, kidney/liver function.

2 Drug-choice-related — wrong drug for the condition; better alternative available.

3 Duplication-related — two drugs with the same action prescribed together.

4 Interaction-related — drug–drug, drug–food, or drug–disease interaction detected.

5 Duration-related — treatment continued too long or stopped too early.

6 Allergy-related — drug prescribed despite a recorded allergy.

7 Administration-related — wrong route, wrong timing, wrong technique.

8 Adherence-related — patient not taking medicines as directed.

**Classification of patients needing priority monitoring:**

1 Elderly patients (polypharmacy, altered drug handling).

2 Children (weight-based dosing, high error risk).

3 Patients with kidney or liver disease (dose adjustment needed).

4 Critically ill / ICU patients.

5 Patients on high-risk medicines (e.g., blood thinners, insulin, chemotherapy).

6 Pregnant and lactating women.

## 8.6 Mechanisms/Processes

**Process: Medication chart review (step-by-step).**

1 Collect the medication chart and the patient's case sheet.

2 List every ordered medicine with dose, route, frequency, start date.

3 Check each medicine against the diagnosis — is it indicated? Is anything indicated but missing?

4 Check doses for age, weight, kidney and liver function.

5 Check for duplications, interactions, allergies, and contraindications.

6 Check that "as required" (PRN) medicines have clear conditions and maximum doses.

7 Note every problem; prioritize by seriousness; prepare recommendations.

**Process: Taking a medication history (step-by-step).**

1 Introduce yourself and explain the purpose.

2 Ask open questions: "Which medicines do you take at home — including tablets, syrups, injections, eye/ear drops, skin creams?"

3 Ask specifically about OTC products, vitamins, herbal/traditional medicines.

4 Ask about allergies and past bad reactions to any medicine.

5 Ask about adherence: "Do you ever miss doses? Have you stopped any medicine on your own?"

6 Verify with old prescriptions, medicine strips, or family members where possible.

7 Record the complete list; compare with current hospital orders (reconciliation); resolve differences with the prescriber.

**Process: Ward round participation.**

1 Before rounds: review charts of the patients to be seen; note medicine issues.

2 During rounds: listen to the clinical presentation; contribute medicine advice briefly and clearly.

3 Suggest interventions on the spot where safe; note the team's decisions.

4 After rounds: carry out agreed changes (with prescriber's approval), counsel patients, document interventions.

**Process: Pharmaceutical care plan (the care cycle).**

1 Assess — collect patient data, medication history, clinical status.

2 Identify drug-related problems.

3 Plan — set therapeutic goals with the team and patient; choose actions.

4 Implement — interventions, counselling, monitoring schedule.

5 Follow up — re-assess outcomes; adjust the plan; document everything.

## 8.7 Textual Diagrams/Flowcharts

**Diagram 1 — Drug therapy monitoring and intervention process (master flowchart):**

```
+-----------------------------------------------------------+
|            DRUG THERAPY MONITORING CYCLE                  |
+-----------------------------------------------------------+
        |
        v
  [1] COLLECT   Medication history + chart + case sheet + lab reports
        |
        v
  [2] REVIEW    Medication chart review + clinical review
        |       (indication? dose? duplication? interaction?
        |        allergy? adherence? response?)
        |
        v
  [3] IDENTIFY  List drug-related problems, ranked by seriousness
        |
        v
  [4] PLAN      Decide recommendation for each problem
        |
        v
  [5] INTERVENE Communicate to prescriber / counsel patient
        |
        v
  [6] FOLLOW UP Re-check: was it accepted? did the patient improve?
        |
        +-------> Problem solved? ── NO ──> back to [2] REVIEW
        |
        YES
        |
        v
  [7] DOCUMENT  Record problem, action, outcome in intervention record
```

**Diagram 2 — Where the clinical pharmacist works in the hospital:**

```
Patient admitted
     |
Medication history (pharmacist) ──> Reconciliation with hospital orders
     |
Ward stay: chart review + clinical review + ward rounds
     |
Interventions as needed ──> documented
     |
Discharge: discharge counselling + take-home medicine check
     |
Follow-up monitoring
```

## 8.8 Infographic Concept

INFOGRAPHIC CONCEPT: "The Clinical Pharmacist's Daily Loop" — a circular infographic with six connected segments around a central pharmacist icon: 1. History (clipboard), 2. Chart review (magnifying glass over a chart), 3. Round (bedside team), 4. Intervene (speech bubble with a checkmark), 5. Counsel (pharmacist talking to patient), 6. Document (file). Arrows show the loop never ends — it repeats for every patient, every day. Side panel: "One loop, one patient, zero preventable harm." Colour theme: hospital blue and white.

## 8.9 Tables

**Table 1: Components of drug therapy monitoring**

| Component | What the pharmacist does |
|---|---|
| Medication chart review | Line-by-line check of ordered medicines for errors and inappropriateness |
| Clinical review | Matches medicines to diagnosis, labs, vitals and patient response |
| Pharmacist intervention | Recommends and implements therapy improvements |
| Ward round participation | Contributes medicine advice during bedside team rounds |
| Medication history | Builds the complete pre-admission medicine list; reconciles with orders |
| Pharmaceutical care | Takes ongoing responsibility for medicine outcomes |

**Table 2: Common drug-related problems found on chart review**

| Problem | Example |
|---|---|
| Unnecessary drug | Antibiotic continued after infection resolved |
| Missing needed drug | No preventive medicine for a clear risk |
| Wrong dose | Adult dose given to a child; no kidney adjustment |
| Duplication | Two NSAID painkillers together |
| Interaction | Two drugs that dangerously raise bleeding risk |
| Allergy ignored | Penicillin ordered despite recorded allergy |
| Poor adherence | Patient skipping doses at home |

**Table 3: Intervention communication — do's**

| Do | Why |
|---|---|
| Be specific about the problem | Vague warnings are ignored |
| Give evidence (guideline/lab value) | Builds trust with the prescriber |
| Suggest a concrete alternative | Makes acceptance easy |
| Choose the right time and place | Not in front of the patient, unless urgent |
| Document the outcome | Proves value and protects legally |

## 8.10 Examples

1. **Chart review catch:** A patient's chart shows a medicine ordered twice under two brand names — the pharmacist flags the duplication before the evening dose.
2. **Clinical review catch:** Lab reports show worsening kidney values; the pharmacist recommends reducing the dose of a kidney-cleared drug.
3. **Intervention:** The pharmacist recommends changing an injection to a tablet when the patient can swallow — same effect, lower cost, easier for the patient.
4. **Ward round:** During rounds the pharmacist points out that a newly added drug interacts with the patient's long-term medicine; the doctor changes the new prescription on the spot.
5. **Medication history:** The history interview reveals the patient takes a herbal product that increases bleeding risk; the surgical team is informed before the operation.

6 **Pharmaceutical care:** The pharmacist follows an asthma patient: checks inhaler technique, counsels, reviews control at each visit, and documents improvement.

## 8.11 Analogies

1 **Drug therapy monitoring is like a cricket umpire watching the whole match** — not playing, but watching every ball so that mistakes are caught and the game stays fair.

2 **The medication chart is like a flight manifest** — it lists every "passenger" (medicine); the pharmacist checks that no wrong passenger boarded and none is missing.

3 **A pharmacist intervention is like a co-pilot's warning** — "Captain, the fuel gauge looks wrong" — polite, timely, and it can prevent a crash.

4 **Medication history is like reading the previous chapters of a book** — you cannot understand the current chapter (hospital treatment) without knowing what happened before (home medicines).

5 **Pharmaceutical care is like a gardener tending one plant** — not just delivering water (medicines) once, but watching growth, removing weeds (problems), and adjusting care until it thrives.

## 8.12 Pharmacy Relevance

Clinical pharmacy is the hospital face of the profession and the natural career path for a B.Pharm graduate who wants direct patient-care work. Drug therapy monitoring is where the pharmacist's unique knowledge — drugs, doses, interactions, kinetics — saves lives daily. Mastering chart review, intervention, ward rounds, medication history and pharmaceutical care makes the pharmacist an indispensable team member rather than a back-room supplier, and it is the foundation for advanced roles in drug information, pharmacovigilance and therapeutic drug monitoring (Chapter 9).

## 8.13 India Context

Indian hospitals — from district hospitals to large teaching medical colleges — are increasingly appointing clinical pharmacists, and accreditation standards expect structured medication monitoring. With high patient loads, polypharmacy in the elderly, widespread self-medication histories, and heavy use of traditional/herbal products alongside modern medicines, the Indian clinical pharmacist's medication-history and chart-review skills are especially valuable. Ward-round participation is growing in teaching hospitals, where pharmacy students and Pharm.D/clinical trainees learn at the bedside. Documentation of interventions also helps hospitals demonstrate safe-medication practices during quality assessments, as per the latest guidelines/notifications — confirm the current edition.

## 8.14 Key Points

- Clinical pharmacy = pharmacist as an active member of the patient-care team.
- Drug therapy monitoring = continuous checking that therapy is right, working, safe and followed.
- Chart review checks the orders; clinical review checks the orders against the patient's condition.
- Intervention = evidence-based recommendation to improve therapy, always documented.
- Ward rounds put medicine expertise where decisions are made.
- Medication history + reconciliation prevents hidden-medicine errors on admission.

- Pharmaceutical care = the pharmacist's ongoing responsibility for medicine outcomes.

## 8.15 Common Confusions

1 **Chart review vs clinical review:** Chart review looks at the medicine orders alone; clinical review looks at orders *plus* the patient's diagnosis, labs and response.

2 **Intervention vs interference:** An intervention is a professional, evidence-based recommendation made respectfully; it is not overruling the doctor.

3 **Medication history vs prescription:** The history is what the patient *actually takes* (including OTC/herbal); the prescription is what was *ordered*. They often differ — that gap is where errors hide.

4 **Pharmaceutical care vs dispensing:** Dispensing supplies the medicine; pharmaceutical care takes responsibility for what the medicine *achieves*.

5 **Monitoring vs one-time checking:** Monitoring is repeated over the whole treatment course, not a single check at admission.

## 8.16 Common Mistakes

1 Reviewing the chart without looking at the patient's diagnosis and lab reports.

2 Making an intervention without evidence or without suggesting an alternative.

3 Intervening in front of the patient in a way that undermines the prescriber.

4 Forgetting to document interventions and their outcomes.

5 Taking a rushed medication history that misses OTC and herbal products.

6 Not re-checking (following up) after an intervention is accepted.

7 Focusing only on new orders and ignoring long-standing home medicines.

8 Delaying an urgent intervention (e.g., allergy) until the next round.

## 8.17 Mnemonics

- **Monitoring cycle — "CRIIFD":** **C**ollect, **R**eview, **I**dentify, **I**ntervene, **F**ollow up, **D**ocument.
- **Chart review checks — "DIDDAA":** **D**uplication, **I**ndication, **D**ose, **D**uration, **A**llergy, **A**dherence.
- **History questions — "MOHA":** **M**edicines (all types), **O**TC + herbal, **H**ow taken (adherence), **A**llergies/past reactions.
- **Care plan — "APIF":** **A**ssess, **P**lan, **I**mplement, **F**ollow up.

## 8.18 Exam Summary

- Define clinical pharmacy; describe its scope in a hospital.
- Explain drug therapy monitoring and draw its cycle flowchart.

- Describe medication chart review: steps and common problems detected.
- Distinguish clinical review from chart review.
- Explain pharmacist intervention: types, communication principles, documentation.
- Describe ward round participation: before, during and after rounds.
- Explain medication history taking: steps and reconciliation.
- Define pharmaceutical care and describe the care cycle.

## 8.19 One-Minute Revision

Clinical pharmacy = pharmacist in the care team. Monitoring loop: Collect → Review (chart + clinical) → Identify problems → Intervene → Follow up → Document. Chart review checks orders; clinical review matches orders to the patient. Interventions: be specific, evidence-based, polite, documented. Ward rounds: prepare, contribute, follow through. Medication history: ask about ALL medicines (prescription, OTC, herbal), allergies, adherence — then reconcile with hospital orders. Pharmaceutical care: Assess → Plan → Implement → Follow up, with the pharmacist responsible for medicine outcomes.

## 8.20 Questions

### Short Answer Questions

1 Define clinical pharmacy.

2 What is drug therapy monitoring?

3 Distinguish between medication chart review and clinical review.

4 What is a pharmacist intervention? Give two examples.

5 What is a medication history?

6 Define pharmaceutical care.

7 List four types of pharmacist interventions.

8 Name three groups of patients needing priority monitoring.

### Long Answer Questions

1 Define clinical pharmacy and describe its scope. Explain the drug therapy monitoring cycle with a neat flowchart.

2 Describe medication chart review and clinical review in detail. What drug-related problems are commonly detected?

3 Explain pharmacist intervention: types, principles of communicating with prescribers, and documentation. Describe the pharmacist's role in ward rounds.

4 Describe the steps of taking a medication history and the concept of reconciliation. Explain pharmaceutical care with its care cycle.

## MCQs (with answer keys)

1 Medication chart review primarily involves:

a) Counting tablets in the store b) Systematic checking of ordered medicines for errors and inappropriateness c) Interviewing the patient's family about income d) Cleaning the ward **Answer: b**

1 Clinical review differs from chart review because it also considers:

a) The hospital's electricity bill b) The patient's diagnosis, lab reports and response to treatment c) The pharmacist's leave schedule d) Medicine prices only **Answer: b**

1 An example of a pharmacist intervention is:

a) Recommending a dose reduction in kidney disease b) Refusing to talk to the doctor c) Dispensing without checking d) Hiding an error **Answer: a**

1 Medication history must include:

a) Only the current hospital prescription b) All prescription, OTC and herbal products plus allergies c) Only expensive medicines d) Only the patient's favourite brand **Answer: b**

1 Reconciliation means:

a) Comparing medicine lists to remove errors and duplications b) Arguing with the prescriber c) Returning medicines to the store d) Discharging the patient early **Answer: a**

1 Pharmaceutical care means the pharmacist:

a) Only supplies medicines b) Takes responsibility for the patient's drug therapy outcomes c) Works only in the community pharmacy d) Avoids talking to patients **Answer: b**

1 Priority monitoring is needed for all EXCEPT:

a) Elderly on many medicines b) Children c) Patients with kidney disease d) Healthy adults on a single short course with no risk factors **Answer: d**

1 Every pharmacist intervention should be:

a) Kept secret b) Documented with the problem, action and outcome c) Made only once a year d) Communicated only to nurses **Answer: b**

## Viva Questions

1 What is the difference between a clinical pharmacist and a dispensing pharmacist?

2 What do you check first in a medication chart review?

3 How do you communicate an intervention to a busy doctor?

4 Why must OTC and herbal products be asked about in a medication history?

5 What is reconciliation, and when is it done?

6 Give one example each of a dose-related and a duplication-related intervention.

7 What does "pharmaceutical care" add beyond dispensing?

### Application-Based Questions

1 On chart review you find a 70-year-old patient with reduced kidney function receiving a full adult dose of a medicine cleared by the kidneys. Walk through your monitoring cycle: what you check, what you recommend, how you communicate it, and how you follow up.

2 During ward rounds, the team adds a new medicine that you know interacts with the patient's long-term therapy. Describe exactly what you say and do, before, during and after the round.

3 A newly admitted patient cannot recall the names of her home medicines. Describe how you would still build a reliable medication history.

4 Design a one-page intervention record format (headings only) that a hospital pharmacy could use to document clinical interventions.

## 8.21 References


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# CHAPTER 9: Drug Information Services, Medication-Related Problems, Poison Information and Therapeutic Drug Monitoring

## 9.1 Learning Objectives

By the end of this chapter, the student will be able to:

1 Define a drug information service and describe the types of queries it handles.

2 List sources of drug information and describe the steps of answering a query.

3 Classify drug/medication-related problems.

4 Describe drug and poison information services, including poison information centres and their role in poisoning management.

5 Define therapeutic drug monitoring (TDM), state when it is needed, and describe its process.

6 Explain the narrow therapeutic index concept in simple words.

## 9.2 Definitions

**Drug information service (DIS):** An organized service — usually run by pharmacists — that provides accurate, unbiased, up-to-date answers to questions about medicines asked by doctors, nurses, pharmacists, and patients.

**Drug query:** A question about a medicine submitted to the drug information service, e.g., "Can this tablet be crushed?" or "Is this drug safe in pregnancy?"

**Medication-related problem (MRP) / drug-related problem (DRP):** Any undesirable event, risk, or unmet need connected with drug therapy that interferes with achieving the desired treatment goal.

**Poison information service:** A specialized service that gives immediate advice on the management of poisoning — what the poison is, how dangerous the exposure is, and what first aid and treatment steps to take.

**Poison information centre:** A dedicated unit (often with a telephone helpline) staffed by trained professionals that provides round-the-clock guidance on poisoning cases to doctors and the public.

**Therapeutic drug monitoring (TDM):** The practice of measuring the concentration of a medicine in the patient's blood at the right time and using that measurement — together with the patient's clinical condition — to adjust the dose for best effect and least harm.

**Therapeutic range (therapeutic window):** The blood-concentration range of a drug in which it works effectively without causing unacceptable toxicity.

**Narrow therapeutic index (NTI):** A property of a drug where the gap between the effective dose and the toxic dose is very small — so small changes in dose or blood level can cause treatment failure or poisoning.

## 9.3 Terminology Table

| Term | Meaning |
|---|---|
| Primary source | Original research — journal articles, clinical trial reports |
| Secondary source | Compilations that index/abstract primary sources (databases, review journals) |
| Tertiary source | Summarized references — textbooks, formularies, compendia |
| Enquirer | The person asking the drug information question |
| Background information | Extra details collected from the enquirer (patient age, other drugs, kidney function) needed to answer correctly |
| Triage (of queries) | Sorting questions by urgency — emergency questions answered first |
| Antidote | A medicine or substance that counteracts the effect of a poison |
| Decontamination | Removing or reducing poison from the body (e.g., stopping exposure, gut decontamination where appropriate) |
| Supportive care | Treatment that keeps the patient stable (airway, breathing, circulation) while the poison's effect passes |
| Trough level | The lowest drug concentration in blood, measured just before the next dose |
| Peak level | The highest drug concentration in blood, measured after a dose is absorbed |

| Term | Meaning |
|---|---|
| Steady state | The condition where drug levels in blood have stabilized after repeated dosing |

## 9.4 Simple Explanations

### Concept 1: Drug information service — the medicine question desk

- **Simple explanation:** Doctors and nurses have thousands of medicine questions. The drug information service is the pharmacist-run "question desk" that researches each question and gives a referenced, unbiased answer — quickly for emergencies, thoroughly for the rest.
- **Example:** A nurse asks whether an injection can be given through the same IV line as another drug. The pharmacist checks compatibility references and answers: yes/no, with the source cited.
- **Textual diagram:**

```
Question received (phone/ward/online)
        |
Triage: emergency or routine?
        |
Collect background information (who, which patient, which drugs)
        |
Search sources (tertiary → secondary → primary)
        |
Formulate clear answer with references
        |
Communicate answer + document the query
```

- **Key takeaway:** DIS = right answer, from reliable sources, at the right speed, with documentation.

### Concept 2: Types of queries

- **Simple explanation:** Queries range from simple ("What is the dose?") to complex ("Is this combination safe in a pregnant patient with kidney disease?"). They are classified by topic (dose, interaction, side effect, pregnancy, compatibility, identification of tablets, poisoning) and by urgency (immediate, urgent, routine).
- **Example:** An emergency query — "A child swallowed 20 iron tablets, what do we do?" — is answered immediately and the poison centre is looped in; a routine query — "What is the mechanism of this new drug?" — is researched and answered the same day.
- **Key takeaway:** Classify every query by topic and urgency before researching.

### Concept 3: Sources of drug information

- **Simple explanation:** Tertiary sources (textbooks, formularies) answer most questions fast. If not enough, secondary sources (databases, abstracts) point to studies. Primary sources (original trial papers) are used for new or controversial questions. Always prefer current, authoritative sources.
- **Example:** For "usual adult dose", a standard formulary (tertiary) is enough; for "does this drug really reduce deaths?", the original clinical trial (primary) must be read.
- **Textual diagram:**

```
Start with TERTIARY (textbooks, formularies) ── enough? ── YES ──> Answer
        | NO
        v
SECONDARY (databases, indexes) ── find relevant studies ── enough? ── YES ──> Answer
        | NO
        v
PRIMARY (original research papers) ──> critical appraisal ──> Answer
```

- **Key takeaway:** Move from summarized to original sources only as the question demands.

## Concept 4: Medication-related problems — classification

- **Simple explanation:** A medication-related problem is anything about drug therapy that stops the patient getting the best result: a needed drug is missing, a wrong drug is given, the dose is wrong, the patient doesn't take it, or it causes harm. Classifying problems helps find and fix each one systematically.
- **Example:** A patient with high blood pressure takes no medicine for it (missing needed drug); another takes two drugs doing the same job (duplication); a third gets a rash from a drug (adverse reaction) — three different problem classes.
- **Key takeaway:** Name the problem class first; the solution follows from the class.

## Concept 5: Poison information services and centres

- **Simple explanation:** In poisoning, minutes matter. A poison information centre gives instant, expert advice: identify the poison, judge how dangerous the dose is, and guide first aid and hospital treatment — including whether an antidote exists and supportive care steps.
- **Example:** A toddler drinks kerosene. The family calls the poison helpline, which advises: do NOT induce vomiting (risk of lung injury), keep the child calm, and rush to hospital — the hospital team calls the centre for the treatment protocol.
- **Textual diagram:**

```
Poisoning exposure
      |
Call poison information centre ──> Identify substance + amount + time + patient details
      |
Assess toxicity risk
      |
Advise: first aid do's and don'ts
      |
Guide hospital team: decontamination, antidote, supportive care, monitoring
      |
Follow up outcome; document the case
```

- **Key takeaway:** The poison centre turns panic into a clear, step-by-step rescue plan.

## Concept 6: Therapeutic drug monitoring — dosing by measurement

- **Simple explanation:** For some drugs, the same dose gives very different blood levels in different people. TDM measures the actual drug level in blood and adjusts the dose so the level stays in the effective-but-safe range.

- **Example:** A patient on an anti-seizure medicine still has fits — the blood level is below the therapeutic range, so the dose is increased; another patient feels toxic effects — the level is too high, so the dose is reduced.
- **Textual diagram:**

```
Prescribe standard dose
        |
Give doses until steady state (usually 4–5 half-lives)
        |
Draw blood at the correct time (trough or peak as required)
        |
Measure drug concentration
        |
Compare with therapeutic range + assess patient clinically
        |
Too low ──> increase dose | Too high ──> reduce/stop dose | In range + well ──> continue
        |
Repeat monitoring as needed
```

- **Key takeaway:** TDM replaces guesswork with measurement for selected drugs.

### Concept 7: Narrow therapeutic index — explained simply

- **Simple explanation:** Imagine a road: for most drugs the road between "works" and "poisons" is wide — small dose changes are safe. For a narrow-therapeutic-index drug, the road is a narrow bridge: a slightly low dose fails to work, a slightly high dose causes toxicity. These drugs need extra-careful dosing and often TDM.
- **Example:** A blood thinner with NTI: too little → clots form (stroke risk); too much → bleeding risk. The dose must keep the patient exactly on the bridge.
- **Key takeaway:** NTI drugs demand precise dosing, careful monitoring, and caution when switching brands or adding interacting medicines.

## 9.5 Classifications

**Classification of drug information queries (by topic):**

1 Dose and dosage regimen.

2 Drug interactions (drug–drug, drug–food, drug–disease).

3 Adverse drug reactions and side effects.

4 Use in special populations (pregnancy, lactation, children, elderly, kidney/liver disease).

5 Drug compatibility and stability (e.g., IV admixtures).

6 Drug identification (unknown tablet/capsule).

7 Availability, cost, and alternatives.

8 Poisoning and overdose management.

**Classification of queries (by urgency):**

1 Immediate (emergency) — poisoning, life-threatening interaction; answered at once.

2 Urgent — needed within hours for an ongoing clinical decision.

3 Routine — answered within the working day or as scheduled.

**Classification of medication-related problems (one standard scheme):**

1 Untreated indication — patient has a condition needing a drug but gets none.

2 Improper drug selection — wrong drug for the condition or patient.

3 Subtherapeutic dosage — dose too low, frequency too low, duration too short.

4 Overdosage — dose too high, frequency too high, duration too long.

5 Adverse drug reaction — harm from a drug at normal doses.

6 Drug interaction — harmful or therapy-reducing interaction.

7 Failure to receive drug — prescribed but not dispensed, not taken, or not available.

8 Drug use without indication — patient takes a drug with no valid reason.

**Classification of poisons commonly handled (by source):**

1 Medicines (accidental or intentional overdose).

2 Household chemicals (cleaners, kerosene, pesticides).

3 Bites and stings (snake, scorpion, insect).

4 Plants and mushrooms.

5 Industrial chemicals and gases.

## 9.6 Mechanisms/Processes

**Process: Answering a drug information query (step-by-step).**

1 Receive and record the query: enquirer name, contact, date/time.

2 Triage by urgency.

3 Collect background information: patient details (age, weight, pregnancy, kidney/liver status), full medicine list, exact question behind the question.

4 Classify the query by topic.

5 Search sources systematically (tertiary → secondary → primary).

6 Evaluate and synthesize: weigh the evidence, note limitations.

7 Formulate a clear, direct answer with references.

8 Communicate the answer to the enquirer in suitable language.

9 Document: query, background, sources used, answer given, and follow-up if needed.

**Process: Managing a poisoning case (role of the poison information service).**

1 Gather facts: substance name (read the label/pack), amount, time since exposure, route (swallowed, inhaled, skin, bite), patient age/weight/symptoms.

2 Assess risk: is the dose potentially toxic for this patient?

3 Give immediate first-aid guidance: what TO do and what NOT to do (e.g., do not induce vomiting unless specifically advised).

4 Advise on hospital care: airway/breathing/circulation support, decontamination options, antidote if one exists, monitoring parameters.

5 Arrange follow-up: re-contact to track the patient's course.

6 Document the case for records and for learning.

**Process: Therapeutic drug monitoring (detailed steps).**

1 Select the drug: TDM is used for drugs where it adds value (NTI drugs, drugs with variable handling between patients, drugs where effect is hard to judge clinically).

2 Prescribe and administer the starting dose per standard guidance.

3 Wait for steady state (usually after 4–5 half-lives of regular dosing).

4 Draw the blood sample at the correct, specified time (trough just before the next dose, or peak as defined for that drug).

5 Ensure correct sample handling and a validated assay method.

6 Interpret the result together with the clinical picture (levels guide, but the patient decides — treat the patient, not just the number).

7 Adjust the dose: increase if subtherapeutic, reduce or hold if toxic, continue if in range and patient is well.

8 Re-monitor after dose changes and at sensible intervals.

## 9.7 Textual Diagrams/Flowcharts

**Diagram 1 — Drug information query workflow:**

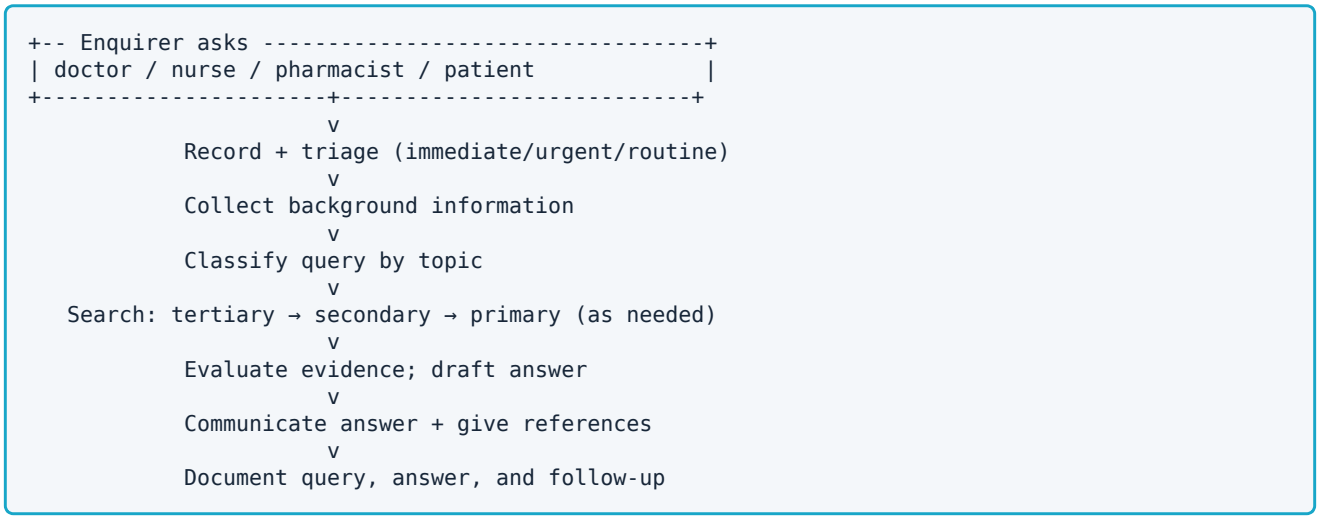

**Diagram 2 — TDM decision flowchart:**

```
Blood level measured at correct time (steady state)
                    |
        +-----------+-----------+
        |           |           |
   Below range   Within range  Above range
        |           |           |
  Check adherence  Patient      Reduce dose /
  + interactions   improving?   hold dose;
        |        YES → continue  check toxicity
        v        NO → reassess   signs
  Increase dose   diagnosis/
  cautiously      adherence
        |
        v
  Re-measure after steady state on new dose
```

## 9.8 Infographic Concept

INFOGRAPHIC CONCEPT: "Ask → Search → Answer: The Drug Information Journey" — a horizontal journey map with five stations connected by a dotted path: 1. ASK (phone icon, "every question recorded"), 2. SORT (traffic-light icon for urgency triage), 3. DIG (magnifying glass over stacked books labelled Tertiary/Secondary/Primary), 4. ANSWER (speech bubble with a checkmark and reference tags), 5. FILE (filing cabinet, "documented for the next asker"). Below, a second strip: "Poison? Minutes matter — call the poison information centre first." Colour theme: teal and amber.

## 9.9 Tables

**Table 1: Sources of drug information**

| Level | Examples (generic) | Used when |
|---|---|---|
| Tertiary | Textbooks, formularies, compendia, standard reference books | Quick factual answers: dose, side effects, interactions |
| Secondary | Indexing/abstracting databases, review journals | Finding relevant studies on a topic |
| Primary | Original clinical trial and case reports | New, rare, or controversial questions needing original evidence |

**Table 2: Medication-related problems — class, clue, action**

| Problem class | Clue | Typical action |
|---|---|---|
| Untreated indication | Condition with no drug | Start needed therapy (prescriber) |
| Improper drug selection | Wrong drug for patient | Recommend better alternative |
| Subtherapeutic dosage | No response, low levels | Increase dose/frequency |
| Overdosage | Toxicity signs, high levels | Reduce/hold dose |
| Adverse drug reaction | New symptom after drug start | Stop/substitute; report ADR |
| Drug interaction | Effect change after new drug added | Adjust/stagger/substitute |
| Failure to receive drug | Prescribed but not taken | Counsel; fix supply/adherence |

| Problem class | Clue | Typical action |
|---|---|---|
| Drug use without indication | Drug with no valid reason | Recommend stopping |

**Table 3: When is TDM needed?**

| Situation | Why TDM helps |
|---|---|
| Narrow therapeutic index drug | Small margin between effective and toxic |
| Large variation between patients | Same dose → very different blood levels |
| Effect hard to judge clinically | No easy symptom or sign to follow |
| Suspected toxicity or treatment failure | Level tells whether dose is the cause |
| Kidney/liver disease, elderly, children | Drug handling altered |
| Suspected non-adherence | Very low level suggests missed doses |
| Drug interactions started/stopped | Levels may shift significantly |

**Table 4: Narrow vs wide therapeutic index**

| Feature | Narrow therapeutic index | Wide therapeutic index |
|---|---|---|
| Gap between effective and toxic dose | Very small | Large |
| Effect of small dose changes | Big — failure or toxicity | Small — usually safe |
| Need for blood-level monitoring | Often needed | Rarely needed |
| Care when switching brands/adding drugs | High caution | Routine caution |

## 9.10 Examples

1. **DIS query:** A doctor asks if a tablet can be crushed for a patient who cannot swallow — the pharmacist checks references and advises which formulations must never be crushed (e.g., slow-release tablets).
2. **Query triage:** A poisoning question jumps the queue ahead of a routine "mechanism of action" question.
3. **MRP — untreated indication:** A heart-attack-risk patient on no preventive therapy is flagged; the prescriber starts appropriate prevention.
4. **MRP — interaction:** A new medicine reduces the effect of the patient's long-term drug; the pharmacist recommends an alternative or dose spacing.
5. **Poison centre:** A farmer exposed to pesticide is guided: remove contaminated clothes, wash skin, go to hospital; the hospital receives the decontamination and antidote protocol.
6. **TDM:** An epilepsy patient's fits continue; the blood level is below range, the dose is raised, fits stop, and the level is re-checked at steady state.
7. **NTI caution:** When a second drug that interacts with the patient's NTI medicine is started, the pharmacist advises closer monitoring and a possible dose adjustment.

## 9.11 Analogies

1. **The drug information service is like a library's reference desk** — you bring any question, the librarian finds the trustworthy book, and gives you the exact page, not a guess.
2. **Triage of queries is like an emergency room's sorting** — the bleeding patient is seen before the patient with a mild cold; urgent drug questions jump the queue.
3. **Classifying medication-related problems is like a doctor diagnosing before prescribing** — you name the disease (problem class) before choosing the cure (solution).
4. **The poison information centre is like a fire brigade control room** — one call gives you the right crew, the right equipment, and the right steps, fast.
5. **TDM is like checking the speedometer while driving** — you don't guess your speed; you measure it and adjust so you stay within the safe limit.
6. **A narrow therapeutic index is like walking a narrow bridge over a river** — too far left (low dose) you fall into treatment failure; too far right (high dose) you fall into toxicity.

## 9.12 Pharmacy Relevance

Drug information, poison information, MRP detection and TDM are the knowledge-intensive services that distinguish the clinical pharmacist. They convert textbook pharmacology into bedside decisions: the right answer in minutes, the hidden problem found on review, the poisoning managed correctly, the dose personalized by measurement. For the B.Pharm student, these services are the most direct application of everything learned in pharmacology, pharmaceutics and pharmaceutical analysis — and the strongest argument for the pharmacist's place in the healthcare team.

## 9.13 India Context

India faces a heavy poisoning load — pesticide exposure in farming communities, household chemical accidents involving children, and snakebite in rural areas — making poison information services and their telephone helplines especially valuable, with management as per the latest guidelines/notifications (confirm the current edition). Drug information services are growing in teaching hospitals and are often run by pharmacy practice departments. TDM is available in larger centres for selected drugs; where assay facilities are limited, careful clinical monitoring plus pharmacist-led review still prevents much harm. Medication-related problems are common with polypharmacy and widespread self-medication, so systematic MRP detection during chart review is a high-impact pharmacist role.

## 9.14 Key Points

- DIS answers medicine questions from reliable sources, triaged by urgency.
- Answer process: record → triage → background → classify → search (tertiary→primary) → answer → document.
- Medication-related problems fall into classes: untreated indication, wrong drug, wrong dose (low/high), ADR, interaction, not receiving drug, drug without indication.
- Poison information centres give rapid, expert poisoning advice: identify, assess risk, guide first aid and hospital care, follow up.
- TDM = measure blood drug level at steady state at the right time → adjust dose to stay in the therapeutic range.

- TDM is most valuable for NTI drugs, variable drug handling, hard-to-judge effects, suspected toxicity/failure, and special populations.
- Narrow therapeutic index = tiny gap between effective and toxic; needs precise dosing and caution with interacting drugs and brand switches.

## 9.15 Common Confusions

1 **TDM vs routine blood tests:** TDM measures the *drug's* concentration, not general health markers like sugar or cholesterol.

2 **Peak vs trough:** Trough = lowest level, just before the next dose; peak = highest level after absorption. Sampling at the wrong time gives a misleading number.

3 **Treating the number vs the patient:** A level in range does not guarantee success, and a slightly out-of-range level in a well patient may need no change — always interpret with the clinical picture.

4 **Poison centre vs emergency department:** The centre advises; the hospital treats. Call the centre *while* arranging hospital care, not instead of it.

5 **Primary vs tertiary sources:** Textbooks (tertiary) are fastest for facts; original papers (primary) are needed for new or disputed questions — neither replaces the other.

## 9.16 Common Mistakes

1 Answering a drug query without collecting background information about the patient.

2 Using an outdated reference book for a fast-changing topic.

3 Giving a poisoning first-aid instruction from memory instead of checking the current protocol (e.g., wrongly advising vomiting).

4 Drawing a TDM sample at the wrong time (not at steady state, or wrong trough/peak timing).

5 Changing a dose on the level alone without assessing the patient's clinical response.

6 Forgetting to re-monitor after a dose change.

7 Ignoring NTI status when a new interacting drug is added.

8 Failing to document queries, poison cases, and TDM decisions.

## 9.17 Mnemonics

- **Query answering — "RTBCSAD":** **R**ecord, **T**riage, **B**ackground, **C**lassify, **S**earch, **A**nswer, **D**ocument.
- **MRP classes — "UISOOAFD":** **U**ntreated indication, **I**mproper selection, **S**ubtherapeutic dose, **O**verdosage, **A**DR, **F**ailure to receive, **D**rug without indication (+ **I**nteraction — "I" for Interaction fits after Improper).
- **Poison case facts — "SARTP":** **S**ubstance, **A**mount, **R**oute, **T**ime since exposure, **P**atient details.
- **TDM steps — "SWISHAR":** **S**elect drug, **W**ait for steady state, **I**nterval-correct sample, **S**ample handling, **H**ead-to-clinical correlation, **A**djust dose, **R**e-monitor.

- **NTI warning — "Narrow Bridge":** picture the narrow bridge — small step, big fall.

## 9.18 Exam Summary

- Define drug information service; classify queries by topic and urgency.
- Describe sources of drug information (primary, secondary, tertiary) with the search sequence.
- Describe the steps of answering a drug information query.
- Classify medication-related problems with examples.
- Describe drug and poison information services; explain the role of poison information centres in poisoning management.
- Define TDM; list situations where it is needed; describe the TDM process with a flowchart.
- Explain narrow therapeutic index in simple words with an example.

## 9.19 One-Minute Revision

DIS = pharmacist-run medicine question desk. Queries classified by topic and urgency (immediate/urgent/routine). Answer steps: Record → Triage → Background → Classify → Search (tertiary→secondary→primary) → Answer → Document. MRP classes: untreated indication, improper selection, subtherapeutic dose, overdosage, ADR, interaction, failure to receive, drug without indication. Poison centres: identify substance/amount/time/route/patient → assess risk → first-aid do's/don'ts → guide hospital care (decontamination, antidote, supportive care) → follow up. TDM: dose → steady state → correctly timed blood sample → compare with range + clinical picture → adjust → re-monitor. NTI = narrow bridge between effective and toxic — dose precisely, monitor closely.

## 9.20 Questions

### Short Answer Questions

1 Define drug information service.

2 Classify drug information queries by urgency.

3 Distinguish between primary, secondary and tertiary sources of drug information.

4 List four classes of medication-related problems.

5 What is a poison information centre?

6 Define therapeutic drug monitoring.

7 What is meant by trough level and peak level?

8 Explain narrow therapeutic index in one paragraph.

### Long Answer Questions

1 Describe the types of drug information queries, the sources of drug information, and the step-by-step process of answering a query.

2 Classify drug/medication-related problems with examples. How does classification help in solving them?

3 Describe drug and poison information services. Explain the role of poison information centres in the management of a poisoning case, with a flowchart.

4 Define therapeutic drug monitoring. When is it needed? Describe the TDM process with a flowchart and explain the narrow therapeutic index concept.

## MCQs (with answer keys)

1 The first step after receiving a drug information query is to:

a) Immediately guess the answer b) Record the query and triage by urgency c) Search primary sources only d) File it without answering **Answer: b**

1 Tertiary sources of drug information include:

a) Original clinical trial papers b) Textbooks and formularies c) Patient interviews d) Newspaper articles **Answer: b**

1 "Patient has a condition needing a drug but receives none" is an example of:

a) Overdosage b) Untreated indication c) Drug interaction d) Adverse drug reaction **Answer: b**

1 The most important first facts in a poisoning call are:

a) The patient's favourite food b) Substance, amount, route, time since exposure, patient details c) The hospital's address only d) The cost of treatment **Answer: b**

1 A TDM blood sample should ideally be drawn:

a) At any random time b) At steady state, at the specified trough or peak time c) Before the first dose d) One year after stopping the drug **Answer: b**

1 TDM is most valuable for drugs with:

a) A wide therapeutic index and predictable effects b) A narrow therapeutic index and large between-patient variation c) No measurable blood levels d) Only topical action **Answer: b**

1 Narrow therapeutic index means:

a) The drug has no side effects b) The gap between the effective and toxic dose is very small c) The drug is very cheap d) The drug acts only in the stomach **Answer: b**

1 In poisoning first aid, the correct approach is to:

a) Always induce vomiting b) Follow the poison centre's specific do's and don'ts for that poison c) Wait at home for symptoms to pass d) Give milk for every poison **Answer: b**

## Viva Questions

1 What is the difference between a drug information service and a poison information service?

2 How do you triage drug information queries?

3 In what order do you search drug information sources, and why?

4 Give two examples each of "subtherapeutic dosage" and "drug use without indication".

5 What details must you collect before advising on a poisoning case?

6 Why must a TDM sample be taken at steady state?

7 Why do narrow-therapeutic-index drugs need extra caution when another drug is added?

### Application-Based Questions

1 A nurse phones: "Can these two injections be mixed in the same IV line for a patient in the ICU?" Describe exactly how you handle this query from receipt to documented answer.

2 On chart review you find a patient taking a medicine with no valid indication, plus a second patient whose infection is untreated. Classify both problems and write the recommendation you would make in each case.

3 A 3-year-old child has swallowed an unknown number of his grandfather's tablets. List the questions you ask the family, the immediate guidance you give, and how you support the hospital team.

4 A patient's anti-seizure drug level comes back slightly above the therapeutic range, but the patient feels well and has no toxicity signs. What do you recommend, and why? What would you do differently if the patient showed toxicity signs?

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