SCHEME : J

Name : _____

Roll No. : _____ Year : 20___ 20___

Exam Seat No. : _____

LABORATORY MANUAL FOR
HOSPITAL & CLINICAL PHARMACY
(20060)

SECOND YEAR D.PHARMACY

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI
(Autonomous) (ISO 9001: 2015) (ISO/IEC 27001:2013)

VISION

To ensure that the Diploma level Technical Education constantly matches the latest requirements of Technology and industry and includes the all-round personal development of students including social concerns and to become globally competitive, technology led organization.

MISSION

To provide high quality technical and managerial manpower, information and consultancy services to the industry and community to enable the industry and community to face the challenging technological & environmental challenges.

QUALITY POLICY

We, at MSBTE are committed to offer the best in class academic services to the students and institutes to enhance the delight of industry and society. This will be achieved through continual improvement in management practices adopted in the process of curriculum design, development, implementation, evaluation and monitoring system along with adequate faculty development programmes.

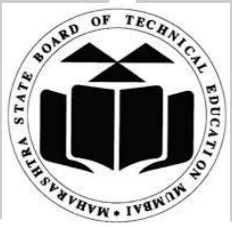
CORE VALUES

MSBTE believes in the following

* Skill development in line with industry requirements
* Industry readiness and improved employability of Diploma holders
* Synergistic relationship with industry
* Collective and Cooperative development of all stake holders
* Technological interventions in societal development
* Access to uniform quality technical education

A LABORATORY MANUAL
OF
HOSPITAL AND CLINICAL PHARMACY
(20060)

Second Year
Diploma in Pharmacy (PH)



Maharashtra State
Board of Technical Education, Mumbai.
(Autonomous)
(ISO 9001:2015) (ISO/IEC27001:2013)

PCI ER- 2020/ 'J' Scheme Curriculum

Maharashtra State Board of Technical Education, Mumbai
(Autonomous) (ISO: 9001:2015) (ISO/ IEC 27001:2013)
4th Floor, Government Polytechnic Building, 49, Kherwadi,
Bandra (East), Mumbai-400051,
(Printed on July, 2024)

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

CERTIFICATE

This is to certify that, Mr. / Ms._____
Roll No. _____ of Second Year Diploma in Pharmacy studying at (Institute)_____
has completed the practical work satisfactorily in Hospital And Clinical Pharmacy (20060) for the academic year 20 - 20 as prescribed in the PCI ER 2020 syllabus.

Date: _____ Enrollment No. : _____

Place: _____ Exam Seat No.: _____

Course Teacher **Principal**

External Examiner

Seal of the Institute

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
MUMBAI

PROGRAM OUTCOMES

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy.
2. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
3. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
4. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
5. **Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
6. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
7. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
8. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
9. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

COMPETENCIES FOR THE INDIAN D.PHARM HOLDERS

Competency is defined as "A distinct composite of knowledge, skill, attitude and value that is essential to the practice of the profession in real life contexts".

The candidates who successfully complete the Diploma in Pharmacy (D. Pharm) program of Education Regulations 2020 (ER-2020), from the institutions approved by the Pharmacy Council of India are expected to attain the following professional competencies.

1. Review Prescriptions: The student should receive and handle prescriptions in a professional manner and be able to check for their completeness and correctness. Also, the prescribers should be contacted for any clarifications & corrections in the prescriptions with suggestions if any.

2. Dispense Prescription / Non-Prescription Medicines: The student should be able to dispense the various scheduled drugs / medicines as per the implications of the Drug & Cosmetic Act and Rules there under. Also, the non-prescription medicines (over-the-counter drugs) should be dispensed judicially to the patients as required.

3. Provide Patient Counseling / Education: The student should be able to effectively counsel / educate the patients / caretakers about the prescription / non-prescription medicines and other health related issues. Effective communication includes using both oral and written communication skills and various communication techniques.

4. Hospital and Community Pharmacy Management: The student be able to manage the drug distribution system as per the policies and guidelines of the hospital pharmacy, good community pharmacy practice and the recommendations of regulatory agencies. Also, be able to manage the procurement, inventory, and distribution of medicines in hospital / community pharmacy settings.

5. Expertise on Medications: The student should be able to provide an expert opinion on medications to health care professionals on safe and effective medication – use, relevant policies and procedures based on available evidences.

6. Proficiency on Pharmaceutical Formulations: The student should be able to describe the chemistry, characteristics, types, merits and demerits of both drugs and excipients used in pharmaceutical formulations based on her/his knowledge and scientific resources.

7. Entrepreneurship and Leadership: The student should be able to acquire the entrepreneurial skills in the dynamic professional environments. Also, be able to achieve leadership skills through teamwork and sound decision-making skills.

8. Deliver Primary and Preventive Healthcare: The student should be able to contribute to various healthcare programs of the nation including disease prevention initiatives to improve public health. Also contribute to the promotion of national health policies.

9. Professional, Ethical and Legal Practice: The student should be able to deliver professional services in accordance with legal, ethical and professional guidelines with integrity.

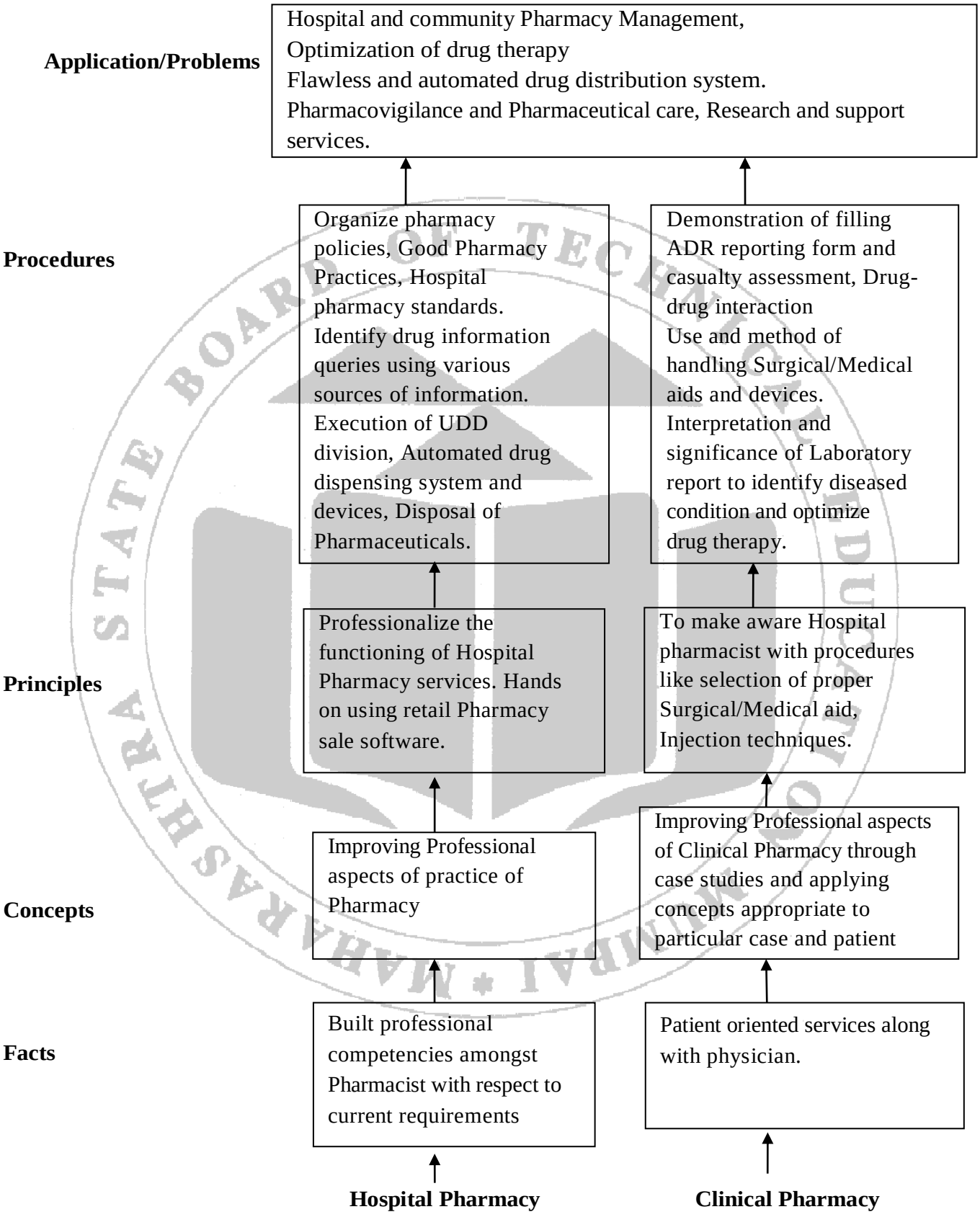
10. Continuing Professional Development: The student should be able to recognize the gaps in the knowledge and skills in the effective delivery of professional services from time to time and be self-motivated to bridge such gaps by attending continuing professional development programs.

COMPETENCY MAPPING WITH THE COURSE

Competencies	Hospital & Clinical Pharmacy
1.Review Prescriptions	✓
2.Dispense Prescription / Non-Prescription Medicines	✓
3.Provide Patient Counselling / Education	✓
4.Hospital and Community Pharmacy Management	✓
5.Expertise on Medications	✓
6.Proficiency on Pharmaceutical Formulations	
7.Entrepreneurship and Leadership	✓
8.Deliver Primary and Preventive Healthcare	✓
9.Professional, Ethical and Legal Practice	✓
10.Continuing Professional Development	✓

GRAPHICAL STRUCTURE OF SUBJECT AREA

Hospital and Clinical Pharmacy(20060)



HOSPITAL AND CLINICAL PHARMACY – PRACTICAL

Course Code: ER20-25P/20060 **25 Hours (1Hours / Week)**

Scope: This course is designed to train the students to assist other healthcare providers in the basic services of hospital and clinical pharmacy.

Course Objectives: This course will train the students with hands – on experiences, simulated clinical case studies in the following:

1. Methods to systematically approach and respond to drug information queries
2. How to interpret common laboratory reports to understand the need for optimizing dosage regimens
3. How to report suspected adverse drug reactions to the concerned authorities
4. Uses and methods of handling various medical / surgical aids and devices
5. How to interpret drug-drug interactions in the treatment of Common diseases.

Course Outcomes: Upon completion of the course, the students will be able to

1. Professionally handle and answer the drug information queries
2. Interpret the common laboratory reports
3. Report suspected adverse drug reactions using standard procedures
4. Understand the uses and methods of handling various medical / surgical aids and devices
5. Interpret and report the drug-drug interactions in common diseases for optimizing the drug therapy

Note: Few of the experiments of Hospital and Clinical Pharmacy practical course listed here require adequate numbers of desktop computers with internet connectivity, adequate drug information resources including reference books, different types of surgical dressings and other medical devices and accessories. Various charts, models, exhibits pertaining to the experiments shall also be displayed in the laboratory.

Practical's

1. Systematic approach to drug information queries using primary / secondary / tertiary resources of information (2 cases)
2. Interpretation of laboratory reports to optimize the drug therapy in a given clinical case(2 cases)
3. Filling up IPC's ADR Reporting Form and perform causality assessments using various scales (2 cases)
4. Demonstration / simulated / hands–on experience on the identification, types, use / application / administration of
   - Orthopedic and Surgical Aids such as knee cap, LS belts, abdominal belt, walker, walking sticks, etc.
   - Different types of bandages such as sterile gauze, cotton, crepe bandages, etc.
   - Needles, syringes, catheters, IV set, urine bag, RYLE's tube, urine pots, colostomy bags, oxygen masks, etc.
5. Case studies on drug-drug interactions (any 2 cases)
6. Wound dressing (simulated cases and role play – minimum 2 cases)
7. Vaccination and injection techniques (IV,IM SC) using mannequins (5 activities)
8. Use of Hospital Pharmacy Software and various digital health tools

Assignments:

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Typical profile of a drug to be included in the hospital formulary
2. Brief layout and various services of the Central Sterile Supplies Department (CSSD)
3. Various types of sterilizers and sterilization techniques used in hospitals
4. Fumigation and pesticide control in hospitals
5. Role of Pharmacists in Transition of Care: Discharge cards, post hospitalization care, medicine reconciliation activities in developed countries
6. Total parenteral nutrition and IV admixtures and their compatibility issues
7. Concept of electronic health records
8. Invasive and Non-invasive diagnostic tests– HRCT, MRI, Sonography, 2D ECHO, X-rays, Mammography, ECG, EMG,EEG
9. Home Diagnostic kits – Pregnancy Test, COVID testing etc
10. Measures to be taken in hospitals to minimize Antimicrobial Resistance
11. Role and responsibilities of a pharmacist in public hospital in rural parts of the country
12. Safe waste disposal of hospital waste

Field Visit

The students shall be taken in groups to visit a Government / private healthcare facility to understand and witness the various hospital and clinical pharmacy services provided. Individual reports from each student on their learning experience from the field visit shall be submitted.

STRATEGY FOR IMPLEMENTATION

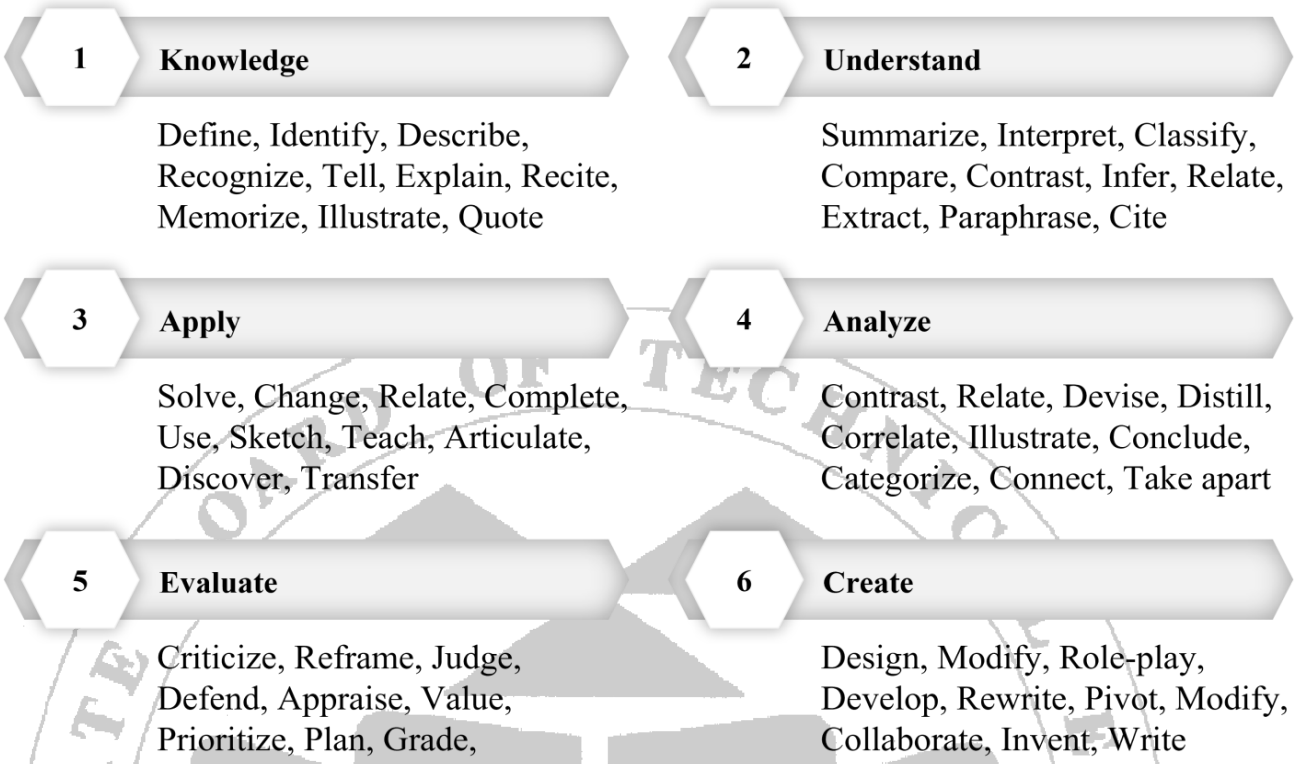
It is suggested that 32-35% experiments shall be completed before every sessional exam.

GUIDELINES FOR TEACHERS

Teacher shall explain the following points to the students before starting of the practical:

1. **Learning Objectives:** To foster better understanding of the subject and to inculcate the skills and attitude related practical's.
2. **Graphical structure:** In graphical structure topics and subtopics are organized in systematic way so that ultimate purpose of learning the subject is achieved. This is arranged in the form of fact, concept, principle, procedure, application and problem.
3. **Elementary Guide to work in Laboratory:** The methods and other finer details of the equipment including equipment specifications should be explained to avoid equipment breakages, create conducive environment for proper organizing of the practical work with the time schedule.
4. Teachers should verify and check the work conditions of the equipment and request the students to follow the standard operating procedures (SOP).
5. Before starting the practical, Teachers should explain the strategies of the experiment.
6. Mannequin, simulated cases may be used wherever required.
7. Teachers should ensure the active participation of students while performing the experiment.
8. Observations should be checked individually and each student should be given a chance to perform the experiment.
9. Teachers should ask the students to complete the questions which are given at the end of the experiment accordingly.
10. Teacher can give more questions to the students at the end of the experiment.
11. Assessment of manuals should be done according to the assessment norms. Proper marks should be distributed according to the performance of the individuals.
12. Teachers should explain the competencies that student should achieve, in detail with their importance to students after completion of their course.
13. Explanation about various equipment with some interesting videos, reagents, chemicals, glassware's should be given to students prior to commencing of the practical.
14. Teachers should observe the students when students are performing practical's in groups, proper contributions of the individual student should be there and record of observation should be noted by all of them.
15. Teachers should also organize a visit to a Government / private healthcare facility to understand and observe the various hospital and clinical pharmacy services provided.
16. Teachers should also ask them to gather information about latest equipments, software used in hospital.
17. Teachers may suggest the students to refer to sources of information such as literature, research papers, books, attending conferences, seminars for the updation of knowledge.
18. According to the professional competencies given by PCI, teachers should develop the professional skills of the students.
19. Teacher should conduct different types of sessions for students such as quiz, group discussions projects on different topics, etc.
20. Teachers should follow Bloom's taxonomy that encourages higher-order thought in their students by building up from lower-level cognitive skills.
21. Teachers should ensure that revised CIAAN– 2017 norms or the latest norms given by MSBTE are followed simultaneously and implemented.
22. Teachers should follow the guidelines given by PCI & MSBTE from time to time.

GUIDELINES OF BLOOMS TAXONOMY LEVELS



INSTRUCTIONS TO STUDENTS

Students should follow the instructions given below for better understanding of the subject from a theoretical and practical concept of view.

1. Listen carefully to the lecture given by teacher about importance of subject, graphical structure, skills to be developed, information about equipment, instruments, procedure, method of continuous assessment, tentative plan of work in laboratory and total amount of work to be done in a year.
2. Teacher act as a simulator only, practical significance and theoretical background must read by the student a day in advance and perform practical by using resources. Thereafter ask the queries to the Teacher.
3. Understand and organize the work in the group and make a record of all observations.
4. Students should actively participate in group activities, role play, discussions, etc. and strive to achieve the knowledge, skills, and attitude.
5. The practical applications of every experiment should be noted by the students.
6. Write the answers of the questions allotted by the teacher during the same practical hours if possible or afterwards, but immediately.
7. Student should submit the manual for assessing regularly on the scheduled date.
8. Student should not hesitate to ask any difficulty faced during conduct of practical / exercise.
9. Student shall refer periodicals /journals / pharmacopoeias, magazines, proceedings of the seminars, refer websites related to the scope of the subjects and update their knowledge and skills.
10. Student should develop the habit of not to depend totally on teachers but to develop self learning techniques.
11. Students should develop different types of competencies to become competent Pharmacists.
12. Student shall visit the hospitals and should make a project report on it as directed by the teacher.

LABORATORY MANUAL OF HOSPITAL AND CLINICAL PHARMACY
MAPPING OF COURSE OUTCOMES

Sr. No	Title of Experiment	CO1	CO2	CO3	CO4	CO5
1	To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case-1.	√				
2	To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case-2.	√				
3	To demonstrate the identification, Types and use of orthopedic aids: knee cap, Lumbo sacral and abdominal belt				√	
4	To demonstrate the identification, Types and use of walking aids.				√	
5	To demonstrate the identification, Types and use of bandages.				√	
6	To demonstrate the identification, Types and use of needles and syringes.				√	
7	To demonstrate the identification, Types and use of urinary catheters, urine bags, urine pots.				√	
8	To demonstrate the identification, Types and use of colostomy bags.				√	
9	To demonstrate the identification, Types and use of Ryle's tube.				√	
10	To demonstrate the identification, Types and use of oxygen mask.				√	
11	To demonstrate the use of Intravenous (IV) sets				√	
12	To interpret the given laboratory reports for optimization of drug therapy: Case-1.		√			
13	To interpret the given laboratory reports for optimization of drug therapy: Case-2.		√			
14	To identify the type of drug-drug interaction in the given Case-1.			√		√
15	To identify the type of drug-drug interaction in the given Case-2.			√		√
16	To perform wound dressing to knee injury Case-1.				√	
17	To perform wound dressing to diabetic foot ulcer Case-2.				√	
18	To fill correctly IPC's ADR reporting form and perform casualty assessments using various scales in the given Case- 1.			√		
19	To fill correctly IPC's ADR reporting form and			√		

	perform casualty assessments using various scales in the given Case-2.					
20	To study the administration of intravenous infusion in the mannequin.				√	
21	To study the administration technique of intramuscular injection in the mannequin.				√	
22	To study the administration technique of subcutaneous injection in the mannequin.				√	
23	To study the administration technique of intradermal injection in the mannequin.				√	
24	To study the administration technique of injectable vaccine in the mannequin.				√	
25	To study the use of Hospital Pharmacy Software and various digital health tools.				√	

LIST OF EXPERIMENTS AND RECORD OF PROGRESSIVE ASSESSMMENT

Sr No	Title of Experiment	Page No	Date of Performance	Date of Submission	Assessment Marks	Teachers Signature
	Systematic approach in handling drug information queries using different resources of information	1				
1	To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case-1.	6				
2	To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case-2.	11				
	Demonstration of Orthopedic Aids					
3	To demonstrate the identification, Types and use of orthopedic aids: knee cap, Lumbo sacral and abdominal belt.	16				
4	To demonstrate the identification, Types and use of walking aids.	23				
	Demonstration of Surgical Aids					
5	To demonstrate the identification, Types and use of bandages.	30				
6	To demonstrate the identification, Types and use of needles and syringes.	39				
7	To demonstrate the identification, Types and use of urinary catheters, urine bags, urine pots	47				
8	To demonstrate the identification, Types and use of colostomy bags.	54				
9	To demonstrate the identification, Types and use of Ryle's tube.	59				

I) PRACTICAL RECORD MARKS*:

Sessional Exam	Experiment No.		Total no. of experiment conducted	Average marks obtained for the experiment conducted. (out of 10)*	Teacher's Signature
	From	To			
First Sessional					
Second Sessional					
Third Sessional					

*Sessional wise marks should be considered for internal assessment of practical sessional examinations (out of 10M)

II) ASSIGNMENT MARKS#:

Sr. No.	Title of Assignment	Marks out of 05#	Assignment Marks (Average of three)	Teacher's Signature
1				
2				
3				

#Marks should be transferred from Appendix -1 A typical format for assessment of an assignment.

III) FIELD VISIT REPORT MARKS$:

Sr. No.	Title of Field Visit	Marks out of 05$	Field Visit Marks (Average of three)	Teacher's Signature
1				
2				
3				

$Marks should be transferred from Appendix -2 A typical format for assessment of an assignment.

Average Sessional Mark out of 10	Assignments Mark out of 05 (Average of three)	Field Visit Mark out of 05(Average for the reports)	Total Marks out 20	Teacher's Signature

Theory

Systematic Approach in Handling Drug Information Queries

Clinical Pharmacy describes the important role of pharmacist is to interact with patient and health care providers, ensures the appropriate & safe use of drugs in patient care, monitoring drug therapy and providing drug information to requester like patient, health care providers, community.

Drug information (DI) is the knowledge gathered either in written form (books, journals, periodicals etc) or transmitted by oral communication or by electronic device. A Drug Information Service typically refers to a specialized healthcare service within a healthcare institution, such as a hospital or a pharmacy that provides accurate and evidence-based information about medications to patient, physician, pharmacist and other healthcare providers etc. Drug Information Centre (DIC) is department in the hospital designed for receiving, collecting, analyzing & providing unbiased, accurate & up-to-date information about drugs & their use.

Pharmacists should assume that all patients need pharmaceutical care until they have been assessed to exclude drug therapy problems. However, due to limited resources, it may not always be possible to conduct individual assessments. In such cases, a systematic approach may be necessary to adopt and prioritize and facilitate the targeting of care.

Watanabe et al. introduced a systematic five-step approach for addressing Drug Information (DI) queries in 1975. This method provided guidance to student pharmacists on handling DI requests. Over the past four decades, modifications to this approach have been introduced: however, the basic concepts of Watanabe et al., have remained the "gold standard for answering DI queries. Following are the five-step systematic approach to responding drug information request,

Obtaining information about the requester

1. Determining the need of true DI
2. Classifying the request
3. Conducting an efficient search using available resources
4. Evaluating the literature and disseminating the information to the requester, and following up when appropriate.

1. Obtaining information about the requester:

The initial step of systematic approach is to identify the requester. This includes gathering demographic details such as their professional background (e.g., physician, nurse, pharmacist, patient) and contact information. This information is essential for delivering the response to meet the requester's needs. The requester's professional background guides the focus of research to be conducted and determines the language used in formulating the final response. Failing to obtain this information may from the requester may be problematic. Hence, pharmacist needs to contact the requester for follow-up questions or additional information that may modify the response.

2. Determining the need of true DI :

Frequently, the original DI request may not accurately reflect the true need for drug information. For example, if a requester is asking for the dose of aspirin. It may appear to be a straightforward inquiry regarding dosing recommendations for a patient. However, it is possible that the pharmacist will need to evaluate another aspect this drug therapy. For instance, the requester might be dealing with a pediatric patient under 12 years old or an elderly individual aged 50 or above who has suffered with thromboembolism. This additional context may change the nature of search. At this point, the request is no longer a simple dosing question. In such cases, the request evolves beyond a simple dosing query to include considerations about the appropriateness of aspirin usage in specific patient populations, such as those under 12 years old, over 50 years old, or patients with venous thrombo embolism who may already be on oral anticoagulant therapy. In general, the pharmacist

should always ask the requester why the question is being asked and if the question is patient related.

Once the pharmacist has identified the requester's information needs, they may find it necessary to obtain patient-specific details to address the inquiry accurately. This may include requesting information such as the patient's name, medical record number, location, and various demographics (e.g., height, weight, age), as well as relevant laboratory data (e.g., drug levels, serum creatinine levels, liver enzyme levels). As the pharmacist may not possess all the required information during the initial intake of the query, it may be essential for them to follow up with the requester to obtain this information. Most requesters desire a quick response and may not understand the need to provide additional information or to clarify the question being asked. The pharmacist must clarify that this information is necessary to provide an appropriate response

3. **Classifying the request:**

Classify requests as patient specific or academic and by type of question (e.g., Availability, dosage/administration, Adverse drug reaction, Pharmacokinetics, Pharmacoeconomic, Therapeutic use, Drug interaction, drugs in pregnancy/ lactation, compatibility, toxicology etc.). Request classification helps the pharmacist in developing a search strategy by identifying the appropriate references that contain the information requested.

4. **Conducting an efficient search using available resources:**

Once the request is classified, a search for information should be initiated. In order to maximize your search efficiency and accuracy, it is necessary to develop a search strategy and before developing a search strategy, it is necessary that we have the same understandings for different terms.

Search Terms: Always search under the generic drug name and not the trade name (Generic names are universal; trade names are specific to counties. Also, cannot assume sources will cross reference.).

Search Strategy:

Tertiary literature → Secondary literature → Primary literature

- Using a stepwise approach, most searches should begin by using tertiary literature- Review general references first (eg. reference books, Micromedex etc). (Remember: information is only as current as the publication date)
- If there is a doubt that newer or more detailed information is required on the topic, it might become necessary to seek additional resources, such as journal articles. Searching for journal articles directly can be impractical or even impossible. Hence, start with the most current index and abstracting databases, which can provide reference citations to the primary literature.
- Primary literatures retrieve the original articles indexed and use evaluative skills to select relevant article.

On the basis of the origin, composition & function, the medical literature can be classified into three types,

1. Primary literature
2. Secondary literature
3. Tertiary literature

Primary Literature:

- It serves as the foundation of medical literature.
- Original articles published in journals.
- Quality of information varies and primary literature must be read critically.
- Journals can be published weekly, biweekly, monthly, quarterly, or annually

- Example: Journal of the American Medical Association (JAMA), Indian Journal of Pharmacology etc

Secondary Literature:

- Sources are used to access the primary literature
- Considered as a bibliographical indexing system
- Sources are typically not useful without access to primary literature
- Advantage over primary literature is efficiency in locating articles of specific interest
- Example: MEDLINE through PubMed

Tertiary Literature:

- It provides the compilation of information gathered from primary literature and other resources.
- It is the most efficient source of information, but limited by the date of publication and the depth and detail of information on the topic searched.
- Examples: Reference textbooks, Drug Information Handbook

Efficient searches depend on the ability of the pharmacist to locate information quickly. This requires a pharmacist to be aware of the institution's Dl and library resources, including availability of print and digital tertiary references; familiarity with available secondary databases; and ability to access full-text e-journal articles.

5. **Evaluate the literature, provide the findings to the requester, and conduct follow-up as necessary:**

It is a common practice for pharmacists to simply forward discovered information (e.g., review articles, reference pages, internet printouts) to the requester without conducting a thorough analysis or providing a description of the information. While this method of responding to drug information (DI) requests may be convenient and sometimes appropriate, it's always necessary for the pharmacist to critically evaluate and analyze the information found. This evaluation involves assessing the relevance of the information to the presented scenario and integrating personal experience and knowledge. Additionally, consulting with colleagues can be beneficial as their input may offer valuable insights or interpretations.

The response to the requester, whether oral or written, should be tailored to their specific needs, taking into account language, depth, and scope of content. In general, the response should begin by restating the question to ensure the pharmacist's understanding is correct. Subsequently, describing the resources used for the search and the information found in each source is essential. When citing information obtained from secondary resources, providing the article's citation is important. Similarly, when referencing information sourced from an internet search engine, specifying the website and date of search is crucial.

When preparing a written response, it's advisable to keep it concise and focused on addressing the question asked. Formulating a lengthy written response may result in the response being lost among the other information provided in the response letter.

Follow Up:

Although, it may not always be possible to follow up on a completed response, it should be pursued whenever feasible. A pharmacist may be time-constrained and required to provide an immediate response to drug information (DI) request. However, when the opportunity arises, they may need to conduct or request a colleague to conduct a more extensive search. If additional information is discovered, it is essential to notify the requester and provide them with this supplementary information.

References:

Appendices. In: Patrick M. Malone and Meghan J. Malone and Sharon K. Park. Drug Information: A Guide

for Pharmacists, 6e. McGraw-Hill Education; 2018.
https://accesspharmacy.mhmedical.com/content.aspx?aid=1151747959
i.American journal of health-system pharmacy: AJHP: official journal of the American Society of Health-System Pharmacists 66(8):706-11

Solved Case Study:

Case:

A 74 year old man (Mr. ABC) presents to the clinic (HOSP, Mumbai) with complaints of dizziness and weakness over the past week. He reports feeling lightheaded when standing up from a seated position. Mr. ABC reports that his symptoms started approximately one week ago. He denies any recent falls or trauma. He has not experienced any chest pain, palpitations, shortness of breath. He has been compliant with his medications and denies any recent changes in his regimen. His past medical history included Hypertension, Type 2 Diabetes Mellitus, Hyperlipidemia, Depression for which he was being treated currently. His Current Medications included:

Propranolol 80 mg daily for hypertension
Metformin 1000 mg twice daily for diabetes
Atorvastatin 40 mg daily for hyperlipidemia
Amitriptyline 75 mg daily for depression
Physical Examination:

Vital Signs: feeling lightheaded when standing up from a seated position

Blood Pressure: 130/80 mmHg
Heart Rate: 78 bpm
Respiratory Rate: 16 breaths/min
Temperature: 98.6°F (37°C)
General: Alert and oriented x3 (person, place and time), appears fatigued
Cardiovascular: Regular rate and rhythm, no murmurs or gallops
Laboratory Findings:
Serum Creatinine: 1.2 mg/dL (normal range: 0.6-1.3 mg/dL)
Fasting Blood Glucose: 120 mg/dL (normal range: 70-100 mg/dL)
Total Cholesterol: 180 mg/dL (normal range: <200 mg/dL)
Hemoglobin A1c: 7.2% (normal range: <6.5%)

Physician Dr. XYZ contacted to the DIC on 24/04/2024 at 11:30 am via call and email, seeking information on potential drug interactions from a patient's medication history. What potential drug interactions should be considered?

Drug Information request and response:

6. **Obtaining information about the requester:**

Date: 24/04/2024 Time: 11:30am

Requestor name: Dr. XYZ

Requestor's affiliation: Physician

Requestor's Contact information:HOSP, Mumbai, Mob No. 123467891, Email-xyz@gmail.com

Whether patient specific: Yes

Nature of request: Phone call and give information via call or e-mail

Drug information question: Any potential drug interactions from patient's medication history that should be consider?

Background information:

Name of patient- Mr ABC Age- 74 years visited to the clinic with complaints of dizziness and weakness over the past week. He reports feeling lightheaded when standing up from a seated position.

Medication History- medical history included Hypertension, Type 2 Diabetes Mellitus, Hyperlipidemia, depression for which he was being treated currently. His Current Medications included: Propranolol 80 mg daily, Metformin 1000 mg twice daily, Atorvastatin 40 mg daily, Amitriptyline 75 mg daily.

7. **Determining the need of true DI:**

   The physician is inquiring about potential drug interactions among the prescribed medications.

8. **Classifying the request:**

   This is enquiry about drug interaction. Patient receiving drug for Hypertension, Type 2 Diabetes Mellitus, Hyperlipidemia, depression. Are there any drug interactions among these prescribed medications?

9. **Conducting an efficient search using available resources**

   Tertiary literature used:

   Barar FSK. Essentials of Pharmacotherapeutics. 3rd ed. S Chand and Company Ltd. New Delhi; 2005.

   Secondary literature used

   Drug interaction checker: Drugs.com

   Primary literature used

   Guilia Rivasi, Martina Rafaneli. Drug-Related Orthostatic Hypotension: Beyond Anti-Hypertensive Medications. Drugs Aging. 2020; 37(10): 725–738. doi: 10.1007/s40266-020-00796-5.

10. **Evaluate the literature, provide the findings to the requester, and conduct follow-up as necessary:**

    Orthostatic hypotension is a common issue in elderly patients, particularly those with multiple comorbidities and polypharmacy. In Mr. ABC case, the combinations of propranolol with antidepressant drug like amitriptyline contribute to hypotension. Tricyclic antidepressants (TCAs) may potentiate the blood pressure lowering capabilities of other drugs with hypotensive effects due to their peripheral alpha-1 adrenergic blocking activity. Orthostatic hypotension associated with vasodilation may occur. The efficacy of antihypertensive drug propranolol may potentiate due to amitriptyline. Monitor blood pressure closely, especially upon standing, and adjust antihypertensive medications as needed.

Experiment No. 1
Systematic approach in handling drug information queries

1. Aim:

To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case 1.

2. Practical Significance:

A Drug Information Service typically refers to a specialized healthcare service within a healthcare institution, such as a hospital or a pharmacy that provides accurate and evidence-based information about medications to patient, physician, pharmacist and other healthcare providers etc.

Pharmacist has to work for the patient care, and he has to provide this information through drug information centre. Drug Information Centre (DIC) is department in the hospital designed for receiving, collecting, analyzing & providing unbiased, accurate & up-to-date information about drugs & their use. To answer the drug information related queries pharmacist must familiar with drug information resources and use systematic approach to provide accurate and reliable response to drug information queries. In this practical session, students will develop proficiency in systematically addressing drug information queries using primary, secondary, and tertiary sources.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain and follow various steps for handling drug information queries.	CO1	BTL2
2	Classify the drug information queries and request.	CO1	BTL3
3	Conduct an efficient search using available resources.	CO1	BTL3
4	Evaluate the literature for disseminating the information to the requester	CO1	BTL5
5	Collaborate and communicate with colleague students.	CO1	BTL6

4. Relevant Theoretical Background:

Drug Information Sources can be classified into primary, secondary and tertiary.

- **Primary sources of information:** It includes unpublished studies, original articles published in reputed peer-reviewed journals reporting original research, ideas or opinions.
- **Secondary sources of information:** It refers to indexing and abstracting systems that organize and provide easy retrieval of primary resources.
- **Tertiary sources of information:** summarize data from the primary literature, and they include reference books, drug compendia, essential drugs list, treatment guidelines, drug formularies, drug bulletins and pharmacopoeias.
- **Commercial sources of drug information:** It encompasses a wide range of resources provided by pharmaceutical companies, healthcare technology companies. These sources aim to disseminate information about pharmaceutical products, their uses, safety profiles, and other relevant data to healthcare professionals, patients, and consumers.
- **Other sources of drug information:** Computerized or electronic information systems and verbal information.

5. Required resources:

Drug information query, primary, secondary, and tertiary drug information resources

6. Resources used:

7. Precautions to be taken:

- Carefully read the request and classify it accordingly.
- Thoroughly and critically search for the databases, don't just rely on abstracts and try to read full texts.
- Commercial resources are the marketing strategies, hence read primary resources to gather information which offer more in-depth and unbiased information about a topic.

8. Procedure:

Follow the five -steps systematic approach guidelines to answer the following request.

Case: Mr. ABC age 46 years visited to the hospital having complaint of orange-pink to brownish-black discoloration of the skin, brownish-black color of urine, stools. Last two weeks ago Mr ABC diagnosed with multi bacillary (MB) leprosy. His medications are listed below. He was working as an apprentice in mechanics and did not drink alcohol or smoke cigarettes.

Drug used	**Dose**	**Frequency**
Rifampicin	600 mg	Once monthly
Dapsone	100 mg	Once daily
Clofazimine	50 mg	Once daily

Pharmacist Mr. DRX called to the DIC on 24/04/2024 time 11 am for asking about adverse drug reaction of prescribed drugs and any potential risk during therapy to the patient Mr ABC diagnosed with MB leprosy. Information provided via call and e-mail before 25/04/2024.

9. Drug information request and response:

Five-step systematic approach to responding drug information request,

Step-1: Obtaining information about the requester

Step-2: Determining the need of true DI

Step-3: Classifying the request

Step-4: Conducting an efficient search using available resources

Step-5: Evaluating the literature and disseminating the information to the requester

Step-1: Obtaining information about the requester

Date:_____ **Time:** _____

Requestor name:

_____

Requestor's affiliation:

_____

Requestor's Contact information:

_____

Whether patient specific:

_____

Nature of request:

_____

Drug information question:

_____

_____

Background information:

_____

_____

Step-2: Determining the need of true DI(Find need for accurate and reliable drug information)

Step-3: Classifying the request(Availability of dosage/administration/ Adverse drug reaction/ Therapeutic use/Drug interaction/drugs in pregnancy or lactation/ compatibility/toxicology etc.)

Step-4: Conducting an efficient search using available resources

Tertiary literature used

Secondary literature used

Primary literature used

Step-5: Evaluate the literature, provide the findings to the requester, and conduct follow-up as necessary

10. Result:

11. Conclusion:

12. References:

i. Shargel L, Mutnick AH. "Comprehensive Pharmacy Review" 4th Ed. Lippincott Williams Wilkins; 2001; 406-415.

ii. Australian drug information- procedure manual. The Society of Hospital Pharmacists of Australia.

iii. https://www.ashp.org/-/media/assets/pharmacy-practice/resource-centers/preceptor-toolkit/sicp-busy-day systematic-approach-answering-drug-info-requests.pdf

13. Practical related questions :

a. Define Drug information Service

b. Explain various sources of drug information.

c. Give some examples of questions that can be asked to collect background information from the requester.

d. Explain search strategy for conducting efficient search using available resources.

e. Which are the basic steps for systematic approach in handling drug information queries?

(Space for Answers)

13. Assessment Scheme:

Particular	Understanding the basic concept(Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 2
Systematic approach in handling drug information queries

1. Aim:

To follow the systematic approach in handling drug information queries using primary/secondary/tertiary source of information: Case 2.

2. Practical Significance:

A Drug Information Service typically refers to a specialized healthcare service within a healthcare institution, such as a hospital or a pharmacy that provides accurate and evidence-based information about medications to patient, physician, pharmacist and other healthcare providers etc.

Pharmacist has to work for the patient care, and he has to provide this information through drug information centre. Drug Information Centre (DIC) is department in the hospital designed for receiving, collecting, analyzing & providing unbiased, accurate & up-to-date information about drugs & their use. To answer the drug information related queries pharmacist must familiar with drug information resources and use systematic approach to provide accurate and reliable response to drug information queries. In this practical session, students will develop proficiency in systematically addressing drug information queries using primary, secondary, and tertiary sources.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain and follow various steps for handling drug information queries	CO1	BTL2
2	Classify the drug information queries and request.	CO1	BTL3
3	Conduct an efficient search using available resources.	CO1	BTL3
4	Evaluate the literature for disseminating the information to the requester	CO1	BTL5
5	Collaborate and communicate with colleague students.	CO1	BTL6

4. Relevant Theoretical Background:

Drug Information Sources can be classified into primary, secondary and tertiary.

- **Primary sources of information:** It includes unpublished studies, original articles published in reputed peer-reviewed journals reporting original research, ideas or opinions.
- **Secondary sources of information:** It refers to indexing and abstracting systems that organize and provide easy retrieval of primary resources.
- **Tertiary sources of information:** summarize data from the primary literature, and they include reference books, drug compendia, essential drugs list, treatment guidelines, drug formularies, drug bulletins and pharmacopoeias.
- **Commercial sources of drug information:** It encompasses a wide range of resources provided by pharmaceutical companies, healthcare technology companies. These sources aim to disseminate information about pharmaceutical products, their uses, safety profiles, and other relevant data to healthcare professionals, patients, and consumers.
- **Other sources of drug information:** Computerized or electronic information systems (Internet) and verbal information.

5. Required resources:

Drug information query, primary, secondary, and tertiary drug information resources

6. Resources used:

7. Precautions to be taken:

- Carefully read the request and classify it accordingly.
- Thoroughly and critically search for the databases, don't just rely on abstracts and try to read full texts.
- Commercial resources are the marketing strategies, hence read primary resources to gather information which offer more in-depth and unbiased information about a topic.

8. Procedure:

Follow the five -steps systematic approach guidelines to answer the following request.

Case: Mrs. ABC, a 30-year-old pregnant woman in her third trimester, presents to the clinic (Hosp, Latur) with a history of epilepsy. She has been on antiepileptic medication carbamazepine (200 mg twice day) for several years to control her seizures. She Recently, Mrs. ABC developed symptoms of a viral infection, including fever, cough, and body aches. She is concerned about the safety of her epilepsy treatment during pregnancy, deformity causing therapy and seeks guidance from physician on managing her condition while dealing with the viral illness.

Her family physician Dr. XYZ called to the DIC on 24/04/2024 Time 04 pm giving information via call and e-mail for How to manage drug therapy for the viral infection in pregnant patient having epilepsy?, How to manage epilepsy therapy in pregnancy?

9. Drug information request and response:

Five-step systematic approach to responding drug information request,

Step-1: Obtaining information about the requester

Step-2: Determining the need of true DI

Step-3: Classifying the request

Step-4: Conducting an efficient search using available resources

Step-5: Evaluating the literature and disseminating the information to the requester

Step-1: Obtaining information about the requester

Date:_____ **Time:** _____

Requestor name:

_____

Requestor's affiliation:

_____

Requestor's Contact information:

_____

Whether patient specific:

_____

Nature of request:

_____

Drug information question:

_____

_____

Background information:

_____

_____

_____

_____

Step-2: Determining the need of true DI (Find need for accurate and reliable drug information)

Step-3: Classifying the request (Availability of dosage/administration/ Adverse drug reaction/ Therapeutic use/Drug interaction/drugs in pregnancy or lactation/ compatibility/toxicology etc.)

Step-4: Conducting an efficient search using available resources

Tertiary literature used

Secondary literature used

Primary literature used

Step-5: Evaluate the literature, provide the findings to the requester, and conduct follow-up as necessary

10. Result:

11. Conclusion:

12. References :

i. Shargel L, Mutnick AH. "Comprehensive Pharmacy Review" 4th Ed. Lippincott Williams & Wilkins; 2001; 406-415.

ii. Australian drug information- procedure manual. The Society of Hospital Pharmacists Australia.

iii.https://www.ashp.org/-/media/assets/pharmacy-practice/resource-centers/preceptor-toolkit/sicp-busy-day systematic-approach-answering-drug-info-requests.pdf

13. Practical related questions:

a. How will you classify the request?

b. How will you determine the need of drug information?

c. Give the examples of primary source, secondary source and tertiary source of information.

d. Give examples of website that can be used for getting secondary source of information.

(Space for Answers)

13. Assessment Scheme:

Particular	Understanding the basic concept(Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 03

1. Aim:

To demonstrate and identify the different types and uses of Orthopaedic aids:

1. Knee cap 2. Lumbo sacral (LS) belt 3. Abdominal belt.

2. Practical Significance:

Orthopedic aid improves the quality of life by providing support, and stability, and improves posture and mobility. They are essential for supporting, relieving, and correcting the musculoskeletal system. These aids make a significant contribution to improving mobility, rehabilitation after surgery or injury, and relieving pain. After completion of this practical, student will be able to demonstrate, identify, and dispense appropriate types, and size of Knee caps and belts and counsel the patient about their uses.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Identify appropriate Orthopedic aid as per indication.	CO4	BTL1
2	Describe the application of Knee Cap, LS belt and Abdominal Belt	CO4	BTL2
3	Discuss various types of knee caps.	CO4	BTL2
4	Demonstrate the use of Knee Cap, LS belt and Abdominal Belt	CO4	BTL3
5	Practice and follow ethics while performing practical.	CO4	BTL6

4. Relevant Theoretical Background:

Orthopedic aids are technical devices that serve to establish and repair damage to the locomotor system, correct the aesthetic defects of the body, provide assistance to disabled persons, and to perform physiological movements. These are the material that helps the patient with mobility and support and gives relief from any orthopaedic pain. There are different types of orthopaedic aids available from which some examples are given below table such as:

Sr. No.	Orthopaedic Aids	Uses
01	Clavicular and Shoulder Braces	Provide support, immobility, stability and align clavicle fracture in the correct position.
02	Forearm-wrist orthoses	Provide support, immobility stability and align forearm and wrist fracture in the correct position
03	Knee Cap	Provide strength, stability and immobility to knee.
04	LS belt	Provide strength, stability and immobility to Lumbo-sacral region.
05	Abdominal Belt	Speed up the recovery process after abdominal surgery.
06	Sacroiliac belt	Provide strength, stability and immobility to Sacroiliac region.
07	Knee-ankle-foot orthosis	Provide support to the muscles, stabilize the joints and assist safe ambulation.
08	Spinal Orthosis	Provide strength, support and stability to Spinal region.
09	Cervical collar	Provide support to the neck and spine and limit head movement after injury
10	Cane and Crutches, Walker and Wheelchair	Provide stability and support mobility for individuals who have limited ability to walk independently due to injuries, pain or medical condition. Improves the quality of life of the patient.

4.1.Knee Cap

A knee Cap is a medical device that stabilizes and provide support to knee joint and holds it in place. Healthcare providers use braces to protect and support your knee after an injury or knee surgery. It is also called as knee braces orthoses or Knee sleeves.

4.1.1 Uses of Knee Cap

It is used to treat common knee injuries, including Knee sprains, Knee ligament injuries such as Anterior cruciate / Lateral-Medial collateral ligament injury, Patello femoral pain syndrome, Patellar tendinitis or other tendon issues, and Patellar dislocations. Knee caps can used to treat some health conditions such as Peripheral neuropathy, Knee arthritis, joint hypermobility syndrome or Ehlers-Danlos syndrome, etc. Also used to provide support for sports injuries and manage knee pain.

4.1.2 Advantages of Knee Cap or Braces

- It provides support to the knee and holds it in place.
- It restricts the mobility of the Knee.
- It provides stability to the knee and its ligaments.
- It provides warmth to the knee region and reduces pain and inflammation.
- It improves blood circulation in the region.
- It improves the quality of life of elderly patients by providing support to the knee.
- It alleviates knee discomfort through compression, etc

4.1.3 Management of Knee injuries and pain: The following measures are to be taken for the management of knee injuries.

i. Rest: Take a proper rest from normal activities to reduce repetitive strain on the knee, give the time for the healing injury and prevent further damage.

ii. Ice Therapy: Ice reduces both pain and inflammation. Although ice therapy is generally safe and effective, don't use ice for more than 20 minutes at a time because of the risk of damage to nerves and skin.

iii. Heat Therapy: Heat pack if applied over affected or painful areas, patient relieves pain temporarily.

iv. Compression Therapy: Compression helps prevent fluid buildup in damaged tissues and maintains knee alignment and stability. It should be tight enough to support the knee without interfering with circulation.

v. Elevation: Elevation of the leg helps to reduce oedema or swelling and improves circulation.

4.1.4 Types of Knee Caps or Braces (Fig. 3.1): The most common types of knee brace include:

i. Unloader knee braces: It supports to the knee and holds it in place. They help absorb some of body weight and “unload” pressure off the knee to other parts of leg that are strong enough to bear it. These are commonly suggested in knee arthritis.

ii. Patellofemoral knee braces: Patellofemoral braces protect and support Patella (Kneecap) and the front of the knee. These are commonly suggested in knee cap/ligament injury or surgery.

iii. Knee Immobilizer braces: These are knee braces wear while recovering from surgery. They are usually stiffer and immobilize movement.

iv. Functional Knee braces: Like their name sounds, functional braces improve functioning of knee by providing support. It moves the knee, but prevent it from moving too much or too far in one direction. It is the most common type of brace people wear after a knee injury.

v. Prophylactic braces: Generally, athletes wear these braces to prevent knee injuries. These are popular among people who play contact sports like football or rugby.

4.2 Lumbo-Sacral (LS) Belt (Fig. 3.2)

A lumbar belts can be used for the treatment and prevention of lower back pain.Lumbo sacral belt also called as Lumbosacral corset. Lumbar belt were selected, taking into consideration flexibility, comfort, and economy for use in daily life and work. Orthopedicians are generally advised in the instances of low back pain such as:

a. Low Back severe muscle spasm
b. Lumbar prolapsed intervertebral disc
c. Sciatica back pain
d. Loss of lumbar lordosis (Flat-Back Syndrome)

The primary purpose of Lumbo-Sacral belt is to support the lower back by acting as a brace. While working, walking, running, or travelling, it serves a support to protect the low back from excessive bending and jerking. Due to application of Lumbo-Sacral belt less weight is transferred over the low back due to weight distribution and prevent further harm.

Fig. 3.1:.i. Unloader ii. Patellofemoral iii. Immobilizer iv. Functional v. Prophylactic

Fig. 3.2: Front and Back of Lumbo Sacral Belt or Corset

Fig. 3.3: Front and Back of Abdominal Belt

4.3 Abdominal Belt (Fig. 3.3)

A compressive belt that wraps around the abdomen is called an Abdominal Belt. Abdominal belts are commonly called abdominal binders. Abdominal belts are made up of elastic and have Velcro or hook and loop closures. Some abdominal binders offer secondary lumbar support. Others have straps that hold surgical drainage tubes in place. After abdominal surgery, an abdominal belt may be worn to speed up recovery, support the surgical incision, reduce the swelling, improve blood circulation, improve patient mobility, and strengthen the abdominal muscles. An abdominal belt is prescribed to recover from the following post-surgical cases:

A Caesarean section; Bariatric surgery; Exploratory laparotomy; Hysterectomy; Tummy tuck; Spinal surgery, etc.

5. Requirements:

Knee Cap of various types, Lumbo sacral belt, Abdominal belt and tailor's measuring tape.

6. Requirements used:

_____

_____

7. Precautions to be taken:

- Remove the Knee cap, Lumbo-Sacral or Abdominal belt periodically, to avoid itching to the skin.
- Select the appropriate size of Knee cap or belt for better results.
- Discontinue the use of a Knee cap or belt, if any allergic reactions persist.

8. Demonstration:

The subject teacher must demonstrate the technique of use of a Knee belt, Lumbo sacral belt and abdominal belt. Students are suggested to read the theoretical background of Knee belt, Lumbo sacral belt and abdominal belt. As different varieties and sizes of Knee braces, Lumbo sacral belts and Abdominal belts are available in market, teachers must refer to the instruction manual available with the product for stepwise demonstration and give activities to the students. You tube videos can also be used for support.

8.1 Demonstrate the procedure for using Knee cap or braces

1. Measure the circumference in inches or centimeters, around the midthigh approximately 6 inches above the knee by using tailor measuring tape.
2. Suggest the appropriate size of the belt/braces; recommended by the manufacturer.
3. Putting on knee face

i. Pull the brace on over leg.
ii. The brace should be worn against the skin and not over clothing, as this will cause the brace to slip and move.
iii. Put the knee brace on, then sit down with your foot flat on the floor and your knee bent at a 90-degree angle.
iv. Bend the knee brace and then place it onto your leg so that the knee joint on the brace is over your knee.
v. The bottom strap should be fastened first, followed by the middle strap and then any other straps.
vi. Check that all the straps are still tight enough.

Knee Cap or Knee Braces Size Table:

Sr. No.	Size	In Inches	CMS
1	Small (S)	14.8-17.2	37-43
2	Medium (M)	17.2-19.6	43-49
3	Large (L)	19.6-22.0	49-55
4	X-Large (XL)	22.0-24.4	55-61
5	XX-Large (XXL)	24.4-26.6	61-67
6	XXX-Large (XXXL)	26.6-29.2	67-73

(Note: The sizes of knee cap may vary from manufacturer to manufacturer, so refer its leaflet)

8.2 Demonstrate the procedure for using the Lumbo-Sacral belt

1. Measure the size of the waist of the patient in inches or centimeters at the level of the hip bone by using tailor measuring tape.
2. Suggest the appropriate size of the Lumbo-Sacral belt.
3. Most braces are put on by following a few general steps:

i. Wrap the brace around the back with the wings against either side of the torso.
ii. Reaching to wrap the brace behind the body can be difficult with a painful back and enlisting help from a partner or friend may be advisable.
iii. Make more precise adjustments to the tightness and pressure in the brace; typically, small adjustments are made using two pull tabs on either side of the brace

iv. Connect the two ends across the abdomen.

Lumbo- Sacral belt Size Table:

Sr. No.	Size	In Inches	CMS
1	Small (S)	28-34	71.12-86.36
2	Medium (M)	34-40	86.36-101.6
3	Large (L)	40-46	101.6-116.84
4	X-Large (XL)	46-52	116.84-132.08
5	XX-Large (XXL)	52-58	132.08-147.32
6	XXX-Large (XXXL)	58-64	147.32-162.56

(Note: The sizes of Belt may vary from manufacturer to manufacturer, so refer to its leaflet)

8.3 Demonstrate the procedure for using abdominal belt

1. Measure the size of the waist of the patient in inches or centimeters at the level of hip bone by using tailor measuring tape.
2. Suggest the appropriate size of the Abdominal Belt.
3. Most braces are put on by following a few general steps:

i. Position the binder with the top edge just below navel and V point facing down. Stretch the binder out sideways.

ii. Stretch the binder as you wrap it around.

iii. Connect the two ends across the abdomen

iv. Remember, a secure fit won't restrict breathing; the stretching and compression actually facilitates deep breathing.

Abdominal belt Size Table:

Sr. No.	Size	In Inches	CMS
1	Small (S)	28-32	70-80
2	Medium (M)	32-36	80-90
3	Large (L)	36-40	90-100
4	X-Large (XL)	40-44	100-110
5	XX-Large (XXL)	44-48	110-120

(Note: The sizes of Belt may vary from manufacturer to manufacturer, so refer to its leaflet)

9. Activities and Observations:

9.1: Activity I (Role play):

A patient with injured knee has been prescribed with functional knee cap. Suggest the suitable size (Refer Knee Cap or Knee Braces Size Table) of functional knee cap or brace by performing given procedure.

Also, demonstrate the stepwise procedure and counsel him/her about precautions to be taken while using the functional knee cap.

Knee Cap or Braces: A. Measured circumference above mid thigh:_____ (inches/ cm).

B. Suggested Size of Functional knee cap/ Brace:_____.

Precautions to be taken :

_____

_____

9.2: Activity II (Role play):

A patient with back pain has been prescribed with Lumbo-Sacral belt. Suggest the suitable size (Refer Lumbo- Sacral belt Size Table) of Lumbo-Sacral Belt by performing given procedure.

Also, demonstrate the stepwise procedure and counsel him/her about precautions to be taken while using the Lumbo-Sacral belt.

Lumbo Sacral Belt: A. Measured size of waist _____ (inches/ cm).

B. Suggested Size of Lumbo sacral belt:_____.

Precautions to be taken:

_____

_____

9.3: Activity III (Role play):

A patient who has undergone Caesarean section has been prescribed with abdominal belt. Suggest the suitable size (Refer Abdominal belt Size Table) of Abdominal Belt by performing given procedure.

Also, demonstrate the stepwise procedure and counsel him/her about precautions to be taken while using the abdominal belt.

Abdominal Belt: A. Measured size of hip / waist _____ (inches/ cm).

B. Suggested Size of abdominal belt:_____.

Precautions to be taken:

_____

_____

10. Result:

_____

_____

_____

11. Conclusion:

_____

_____

_____

12. References:

i. https://www.medicalnewstoday.com/articles/318463
ii. https://my.clevelandclinic.org/health/treatments/21034-knee-brace
iii. https://www.mayoclinic.org/diseases-conditions/knee-pain/diagnosis-treatment/drc-20350855
iv. https://www.romsons.in/products/lumbo-sacral-belt
v. https://www.healthline.com/health/abdominal-binder#
vi. https://www.steepergroup.com/SteeperGroup/media/SteeperGroupMedia/Orthotics/Product%20Ranges/Patient%20Information/Knee-Brace.pdf

13. Practical related questions :

a. Enlist the various types of Orthopedic belts and give its uses.
b. Indicate uses of Knee cap, Lumbo Sacral Belt and Abdominal belt.
c. Enlist the minimum two advantages of Knee cap, Lumbo Sacral Belt and Abdominal belt.
d. Enlist the types of Knee braces.
e. Give the two differences between Lumbo Sacral Belt and Abdominal belt.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 4
Demonstration of Orthopedic Aids

1. Aim:

To demonstrate the identification, Types and use of walking aids

2. Practical Significance:

People who are suffering from different conditions such as arthritis, cerebral palsy, developmental disabilities, diabetic ulcers and wounds, difficulties in maintaining balance, fractures or broken bones in the lower limbs, gout, injury to the legs, feet, or back, obesity, spina bifida, sprains and strains, walking impairment due to brain injury or stroke or visual impairment or blindness. The walking aids are the devices used to maintain the balance and increase the safety of patient. In this practical, the students will be able to learn the different types and use of walking aids.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe the application of walking aids	CO4	BTL2
2	Identify the different types of walking aids.	CO4	BTL3
3	Demonstrate the use of walking aids.	CO4	BTL3
4	Perform and follow ethics in performing practical.	CO4	BTL5
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 Walking aids: These devices are also referred to as ambulatory or mobility assistive devices that designed to help persons with mobility impairments, imbalance in standing and walking. They aim to assist patient with improving their walking pattern, balance, or safety when moving around independently. They can also be used to transmit weight from the upper limb to the ground when it is preferable to reduce weight bearing through the lower limb. Walking aids may be used for a short period of time during the healing and the recovery process or may be used for long term in case of disability, aging, or degenerative disease.

There are a variety of walking aids available to assist the people with poor walking skills. Walking aids include: canes (also known as walking sticks), crutches and walkers.

4.2 Canes (walking sticks):

This device helps to transfer the load from your legs to your upper body by supporting your weight. It takes less weight off your lower body and puts more pressure on your hands and wrists than crutches. It is helpful for those who need minimal assistance to improve balance and stability.

Types of canes:

1. **White canes:** These are one of the more typical cane designs created especially to help those persons who are vision impaired. White canes allow the user to see objects in their path since they are longer and thinner than standard canes.

2. **Offset canes**: These are usually made from aluminium. Their length is adjustable, so there is no need for custom fittings. The major advantage of the offset cane is a bend that allows the handle to be placed directly over the main shaft of the cane. It is used for weight bearing (e.g. osteoarthritic hip/knee pain) by aligning force along shaft.

3. **Quad canes:** These canes feature four feet at the end, giving them a wider base and more solidity. It is necessary for substantial weight bearing (e.g., hemiplegic patients).



Fig. 4.1 White Cane **Fig. 4.2 Offset cane** **Fig. 4.3 Quad Cane**

4.3 Crutches:

Crutches are medical devices designed to aid in movement, by transferring body weight from the legs to the torso and arms. They are mainly used to assist individuals with lower extremity injuries and/or neurological impairment. Person can use them individual or in pairs. Crutches can be worn by persons with temporary injuries or long-term disability to assist the stay upright.

Types of crutches:

1. **Underarm (Axillary) crutches:** Users of underarm (axillary) crutches grab onto the hand grip of an axillary crutch while positioning one portion on the ribs beneath the armpits. Short-term injured people frequently utilise these crutches.

2. Forearm (Lofstrand or elbow or Canadian crutches) crutches: The arm is placed into a metal or plastic cuff and a hand grip required for crutch is maintained. These crutches provide greater weight distribution from the wrist to the arm by providing additional forearm support. Long-term disabled people are more likely to utilize forearm crutches.

3. Gutter crutches (adjustable arthritic crutches or forearm support crutches or crutches with platforms): The forearm rests on a horizontal platform while the hand maintains a grip. These are used for patients who are partial weight bearing, and are particularly useful in rheumatoid conditions.



Fig. 4.4 Underarm crutches **Fig. 4.5 Forearm crutches** **Fig. 4.6 Gutter crutches**

4.4 Walkers (Zimmer frame):

It provides a wider base of support than a walking stick. It is the most stable walking aid, consisting of a freestanding metal framework with three or more points of contact that the user positions in front of them. It is used in patients who require extra support for balance and mobility, such as elderly patients with weakened muscles, arthritis pain, or decreased balance, as well as those who have undergone surgery or injuries, or suffer from conditions like multiple sclerosis, Parkinson's disease, and cerebral palsy.

Types of Walkers:

1. Standard walker: The most basic type of walker is called a standard walker. In order to move, the user must lift the walker. It works best for short distances or when stability is the priority. It is used in elderly patients with weakened muscles, arthritis pain, or decreased balance.

2. Rollator: It is a typical type of walker which has a frame with four wheels, handlebars, and a seat so the user can rest when necessary. Additionally, it has hand brakes as a safety element. It provides mobility support for users with conditions such as Parkinson's Disease, Multiple Sclerosis (MS), Chronic Obstructive Pulmonary Disease (COPD), and Heart Disease, who have good balance but need periodic rest.

3. Knee walkers: This walker has a knee platform, four wheels and a handle. While using rest the knee of injured leg on the platform and push the walker with other leg. A knee walker typically is used for a short time when an ankle or foot problem makes walking difficult.

Fig. 4.7 Standard walker

Fig. 4.8 Rollator

Fig. 4.9 Knee walkers

5. Requirements:

Different types of canes, crutches and walkers

6. Requirements Used:

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7. Precautions to be taken:

- Use walking aids only on firm ground.
- Wear non-heeled and well-fitted shoes.
- Check twice per week the rubber tips of your crutches, especially if you walk outdoors.
- Walking equipment should not be used on slippery or wet floors
- Ensure the practice area is free from obstacles and hazards to prevent falls or injuries during hands-on practice.

8. Demonstration Procedure:

Demonstration of canes, crutches and walkers

The subject teacher must demonstrate the technique of use of walking aids like canes, crutches and walkers to the students. Depending upon the type of walking aid, teachers must refer the suitable instruction manual available with the respective product for stepwise demonstration. YouTube videos can also be used for support. The procedure to use basic walking aids like forearm cane, underarm crutch and standard walker are given below.

8.1 Selection of walking aid:

Selections of proper walking aid consider height, weight, health care plan, risks factors and patient's strength and limitations. Inappropriate selection of a walking aid may increase the risk of falling.

Cane: Patient needing minimal support/ assistance; **Forearm crutches:** patient with strong upper body and good balance; **Underarm crutches:** Patient with weak upper body; **Walker:** Patient with poor balance.

8.2 Procedure to use canes:

1. Positioning/ Fitting:

i. When standing up straight, the top of the cane should touch to the wrist crease. ii. It is considered properly fitted when patient's arm makes a 150° to 160° (from vertical) bend at the elbow while

holding cane. When you hold your cane, elbow should be slightly bent. The cane tip should be placed 4 inches in front of the toe at about a 45° angle (Fig. 4.10). iii. Hold the cane in the hand opposite the side that needs support. For example, if right leg is injured, hold the cane in your left hand.

2. While Walking:

i. Put cane forward and step "injured leg" forward to cane. ii. Lean weight onto crutches and "injured leg". iii. Finish the step with your "healthy leg".

3. While using Stairs:

- **To climb stairs:**

i. Hold the cane in the hand, opposite to "injured leg". ii. Grasp the handrail with free hand. iii. Step up with "healthy leg" first, then step up with the "injured leg". (Remember: "Up with the healthy leg")

- **To come down stairs:**

i. Put cane on the step first. ii. Then, put your "injured leg" on the step. iii. Finally, put "healthy leg", which carries body weight, on the step. (Remember: "Down with the injured leg")

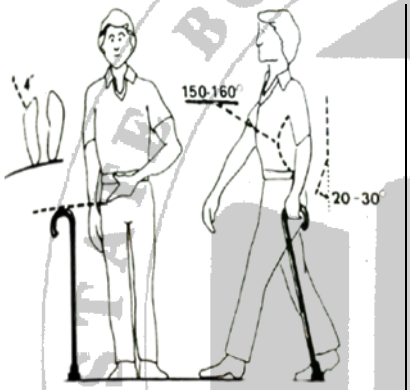


Fig.4.10 Fitting for cane

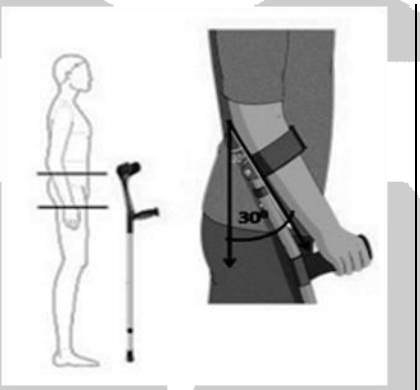


Fig.4.11 Fitting for forearm crutches

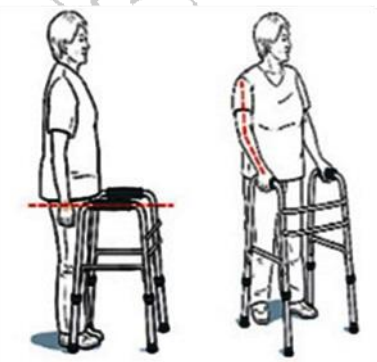


Fig.4.12 Fitting for walker frame

For underarm crutches, start by adjusting the armpit level, then proceed as walking aid.

Fig.4.13Three finger space under the armpit

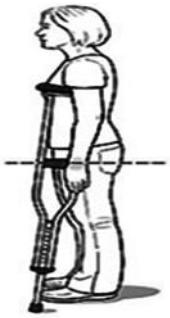


Fig.4.14 Handling at wrist level

Fig.4.15 Elbow bend at 20^0 to 30^0

8.3 Procedure to use crutches:

1. While Positioning/Fitting:

i. When standing up straight, the top of crutches should be about 3 finger space below armpits (Fig. 4.13). ii. The handgrips of the crutches should be even with the top of hip line or at wrist level (Fig. 4.14). iii. When hold the handgrips, elbows should be slightly bent 20^0 to 30^0 (Fig. 4.15).iv. Weight should rest on hands, not on underarm support for avoiding damage to the nerves and blood vessels of armpits

2. While Walking (Fig. 4.16)

i. Lean forward slightly and put crutches about one foot in front of you. ii. Start by initiating the movement about to use the injured foot or leg, but then shift your weight onto the crutches instead. iii. Slowly move the body between the crutches. iv. Finish the step normally with "healthy leg". v. Always look forward, while walking with crutches.

3. While Sitting:

- **Sitting down (Fig. 4.17)**

i. Position yourself in front of a stable chair. ii. Place injured foot forward and hold both crutches with one hand. iii. Use other hand to locate the back of the chair. iv. Gradually lower yourself into the chair. v. Once seated, lean your crutches against a nearby surface.

- **Getting up (Fig. 4.18)**

i. Move slowly to the front edge of the chair. ii. Grasp both crutches with the hand on the side of "injured leg". iii. Push yourself upward to stand on "healthy leg".

4. While using stairs (Fig. 4.19 &4.20)

i. Face the stairs and grip the handrail with one hand while securing both crutches under the opposite armpit. ii. Start ascending with "healthy leg", keeping the "injured leg" lifted behind you. When descending, keep the injured leg lifted in front and descend each step on "healthy leg". iii. Proceed cautiously, one step at a time. iv. If there are no handrails, hold both crutches under arms and hop up or down each step on your "healthy leg".

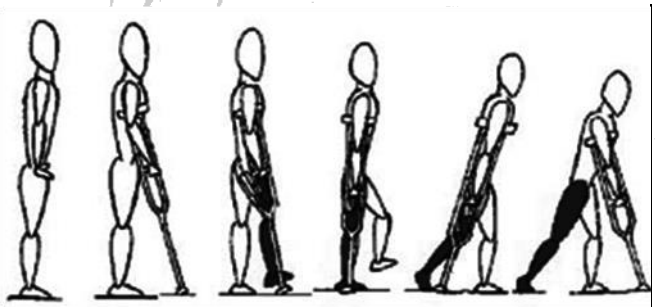


Fig. 4.16

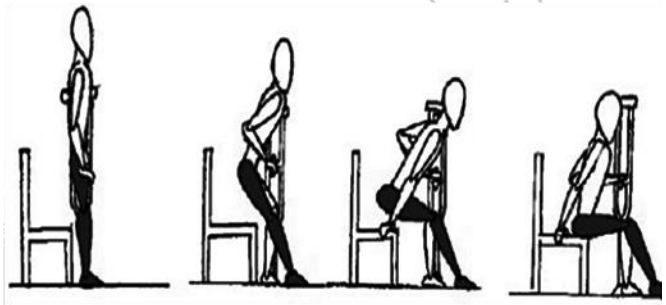


Fig. 4.17

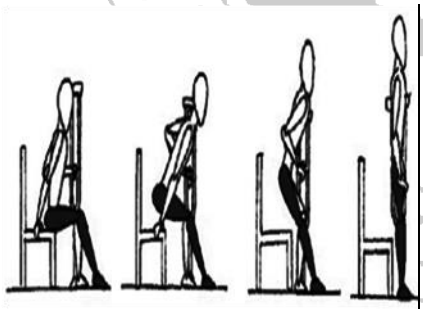


Fig. 4.18

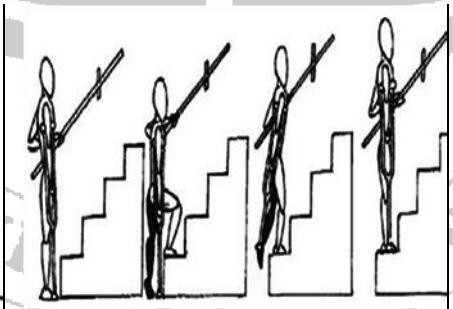


Fig. 4.19

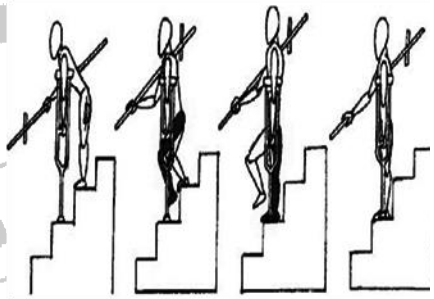


Fig. 4.20

8.4 Procedure to use walker:

1. While Positioning/ Fitting:

i. Ensure that when standing upright, the top of walker aligns with the crease in your wrist (Fig. 4.12). ii. Maintain a slight bend 20^0 to 30^0 in elbows while gripping the handles of the walker. iii. Maintain an erect posture and avoid from leaning forward on the walker. iv. Regularly inspect the rubber tips on the legs of walker to ensure they are in good condition. Replace them if they become worn or uneven.

2. While walking:

i. Placing walker approximately one step ahead, ensuring all four legs are on level ground. ii. Put the "injured leg" forward and use arms to press down on the walker. Avoid stepping too far forward. iii. Apply downward pressure on the walker's handgrips while bringing "healthy leg" forward to align with "injured leg". Always take small, deliberate steps and move with caution.

3. While sitting:

- **To sit:** i. Reposition the body until your legs touch the chair. ii. Use your hands to locate the seat of the chair. iii. Slowly sit down into the chair.
- **To stand up:** i. Push yourself up using the strength of arms and grab the walker's handgrips.

ii. Do not pull on or tilt the walker to help while standing up.

4. While using Stairs

Walker should not use while climbing stairs

9. Activity:

Hands-On experiment:

- Allow students to practice using the walking aids under the guidance of teacher.
- Provide feedback and correction as needed to ensure proper technique and safety.
- Students are suggested to read theoretical background of experiment before performing activity.

Activity: A patient with injured leg has been prescribed to use cane/ forearm crutches/ standard walker. Demonstrate how to use the prescribed walking aid to the patient.

10. Result:

_____walking aid was used for the demonstration &
_____ step was demonstrated.

11. Conclusion:

_____

_____

12. References:

i.Remington-The science and practice of pharmacy.21st Ed. Vol. I/II. Lippincott Williams & Wilkins; 2006:1982-1987.

ii.https://orthoinfo.aaos.org/en/recovery/how-to-use-crutches-canes-and-walkers/

iii.https://www.fvhospital.com/learn-more/walking-aid-information/

iv.Robert Lam. "Choosing the correct walking aid for patients" Can Fam Physician. 2007 Dec; 53(12): 2115–2116.

13. Practical related questions:

a. What is walking aid? And In which condition walking aids are used?
b. Enlist various walking aids.
c. Write the various types of walking aids with their use.
d. Which general precautions should take while using walking aids?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 5
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, Types and use of bandages

2. Practical Significance:

Bandage is used to hold dressing in place over wound. Properly applying the appropriate bandage can materially aid in the patient's recovery. A carelessly or improper applied bandages can cause discomfort to patient; in many instances it may expose the wound to danger of infection, it may even put at risk the life of patient. It is essential therefore, that student familiar with various bandages and is able to apply properly. In this practical, the students will be able to learn about different types of bandages and bandaging technique.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain proper technique to apply bandages.	CO4	BTL2
2	Select suitable type of bandage.	CO4	BTL4
3	Apply bandages using proper technique.	CO4	BTL3
4	Perform and follow ethics in performing practical.	CO4	BTL5
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

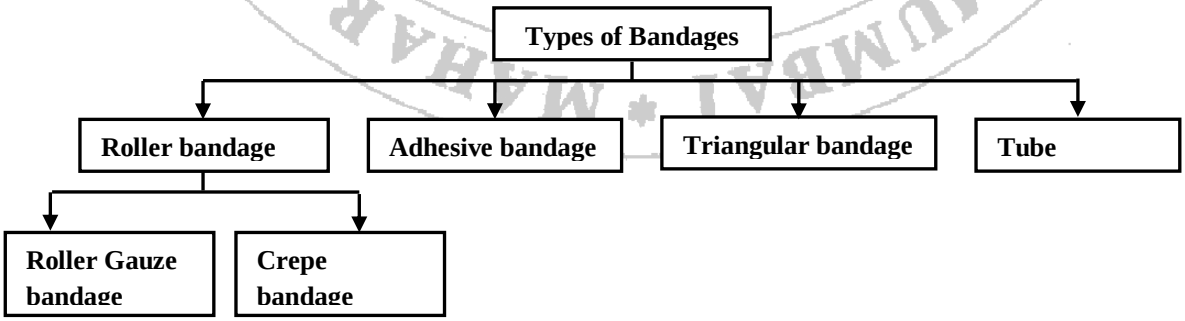
4.1 A bandage is a piece of material used either to hold dressings in place by providing pressure or support.

4.2 Use of bandages

1. Providing support for injured, strained, or dislocated joints.
2. Keeping wounds clean, preventing infection, and promoting recovery.
3. Allowing the injured area to rest.
4. Controlling and halt bleeding.
5. Immobilizing fractures or dislocations to prevent movement.
6. Correcting deformities.
7. Applying consistent pressure to the injured area.

4.3 Types of Bandages

Following are the common type of bandages,



A. Roller bandage:

Roller bandages are the most common type of bandage. They are normally made from a single continuous strip of lightweight and breathable cotton gauze, used primarily for holding dressings against wounds. They can be further divided into two types:

1. Common gauze roller bandage (Cotton or linen bandage): They are used to cover gauze dressings. They come in many different widths and are held in place with tape, clips or pins.

2. Compression/crepe bandage/elastic or tensor bandage: It is a long strip of stretchable cloth that can wrap around a sprain or strain. It provides gentle pressure that helps reduce swelling, making the injury feel better.

B. Adhesive bandage:

Adhesive plaster is also known as sticking plasters or dressings used for minor wounds that are not life-threatening and are not severe enough to call for a full-sized bandage. They shield wounds from additional harm, rubbing, bacteria, and dirt. They retain skin cuts closed and treat wounds.

C. Triangular bandage:

It is multipurpose cloth shaped like a right-angled triangle. They can be used in a number of ways:

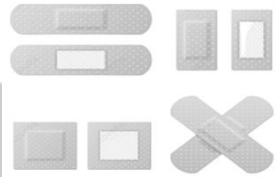
- As a sling (when folded) to support for broken or wounded elbows/arms/wrists.
- As a normal bandage for covering a dressing on a head, foot, knee injuries.
- As a splint for broken bones.
- To apply pressure to a wound in order to stop bleeding.

D. Tube bandage:

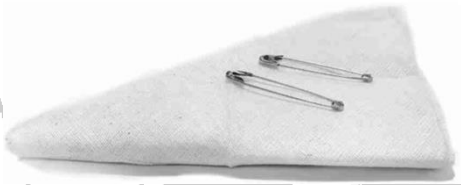
Tubular bandages are made with elastic tubes of thick gauze woven in a continuous circle so as to provide uniform compression. They are used to hold dressing in place, reducing swelling, compression and can aid in immobilizing or supporting to arms, legs, ankles, wrist, knee and elbow joint.

Common guaze roller bandage

Crepe bandage



Adhesive bandgae



Traingular bandage

Tube bandage

5. Requirements:

Different types of bandages, gauze roller bandage, triangular bandage, hand gloves and scissor.

6. Requirements used:

7. Precautions to be taken:

Precautions to be taken while using gauze bandages on wounds

- A bandage should never be applied directly over wound.
- It should be used only to hold in place the dressing which covers the wound.
- Use a sterile roller bandage to avoid infection of wound.
- A bandage should be applied firmly & fastened securely.
- It should not be applied so tightly that it stops circulation or so loosely that it allows dressing to slip.
- If bandages work themselves loose or become unfastened, wounds may bleed they may become infected, and broken bones may become further displaced.

8. Demonstration Procedure:

Demonstration of bandages

The teacher should display various types of bandages to the students and demonstrate the techniques for applying them. (YouTube videos/ charts can also be used for support.)

Each bandaging technique consists of various basic forms of bandaging. The methods of applying the roller bandage and triangular bandage to the limbs and head are given below.

8.1 Roller bandage:

1. Anchoring the bandage:

It consists of several circular turns overlying each other. Initial turns should be applied securely and, when possible, around the part of the limb with the smallest circumference. The wrist and the part immediately above the ankle are preferred for anchoring appropriate bandages. (Wrist anchors and ankle anchors are applied similarly. To establish a secure wrist anchor, follow these steps (Fig.5.1):

a. Place the bandage end diagonally over the wrist's top, passing it underneath and returning it to the initial position.
b. Fold the exposed triangle of the end over the second turn.
c. Complete the anchor by covering it with a third turn. The bandage is now securely anchored.

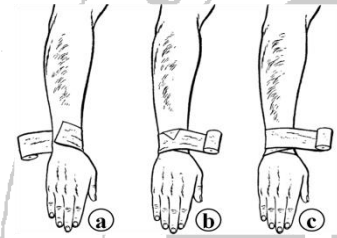


Fig.5.1. Anchoring the bandage

Fig.5.2. Circular turn

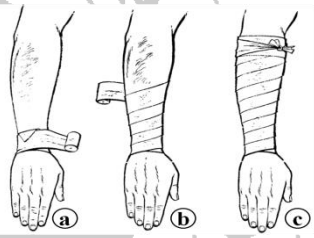


Fig.5.3. Spiral turn

2. Circular turn (Fig.5.2):

It is used to cover cylindrical parts and to anchor bandages. It is used to hold dressings on body regions such as arms, legs, chest or abdomen or to initiate other bandaging techniques. Roller bandage or triangular bandage (folded down to form strip of bandage-cravat) is used for circular bandaging. Almost all bandaging techniques start and end with a few circular bandaging turns.

a. Apply the bandage end to the body part that needs to be bandaged.
b. Layers of bandage are applied over the top of each other, holding the loose end until it is secured by the first circle of the bandage.
c. Two or three turns may be needed to cover an area adequately.
d. Hold the bandage in place with tied, pinned or fastening with adhesive tape.

3. Spiral turns (Fig.5.3):

Spiral turns are preferably used to cover uniform cylindrical parts of the body such as upper arm and upper leg. It covers larger area than that covered by circular bandage.

a. Anchor at wrist.
b. Apply succeeding spiral turns up the forearm approximately 30^{o} angle, with each turn overlapping 2/3rd of bandage's width.
c. Terminate with two circular turns and secure just below elbow.
d. Hold the bandage in place with tied, pinned or fastening with adhesive tape.

4. Spiral reverse turns:

Spiral reverse turns are utilized for bandaging non-uniform cylindrical body parts like the lower leg or lower forearm. This technique involves wrapping the bandage in a spiral manner and folding it back on itself by 180° after each turn. The resulting V-shaped fold enables the bandage to fit tightly to the tapered shape of the body part. This method is necessary when using non-

elasticated bandages. However, with the introduction of elastic fixing bandages, which can be applied to tapered body parts using the spiral technique, means that the reverse spiral technique is far less commonly used in modern practice.

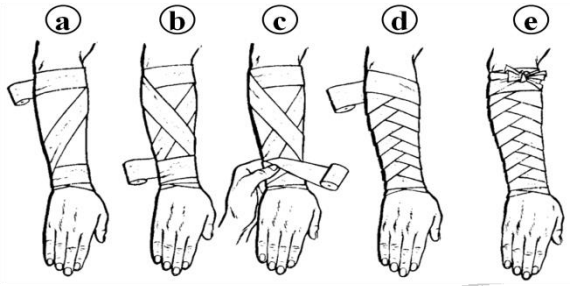


Fig.5.4. Spiral Reverse of Forearm

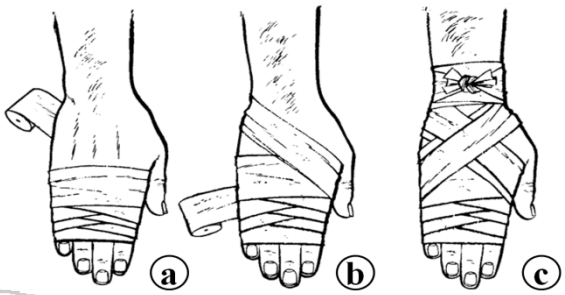


Fig.5.5. Figure-of-Eight of Hand

Eg. Spiral Reverse of Forearm (Fig.5.4)

The spiral reverse of forearm is used to hold dressings or secure splints on the forearm.

a. Begin by anchoring at the wrist with primary turns, and then bring the bandage diagonally up the forearm to just below the elbow and make a circular turn.
b. Next, bring the bandage diagonally downward to the wrist and encircle it. These turns are to secure the dressing while applying the spiral reverse technique. Then, start wrapping the bandage diagonally upward.
c. Instead of continuing upward as in a figure-of-eight pattern, fold the bandage back and hold the fold with your thumb.
d. Proceed around the arm and repeat the procedure until the entire arm is covered. Each turn should overlap approximately two-thirds of the preceding turn, and reverse must be in a straight line.
e. Finish with circular turns below the elbow and secure the bandage in place tied, pinned or fastening with adhesive tape.

5. Figure-of-eight method :

Figure-of-eight method is used to hold dressing, limit joint movement of the hand, elbow, knee, ankle, or foot. Typically, it is employed to bind a flexing joint or body part both belowand above the joint. The figure-of-eight bandage can be applied using a roller bandage.

Eg. Figure-of-Eight of Hand (Fig.5.5): This bandage is used to hold dressings on back or palm of hand. Following is the stepwise procedure for figure-of-eight method of hand,

a. Begin by securing the bandage on the hand with circular turns near the ends of the fingers. Then, extend it diagonally across the back of the hand towards the thumb. Pass it under the thumb and across the palm to the back of the hand.
b. Continue diagonally across the back of the hand to the bottom of the primary turn and across the palm.
c. Repeat this process with several similar turns, ensuring that each turn overlaps about two-thirds of the preceding one on the back of the hand. After sufficient turns, terminate with circular turns around wrist and secure and secure the bandage in place tied, pinned or fastening with adhesive tape.

8.2 Triangular bandage:

They may be used in open or folded. When folded, it is called as cravat (Fig.5.6). They can be used for covering dressing and provide support to broken body parts. Following are the techniques used while applying triangular bandage.

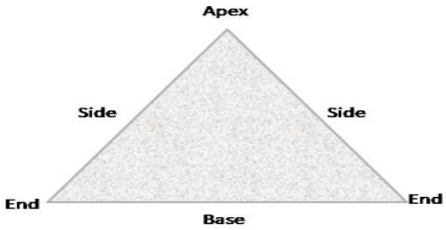
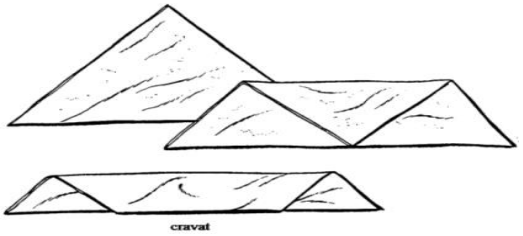


Fig.5.6. Open traingular



Cravat

1. Triangle of Forehead or Scalp (Fig.5.7):

The triangle of forehead or scalp (fronto-occipital) is used to hold dressings on the forehead or scalp.

a. Place middle of base of triangle so that edge is just above the eyebrows and bring apex backward, allowing it to drop over back of head. Bring ends of triangle backward above ears.
b. Cross ends over apex at back of head, carry ends around forehead, and tie them in a square knot.
c. Turn up apex of bandage toward top of head. Pin with safety pin or tuck in behind crossed part of bandage.

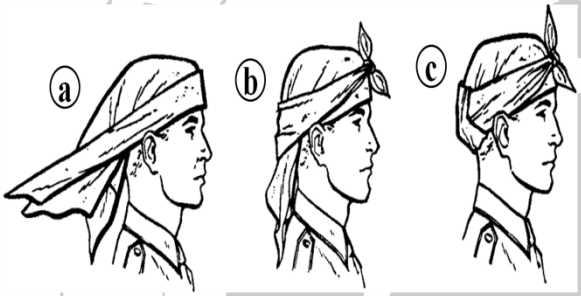


Fig.5.7. Triangle of Forehead

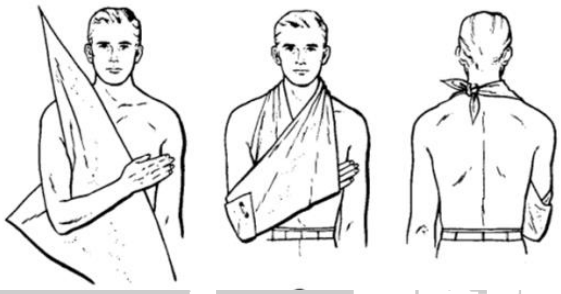


Fig.5.8. Triangular arm sling

2. Triangular Arm Sling (Fig.5.8):

The triangular arm sling (brachio-cervical triangle) is used for the support of fractures or injuries of hand, wrist, and forearm.

In this method of applying the sling, the forearm is supported from both shoulders by the sling.

a. Start by bending the arm at the elbow so that the little finger is positioned about a hand's breadth above the level of the elbow (about a 10^0 angle).
b. Place one end of the triangle over the shoulder on the injured side, allowing the bandage to hang down over the chest with the base facing towards the hand and the apex towards the elbow.
c. Slide the bandage between the body and the arm.
d. Bring the lower end up over the shoulder on the uninjured side.
e. Tie the two ends with a square knot at the neck. Ensure that the knot is placed on either side of the neck, rather than in the middle where it could cause discomfort when the patient is lying on their back.
f. Pull the apex of the bandage towards the elbow until it is snug, then bring it around to the front and fasten it with a safety pin or adhesive tape.

3. Triangle of foot & hand (Fig.5.9):

The triangle of the foot/hand is used to hold dressings of considerable size on the foot/hand.

a. Position the foot at a right angle to the base of the bandage, ensuring that the heel is well forward of the base.
b. Bring the apex of the triangle over the toes and down to the ankle, and then tuck any excess

fabric into small pleats on each side of the foot.

c. Cross each half of the bandage towards the opposite side of the ankle.
d. Wrap the ends of the triangle around the ankle.
e. Tie the ends together securely with a square knot.

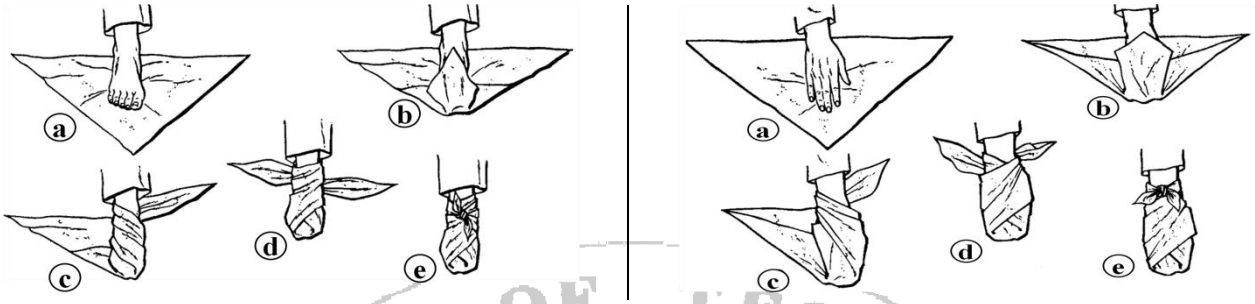


Fig.5.9. Triangle of foot & hand

4. Cravat of Head or Ear (Fig. 5.10):

The purpose of this bandage is to apply pressure to control hemorrhage from wounds of scalp, or to hold dressings on wounds of ear or lower scalp.

a. Position the midpoint of the cravat over the dressing.
b. Wrap each end fully around the head.
c. Secure with a square knot.

5. Cravat of elbow and knee:

- The cravat of the elbow is used to hold dressings around the elbow. (Fig.5.11)
- Start by bending the arm at the elbow and position the center of the cravat at the point of the elbow (olecranon).
- Bring the ends of the cravat up and across each other in overlapping spiral turns. Allow one end to continue up the arm while the other end goes down the forearm.
- Direct the ends to the front of the elbow (antecubital fossa) and tie them securely.
- The cravat of the knee is used to hold dressings around the knee. (Fig.12)
- Position the center of the cravat over the kneecap and allow the ends to hang down on each side of the knee.
- Cross the ends underneath the knee and continue with several overlapping turns, descending down the calf, and then several overlapping turns ascending up the thigh.
- Gather the ends together and tie them securely under the knee.

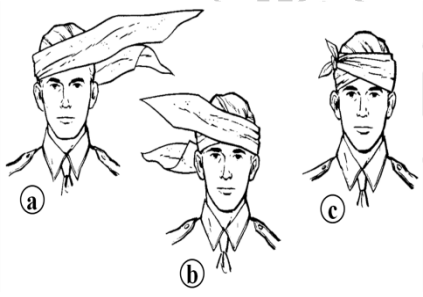


Fig.5.10. Cravat of head

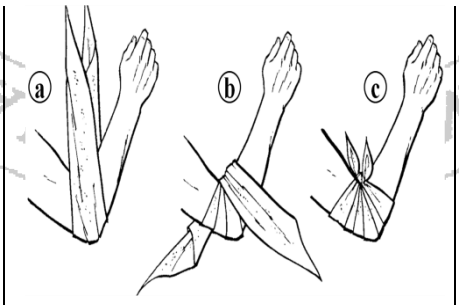


Fig.5.11. Cravat of elbow

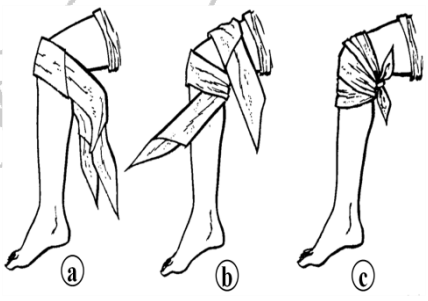


Fig.5.12. Cravat of knee

8.3 Procedure to apply bandage:

After applying the cotton gauze or pad to the wound part, the bandage can be used to keep the dressing at place using following methods:

1. **Select the appropriate bandage material for the injury:**

Choosing the right bandage for the injury depends on various factors such as the type and location of the injury, the level of support needed, and any specific requirements for wound care. It's essential to consider factors like the size and shape of the injured area, the degree of

flexibility required, and any specific features needed for proper wound management. For example, elastic bandages are often used for providing compression and support for sprains and strains, while non-adherent dressings are preferred for covering wounds to prevent sticking and promote healing.

2. **Select the appropriate size of bandage:**
   The width of the bandage to use is determined by the size of the part to be covered. The sizes most frequently used are 2 inch wide and 215 inch long for hand, finger, toes and head bandages; 3 inch wide and 360 inch long for extremities (Upper Extremities (Arms, Elbows, Wrists) & lower extremities (Legs, Knees, Ankles); 4 inch wide and 360 inch long for thigh, groin and trunk.
3. **Prepare the patient for bandaging**:
   - Position the intended body part for bandaging appropriately.
   - Ensure that the body part that is to be bandaged is clean and dry.
4. **Apply the anchor wrap.**
   Follow the procedure as given above
5. **Apply the bandage wrap to the injury:**
   Following bandaging technique use according to injured body part,
   - Circular wrap for covering small dressing or to end other bandage patterns.
   - Spiral wrapping method for large, uniform cylindrical areas.
   - Spiral reverse wrap to cover small to large conical areas (non-uniform cylindrical area) example, from ankle to knee, wrist to elbow.
   - Figure eight wrap to support or limit joint movement like ankle, or foot, elbow.
   - Recurrent wrap for anchoring a dressing on fingers.
6. **Check the circulation after application of the bandage:**
   - Check the pulse distal to the injury.
   - Examine the skin beneath the bandage for any signs of discoloration.
   - Inquire with the patient regarding any sensations of numbness or coldness in the bandaged area.
   - If required, remove and reapply the bandage.

9. Activity (Role Play):

A patient with _____ (limb {Upper Extremities (upper arms, forearm, Elbows, Wrists)/ lower extremities (upper legs, Knees, lower leg, Ankles, calf thigh)} / head) injury has visited your hospital. Identify the type of bandage to be applied and wrap/cover the injury using appropriate technique.

Injured Part:_____

Type of injury:_____

1. Select the appropriate type of bandage to be applied:_____
2. Select the appropriate width of bandage:_____
3. Identify and apply the appropriate bandage technique applied to the injured part:_____
4. Take the photograph of the bandage applied to the injured body part, print it and paste the picture in the designated space below:

10. Result:

_____

_____

11. Conclusion:

_____

_____

12. References:

i. Remington-The science and practice of pharmacy.21st Ed. Vol. I/II. Lippincott Williams & Wilkins; 2006:1970-1974.
ii. Taylor MD. Department of army field manual. Washington 25,DC; June 1957
iii. https://aerohealthcare.com/news/articles/different-types-of-bandages-and-their-uses/

13. Practical related questions :

a. Define bandage. Enlist the types of bandages.
b. Write the uses of bandage.
c. Name the techniques to be used for roller bandage.
d. Which bandaging techniques are used for non-uniform cylindrical body part & limiting the joint movement?
e. What is the appropriate bandage size for thigh and forearm?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept(Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 6
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, Types and Uses of needles and syringes.

2. Practical Significance:

Syringes are small hollow tubes used for injecting or withdrawing liquids. It may be attached to a needle to withdraw fluid from the body or inject medication into the body. It eases the administration of drug by parenteral route and is able to achieve rapid delivery. In order to ensure timely distribution of parenteral devices to the various departments and authorized persons in the hospital, pharmacist must have knowledge about the availability and use of different types of needles and syringes. In this experiment, the students will learn about different types of needles and syringes.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Identify different types of needles and syringes.	CO4	BTL1
2	Describe different parts of needles and syringes.	CO4	BTL2
3	Demonstrate the angle of insertion of needles and syringes using mannequins.	CO4	BTL3
4	Practice and follow the ethics in performing practicals.	CO4	BTL6
5	Collaborate and communicate with fellow students.	CO4	BTL6

4. Relevant Theoretical Background:

Needles: The needle is a metal tube that is hollow and has a pointy tip. Needles are also called cannulas. There are different types of needles but hypodermic needles are hollow shaped used to administer medication (drugs) parenterally. Hypodermic needles have been made of stainless steel, hyperchrome steel, carbon steel, chromium, nickeloid, platinum, platinum-iridium, silver, or gold. Parts of Hypodermic needles are hub, shaft and beveled tip.

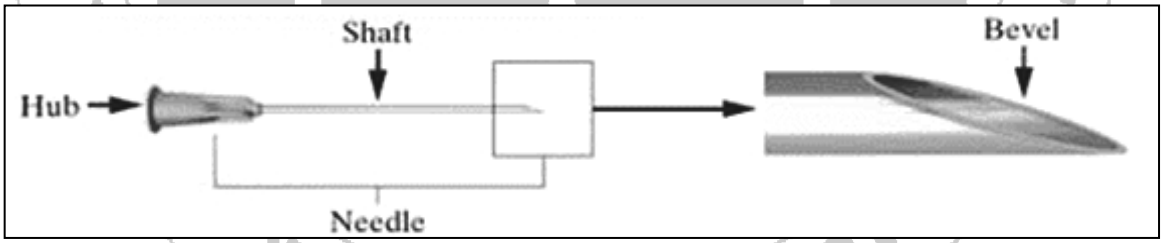


Fig. 6.1 Needle with its components

Hub: Hub is located at one end of the needle, and it is the structure that attaches on top of the different sizes of syringes.

Shaft: The shaft is the long and slender stem of the needle that is beveled at one end to form a point. It is made of stainless steel.

Lumen: The bore of the needle shaft, which is hollow and cylindrical, is known as the lumen.

Needle Bevel: It is the angular, pointed tip of the needles end. It facilitates non-traumatic entry into tissues. For skin injections, there are four different types of bevel.

1. **Regular or Normal bevel:** The most common bevel, used for a vast majority of applications. Typically used for intramuscular and subcutaneous injections.
2. **Short bevel:** The needlepoint geometry is designed to minimize unwanted injection depth, such as penetration through a vessel wall, and to obtain rapid withdrawal or dispersion of a fluid. Typically used for specialty applications such as arterial blood gas sampling and nerve blocks.

3. **Intradermal or Cutaneous bevel:** The geometry of the tip is designed to allow for shallow and low-angle insertion of the needle just below the epidermis. This unique needle bevel is used primarily for skin testing (e.g., allergy tests).

4. **5-bevel:** The two additional bevels create a flatter, thinner surface that has been less painful.

5. **Blunt tips:** Blunt tips or dispensing needles prepare and administer medications to patients usually through an IV device instead of a direct injection. These tips are safer for caregiver use, since they do not have a sharp tip.

6. **Safety tips:** Safety tips protect the user from accidental stick injuries. They are available in retracting, shielding and sliding sleeves.

a) Regular **b) Short** **c) Intradermal** **d) 5-bevel** **e) Blunt** **f) Safety tips**

Fig. 6.2 Types of bevels

Selection of Needles: There are many different syringes and needles, suiting many different procedures. It is important to choose the needles and syringes carefully according to the type of injection to be administered. For example, the length and gauge of needle and type of syringe must be suitable for the injection site, viscosity, and volume of medication. The size, age and condition of the patient are other key factors in the selection process.

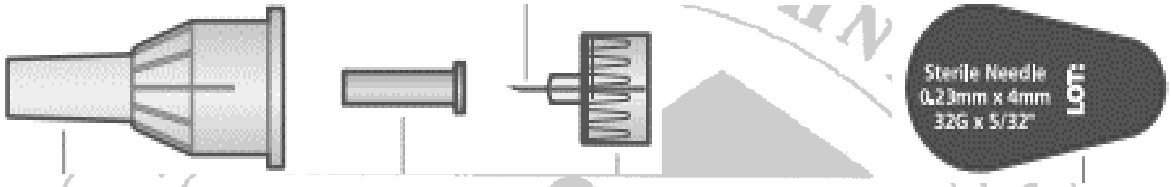
Table 6.1: Select right length and gauze of needle based on Age, Site and depth of Administration.

Intramuscular (IM)*	**Location of Injection**	**Needle Length (inches /mm)**	**Needle Gauge**	**Needle Angle**
Pediatric				
Infants < 12 months	Vastus lateralis muscle (≤0.5ml vol.)	5/8"-1" 22mm – 25mm	25-27 G	90˚
12 months to 18 years (toddlers and older children)	Deltoid muscle Ventrogluteal muscle Dorsogluteal muscles (not recommended for <3 years) Vastus lateralis muscle	5/8"-1 1/4" 22mm – 30mm	23-25 G	90˚
Adult				
> 18 years	Deltoid muscle, Ventrogluteal muscle (may be best site for cachectic adults) Dorsogluteal muscles (only if recommended by drug manufacturer, avoid in obese adults) Vastus lateralis muscle	1"-1 1/2" (up to 3" for large adults). 5/8" for men and women <130 lbs. 25mm – 40mm (up to 76mm for large adults)	19 – 25 G	90˚
Subcutaneous (SubQ)				
Pediatric to Adult	Anterolateral thigh Upper outer Tricep area; Upper buttocks	Insulin delivery: 3/20"-1/2"	Insulin delivery: 29 – 32 G	45°-90°

	Abdomen (avoid 2" radius around umbilicus)	4mm – 13mm Other injections: 13mm – 16mm	Other injections: 26 – 31 G	
Intradermal (ID)				
Pediatric to Adult	Anterior aspect of forearm Upper chest Upper back Back of upper arm	3/8"-3/4" 10mm – 19mm	26-28 G	10˚-15°

Types of pen needles:

1. **Conventional pen needles**(without safety engineering)used by self-injecting patients Pen needles are sterile and can only be used once.



a) Outer cap b) Inner cap c) Cannula and Hub e) Peel Cover

Fig.6.3 Parts of conventional pen needles

2. Safety-engineered pen needles: Used by health care providers (this example shows protective shields at both ends of the pen needle after use).

Fig. 6.4 Safety- engineered pen needles

Syringes:

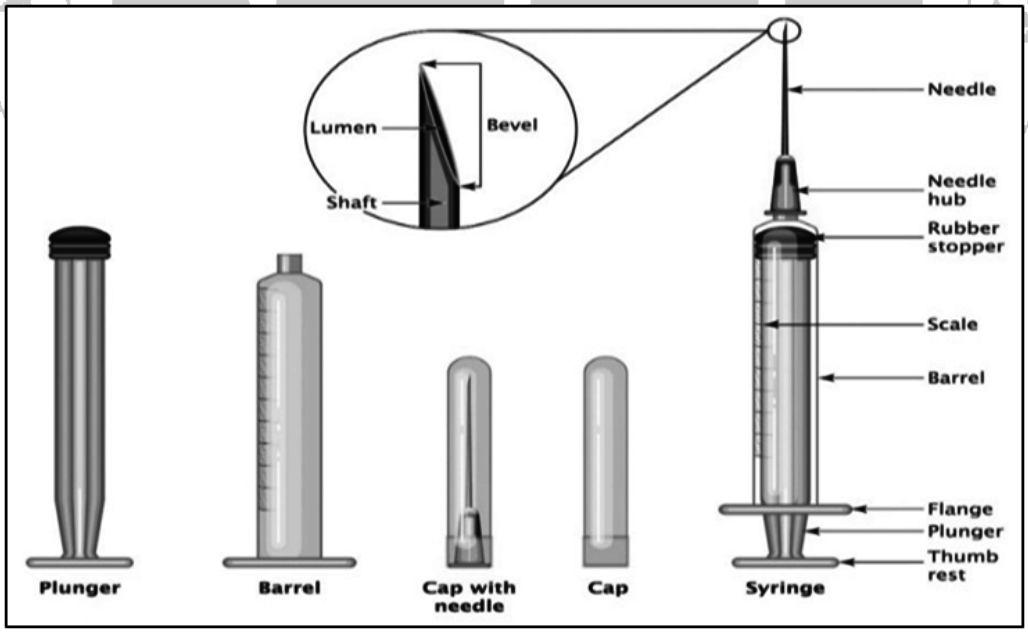


Fig. 6.5 Components of Syringe

Hypodermic Syringes: A syringe is a simple pump consisting of a plunger that fits tightly in a tube to assist pushing liquids or solids into an object either through a needle, tubing, or a nozzle. Syringes are instruments intended for the injection of water or other liquids with medication into the body or its cavities. In former days, syringes were cleaned frequently and re-used. However, after the

development of the plastic disposable syringe, their use became more widespread because of their convenience and the decreased risk of spreading blood-borne infections from the use of infected syringes. Syringes come in a variety of sizes, including 1, 2, 5, 10, and 50 ml. Special syringes include insulin syringes and tuberculin syringes. Insulin syringes has markings in units-40 in 1 ml (red) or 80 in 1 ml (green). They are suitable for administration of insulin. Tuberculin syringe has capacity of 1 ml with 0.01 ml markings. It is useful for administration of very small volumes of parenteral preparations.

a) **Rubber Stopper:** Prevents leakage of medication around the plunger, and acts as an indicator for measuring the syringe's contents (see diagram).
b) **Scale Markings:** Scale markings are typically in milliliter (ml) units. On insulin syringes, however, graduations are displayed in "units" based on the insulin concentration prescribed. (Example: U-100means 100 units of insulin suspended within 1 milliliter of fluid. A 3/10 mL insulin syringe will accommodate up to 30 units when using U-100 insulin.).
c) **Barrel:** Reservoir for holding liquid, clearly graduated to allow accurate and visual measurement of the syringe's contents.
d) **Flanges:** The "wings" that extend out from the side of the syringe barrel that provides an area or surface for the index finger and middle finger to grasp during aspiration or administration.
e) **Plunger Rod:** A piston-like device inside the barrel.
f) **Thumb Press:** Area where clinician presses to push plunger rod down into barrel to expel contents.
g) **Tip:** There are five types of tip.

i. **Luer Slip Tip:** Generally used for injections requiring secure connection of the syringe to another device. The tip is threaded for a "locking" fit, and is compatible with a variety of needles, catheters and other devices.

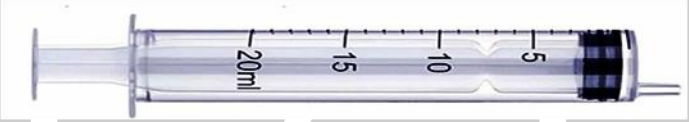


Fig. 6.6 Luer Slip tip

ii. **Luer Lock Tip:** A friction-fit connection that requires the clinician to insert the tip of the syringe into the needle hub or other luer connection in a push-and-twist manner. This will ensure a connection that is less likely to detach. Simply sliding the attaching device onto the syringe tip may not ensure a secure fitting.

Fig. 6.7 Luer Lock tip

iii. **Eccentric Luer Slip Tip:** Allows for work requiring closer proximity to the skin. Generally used for venipunctures and aspiration of fluids.

Fig. 6.8 Eccentric Luer Slip tip

iv. **Catheter Tip:** Used for flushing (cleaning) catheters, gastrostomy tubes and other devices. Insert catheter tip securely into catheter or gastrostomy tube. If leakage occurs, refer to your facility's guidelines

Fig. 6.9 Catheter tip

v. **Permanently Attached needle:** Most commonly found in insulin and 'tuberculin' syringes. Permanently attached needles, also known as integral needles, reduce the amount of medication waste and allow accurate mixing of different medications into one syringe.

Fig. 6.10 PermanentlyAttached Needle

Needle Insertion and Removal:

Injections are the art of giving medications through the use of a needle and syringe. There are several different routes for giving an injection and are often subject to the desired therapeutic effect and the patient's safety and comfort Injections are usually used when a rapid action is required, if the drug is altered by intestinal sections or cannot be absorbed by the alimentary tract, when the patient is unable to take the medication orally or the drug is not available in an oral form.

The syringe should be held like a dart when giving an injection to avoid unintentional medication release as the needle is inserted. Depending on the type of injection, the needle should be placed at the correct angle. For more information on the angles of insertion for each type of injection, see Table 6.1 and Figure 6.11. Holding the syringe steadily after the needle has been inserted is crucial to avoid damage to the tissue. The needle should be drawn out at the same angle that it was inserted.

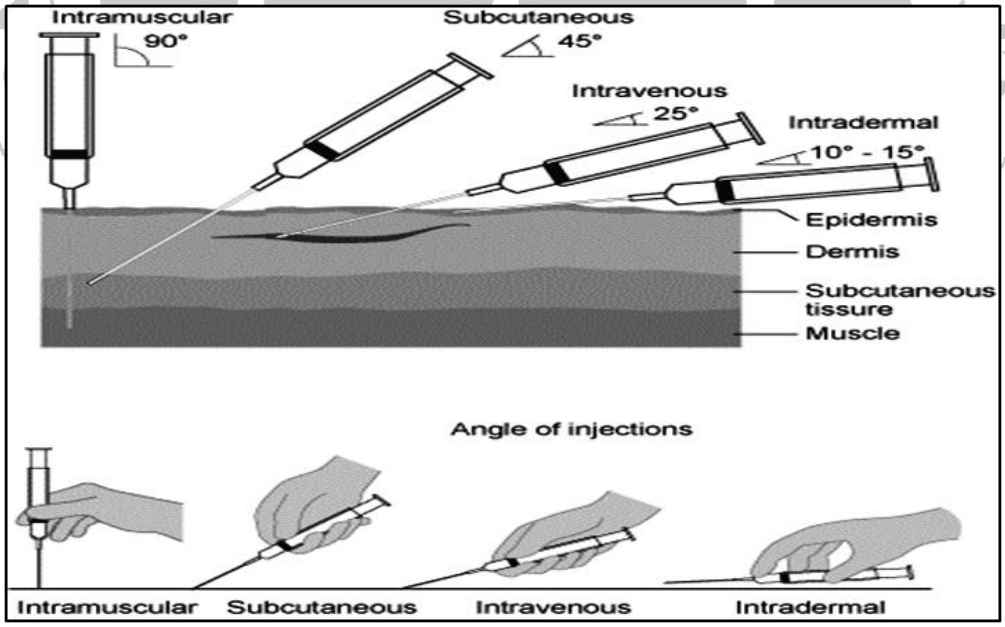


Fig. 6.11 Angle of needle insertion

General Procedure for assembling needle and syringe:

a. Remove the needle from the packaging. Affix it firmly to the syringe. If the syringe has a Luer lock, twist the needle firmly or use pliers to secure the needle.

b. Hold the syringe with both hands. Place a thumb between the base of the needle and the cap. Use at least one finger below your thumb to brace the needle.

c. Press down and forward against the needle cap with your thumb. Because no part of your body is in front of the needle, you will not stab yourself when the cap comes loose.

d. If the cap is particularly difficult to remove, it may help to use your second hand to twist the needle cap. This can make it easier to remove with your thumb.

e. Possibly do not recap needles.

f.If you muster cap a needle, use the "one hand scoop" technique.

g. Place the needle cap on a flat surface. Hold the syringe with one hand. Keep the other hand clear of the work area.

h. Carefully lower the needle tip toward and into the needle cap.

i. When the needle is mostly in the cap, scoop upward to lift the needle cap onto the needle.

j. Once the needle cap is on the needle, use your second hand to secure the cap to the needle.

Precautions to be taken during use and disposal of sharps safely:

The proper care should be taken while using and discarding sharps. The following instructions should be discarded as per good disposal practices for sharps:

a. Dispose sharps properly.
b. Dispose it in an authorized sharps disposal container. Place the disposal container where sharps are used so that they may be disposed of right away after use. The facility is responsible for ensuring that the container is disposed of properly.
c. Never fill sharps containers to the brim.
d. Never use recapped, cut, or bended needles.
e. Do the documentation or reporting of any events or mishaps involving body fluids, needle stick injuries, or both in accordance with local regulations.

5. Resources Required:

Different types of Hypodermic needles, Syringes, Sterile Hand gloves and Mannequin.

6. Resources used:

_____

_____

7. Precautions to be taken:

- Do not attempt to recap the needle – this is how most accidental needle-stick injuries happen. The cap is usually bright orange and can be disposed of separately. Do not break, bend or otherwise try to render the syringe useless.
- Keep the sharp end of the needle facing away from you.
- Do not hold the sharps container or ask another person to hold it as you are disposing of the syringe.

8. Demonstration and Activities:

The subject teacher must show different types of needles and syringes to the students. The students should be made aware about various sites of injection using mannequin (use suitable literaturere source). Thereafter, the teacher must demonstrate the angle of insertion of needles depending upon the injection site (Refer Table no. 6.1) using mannequin. You Tube videos can also be used for support.

Activity I

Subject teacher will give you the age of patient, name of injection (generic/brand), dose, and site of injection. You have to dispense the appropriate needle and syringe on the basis of the received information.

Age of Patient: _____years/months

Name of injection: _____

Dose: _____

Site of injection: _____

Needle Gauge	Needle Length (inches/mm)	Syringe type	Syringe Volume

Activity II:

Once you have selected the appropriate needle and syringe in activity I, inject a dummy preparation in the mannequin at the given site with proper angle of needle insertion.

Angle of insertion of needle into the mannequin: _____

9. Result:

_____

_____

10. Conclusion:

_____

_____

_____

11. References:

i. Remington: The science and Practice of Pharmacy, 21st Indian Edition, Volume II, Lippincott Williams and Wilkins Pg. no. 1992-1994
ii. https://www.vitalitymedical.com/syringes-needles.html
iii. https://www.bd.com/documents/international/guides/quickguides/Syringes%20and%20needles/BD-17179-Principles-of-injection-technique_QRG_EN.pdf
iv. https://www.bd.com/content/dam/bd-assets/na/medication-delivery-solutions/documents/in-service-material/BD-2125_Principles_of_Injection_Technique.pdf
v. https://ehs.usc.edu/research/lab/needle-syringe-selection-usage/
vi. https://en.wikipedia.org/wiki/Route_of_administration#

12. Practical related questions :

a. What is needle and syringe?
b. Enlist the various types of syringes.
c. Give the various components of syringe.
d. What are the different types of needle?
e. Give the various sites of drug administration with angle of needle insertion.

(Space for Answers)

13. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 7
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, Types and use of urinary catheters, urine bags, and urine pots.

2. Practical Significance:

Urinary catheters, urine bags, and urine pots ease the life of bedridden patient, facing difficulty for micturition, unconscious patients or patient suffer from surgical procedures. But to enhance the comfortness of patient's proper administration of urinary catheters is very necessary. Also dispensing of proper size and shape, urinary bag and pots are important. Cleanliness and hygiene of Urinary catheters, urinary bag and urine pot are required to avoid urinary tract infections. In this experiment, students will learn the technique of handling the catheter, urine bag and urine pot.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Select the appropriate type of urinary catheter.	CO4	BTL2
2	Describe urinary catheters and its types, urine bag and urine pots.	CO4	BTL2
3	Demonstrate other healthcare professionals about appropriate use of catheters, urine bag and urine pots.	CO4	BTL3
4	Practice and follow ethics in performing practical.	CO4	BTL6
5	Collaborate and communicate with fellow colleagues	CO4	BTL6

4. Relevant Theoretical Background:

4.1 Catheter:

A catheter is a thin tube made from medical grade materials serving a broad range of functions. Catheters are medical devices that can be inserted in the body to treat diseases or perform a surgical procedure. Catheters are manufactured for specific applications, such as cardiovascular, urological, gastrointestinal, neurovascular and ophthalmic procedures. The process of inserting a catheter is called catheterization.

Catheters can be inserted into a body cavity, duct, or vessel, brain, skin or adipose tissue. Functionally, they allow drainage, administration of fluids or gases, access by surgical instruments, and also perform a wide variety of other tasks depending on the type of catheter.

4.1.1. Urinary catheter:

A urinary catheter is a flexible tube for draining urine from the bladder. It may be necessary for a person to use a urinary catheter if they have difficulty passing urine naturally. A range of polymers are used for the construction of catheters, including silicone rubber, nylon, polyurethane, polyethylene terephthalate (PET), latex, and thermoplastic elastomers. Some people may find living with a catheter challenging and uncomfortable at first. However, as people become more accustomed to the catheter, they generally find that it has less impact on their daily lives.

The main disadvantage of using a catheter is that it can allow certain bacteria to enter the body and cause infection. According to the Centers for Disease Control and Prevention (CDC), urinary catheters are responsible for around 75 % of UTIs that people acquire in the hospital. The risk of infection is highest while using an indwelling catheter. Doctors refer to a UTI that results from catheter use as a catheter-associated UTI (CAUTI). Symptoms of a CAUTI can include: a. pain in the lower abdomen or groin area; b. a high temperature; c. a burning sensation during urination; d. more frequent urination

4.1.2 Uses of catheter: Urinary catheters are used in the following conditions, these are as follows:

- Blockage in the urethra.
- Injury to the urethra or urinary bladder.
- An enlarged prostate in males
- Birth defects affecting the urinary tract
- Kidney, ureter, or bladder stones
- Bladder weakness or nerve damage
- Tumors within the urinary tract or reproductive organs.
- To accurately measure urine output in critically ill people.
- To drain the bladder before, during, or after a person has surgery.
- During childbirth, to drain the women's bladder after an epidural anesthetic.
- To deliver medication directly into a person's bladder.
- For treating a person with urinary incontinence if other treatments have not been successful

4.1.3 Types of Catheter: There are three types of urinary catheter:

A. Indwelling catheters:

An indwelling catheter is like an intermittent catheter but remains in place for a period of days or weeks. One end of the indwelling catheter has a deflated balloon attached. A healthcare provider will insert this end into the bladder and then inflate the balloon with sterile water to hold the catheter in place. Indwelling catheters typically drain into a collection bag. A person can strap the bag to the inner thigh or attach it to a stand in a position lower than the bladder. It is important to empty a drainage bag before it becomes full.

There are two main types of indwelling catheter, which have different insertion techniques:

i. **Urethral catheter**. Also called a Foley catheter, the healthcare provider inserts this type through a person's urethra.

ii. **Suprapubic catheter**. A doctor will surgically insert the suprapubic catheter through a small hole a few inches below the belly button. This operation will take place in the hospital while the person is under a local or a light general anesthetic. They are also less likely to cause an infection than a urethral catheter.

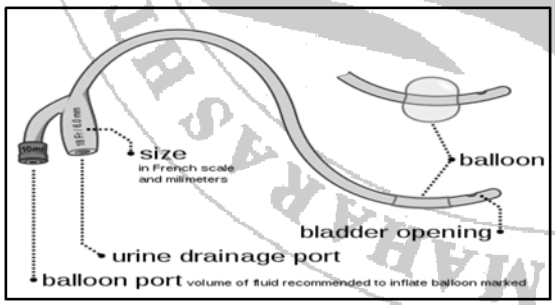


Fig. 7.1 Indwelling Catheter

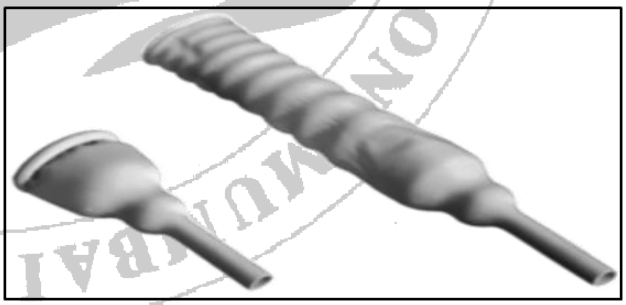


Fig. 7.2 Condom or External Catheter

However, both types of indwelling catheter can cause side effects such as bladder spasms, blockages in the catheter tube, pain, and discomfort.

B. **Condom/ External catheter:**

This is a condom-like device that fits over the penis. A tube attached to the catheter collects urine into a drainage bag. Doctors usually recommend external catheters for males with incontinence who do not experience urinary blockages or retention and can use the catheter themselves. External/Condom catheters do not enter the urethra; they tend to cause very little discomfort. Compared with indwelling catheters, they are also less likely to cause a UTI. External catheters are

for short-term use only. Longer-term use increases the risk of UTIs, damage to the penis due to friction with the condom-like device and a blockage in the urethra.

C. Intermittent catheter:

The intermittent catheter, or a standard catheter, is a thin, flexible tube that a person temporarily inserts into their bladder through the urethra. The external end of the tube may be left open, allowing the urine to drain into a receptacle. Another option is to attach the tube to an external drainage bag, which collects the urine. Once a person has emptied their bladder, they need to remove the catheter. It is necessary to remove the old catheter and insert a new one several times per day to empty the bladder. Possible side effects of using intermittent catheters include: Urinary tract infections (UTIs), Hematuria**,** Bladder stones**,** and Urethral strictures (this is a narrowing of the urethra that can result from repeated trauma) People who insert their own intermittent catheters repeatedly over many months have a higher risk of urethral strictures.

Fig. 7.3 Intermittent catheter

4.1.4 Precautions to be taken while using urinary catheter to reduce the risk of CAUTI:

- Use an aseptic technique and wear sterile hand gloves during catheterization.
- Wash hands thoroughly with soap and warm water before and after touching catheter equipment.
- Keep the skin around the catheter entrance clean by washing it with mild soap and water twice per day.
- Ensure that urine collection bags are kept below the level of the bladder, as this will help prevent blockages.
- Not lying on the catheter, as this can prevent the flow of urine through the tube.
- Ensuring that there are no twists or kinks in the tubing, as blockages can raise the risk of infection.
- Keeping hydrated by drinking one or two glasses of liquid every 2 hours.
- Do the documentation or reporting of any events or mishaps involved in insertion of urinary catheter.

4.2 Urine Bags:

A urine bag is used to collect urine for short or long-period drainage. A urine bag is also called as urine drainage bag or urine collection bag. When attached to a catheter, the bag serves as a container or collector for the urine as it leaves the body and passes through the catheter tube. The bag is generally available in a two-litre capacity and 100 cm length providing unrestricted flow. Bags are ultra-lightweight, smooth, kink-resistant tubing, and easy to carry. It has a non-return valve with a top out put that is effective. The bag is connected to an aseptic catheter easily with the help of a modified tapered connector. There are two types of urine bag:

A. **Leg Bags:** The bag attaches to the end of the catheter tube and is then fixed to the patient's leg, letting them move around freely and go about their regular daily routine without having to particularly worry about their bladder functions.

B. **Night Bags:** As the name implies, this kind of bag is aimed at overnight usage. Such bags tend to be bigger than leg bags, as they're used for draining and collecting urine all through the night, and they tend to be single-use, but may be reusable.

Fig 7.4 Leg Urine Bag

Fig 7.4 Night / General Bag

Fig. 7.5 Urine pot

4.2.1 Procedure for emptying of Urine bag:

1. Empty bag into the toilet when it is a third to half full.
2. Always empty urine bag in a clean bathroom.
3. Do not let the bag or tube openings touch any surface of bathroom (wall, floor, and others).
4. Wash hands well.
5. Keep the bag below hip or bladder till it get empty.
6. Hold the bag over the toilet, or the special container doctor gave you.
7. Open the spout of the bag, and empty it into the toilet or container.
8. Do not let the bag touch to the rim of the toilet or container.
9. Clean the spout with rubbing alcohol and a cotton ball or gauze.
10. Close the spout tightly.
11. Do not place the bag on the floor.
12. Wash hands again.

4.3 Urine pot:

A urine pot, also known as a urine collection container, is a medical device used to collect urine from patients for diagnostic testing or to monitor urine output or patients who have trouble getting out of bed to urinate.

A male urine pot is designed with a wider opening and a longer spout, which makes it easier for men to use. The spout is angled to allow for a comfortable and accurate urine flow. The male urine pot may also have a handle for easy carrying and a secure lid to prevent leakage.

A female urine pot, on the other hand, is designed with a smaller opening and a shorter spout, which is better suited for female anatomy. The female urine pot may also have a contoured shape for a more comfortable fit and a flat base to prevent tipping over. The female urine pot may also come with a secure lid to prevent leakage and ensure hygiene.

It is important to note that urine pots should be made of durable and leak-proof materials, such as plastic or glass, and should be disposable or sterilizable to prevent the spread of infection.

5. Requirements:

Urinary catheters, urine bags and urine pots, sterile gloves, catheterization kit, cleaning solution, lubricant (if not in kit) and prefilled syringe for balloon inflation as per catheter size.

6. Requirements used:

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7. Precautions to be taken:

- Urinary Catheters, Urine bags and urine pots must be handled with care.
- Maintain hygiene to avoid contamination or UTI infection.
- Wash hands properly before and after handling Catheters, Urine bags, or urine pots.

8. Demonstration of urinary catheters, urine bags and urine pots:

The subject teacher must show and explain the purpose of urinary catheters (various types), urine bags and urine pots to the students. The urinary catheterization procedure must be demonstrated to the students using mannequin. YouTube videos can also be used for support.

Procedure for urinary catheterization using indwelling catheter:

1. Collect the supplies.
2. Keep the hands clean.
3. Place waterproof pad under patient.
4. Position the patient depending on gender: For female patients, ask them to lie on back with knees flexed and thighs relaxed. For male patients, ask them to take supine position with legs extended and apart.
5. Attach urinary bag to the bed and ensure that the clamp is closed.
6. Wear sterile gloves using sterile technique.
7. Cover the patient with sterile drape and only expose perineum or penis.
8. Lubricate tip of catheter using sterile lubricant.
9. Check balloon inflation using a sterile syringe.
10. Clean perineal area with the non-dominant hand (As it becomes contaminated in this step). For each cleansing stroke, use sterile forceps and new cotton swab.
11. Pick up the catheter with sterile dominant hand, 7.5 to 10 cm below the tip of the catheter.
12. Insert the catheter.

- **In female patient:**

a. Ask patient to bear down gently to help expose urethral meatus.
b. Insert catheter 5 to 7.5 cm until urine flows from catheter, then insert an additional 5 cm.

- **In male patient:**

a. Hold penis perpendicular to body and pull up slightly on shaft.
b. Ask patient to bear down gently (as if to void) and slowly insert catheter through urethral meatus.
c. Insert catheter 17 to 22.5 cm or until urine flows from catheter.

13. Place the remaining portion of catheter in sterile tray.
14. Slowly inflate balloon for indwelling catheters according to catheter size, using prefilled syringe.
15. After balloon is inflated, pull gently on catheter until resistance is felt.
16. Connect urinary bag to catheter using sterile technique.
17. Secure catheter to patient's leg using suitable adhesive tape at tubing just above catheter bifurcation.

9. Activity:

Perform the urinary catheterization procedure as demonstrated by your teacher, on a mannequin.

10. Result:

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11. Conclusion:

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12. References:

i.https://en.wikipedia.org/wiki/Catheter

ii. https://medlineplus.gov/ency/article/003981.htm
iii. 10.4 Urinary Catheters – Clinical Procedures for Safer Patient Care (opentextbc.ca)
iv. Urine Bag, Urine Collection Bag | Express Medical Supply (exmed.net)
v. https://surgicaldekho.com/surgical-products/urine-pot-for-male-and-female/

13. Practical related questions :

a. Define Urinary catheter, Urine bag and urine pot.
b. Give a minimum two uses of Urinary catheter, Urine bag, and urine pot.
c. Enlist the various types of urinary catheters.
d. What precautions to be taken while handling urinary catheter and urine bag
e. Give the difference between male and female urine pot.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 8
Demonstration of Surgical Aids

1. Aim:

To demonstrate the Identification, Types and Use of colostomy bags.

2. Practical Significance:

A colostomy bag is a plastic bag that collects fecal matter from the digestive tract through an opening in the abdominal wall called a stoma. The stoma permits stools to exit through the abdomen instead of going through the rectum and bowels. In such situation, patient wears a colostomy bag to protect their stoma and gather faeces. Hence healthcare professional need to enhance clinical training, educate patients, improve the quality of care, and reduce stigma and anxiety associated with colostomy surgery. It is essential therefore; students must know types and procedure of use of colostomy bag. In this experiment, the students will learn about types of colostomy bags and procedure of using a colostomy bag.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain colostomy bags, its types, advantages and disadvantages.	CO4	BTL2
2	Proper handling of colostomy bag.	CO4	BTL3
3	Demonstrate the use of colostomy bag.	CO4	BTL3
4	Practice ethical conduct and maintain cleanliness within the laboratory.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 An ostomy is a surgical procedure that involves the removal of diseased portions of the gastrointestinal or urinary system and creation of an artificial opening (Stoma) in the abdomen to allow for the elimination of body wastes.

A colostomy is one type of ostomy in which one end of large intestine out through an opening (stoma) made in the abdominal wall. (Fig. 8.1)

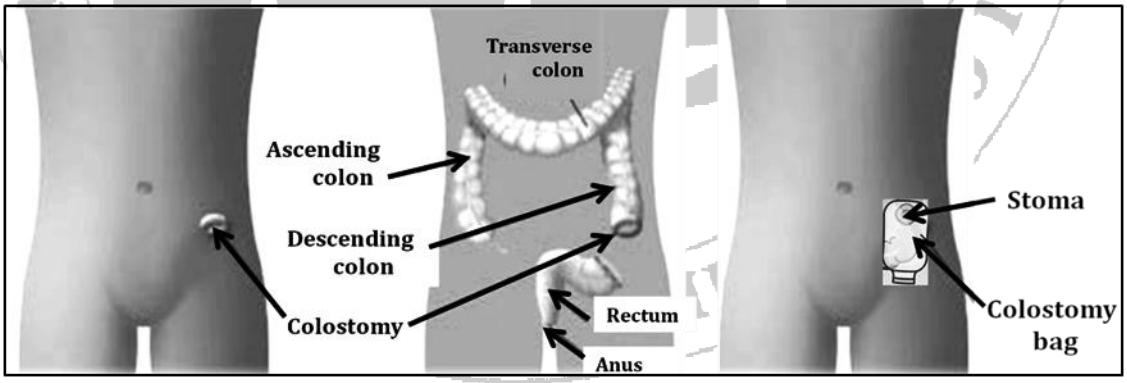


Fig.8.1 Colostomy

Surgeons create a new opening in abdominal wall for faeces to come out when a portion of the colon needs to be removed for therapeutic reasons. A colostomy bag is a plastic bag that attaches to stoma in the abdominal wall to collect faeces from the digestive tract. Immediately after a colostomy operation, physicians connect a bag to the stoma. As the stool travels through the digestive system, the colostomy bag can catch it.

Colostomy may be short-term or permanent. Sometimes the colostomy is temporary in which once body has completely recovered from the initial surgery, a subsequent procedure will be performed to reattach the ends of the large intestine. The colostomy may be permanent in other conditions, such as when the colon has been removed due to colon cancer.

4.2 Need of colostomy bag:

Colostomy is recommended in patient who is experiencing problem problems with their colons, such as colorectal cancer, Bowel obstructions or injuries, inflammatory bowel diseases, including Crohn's disease, ulcerative colitis and diverticulitis.

4.3 Parts of colostomy bag:

Components of a colostomy bag include, Pouch: The main bag where stool collects; Flange/wafer: The adhesive part that sticks to the skin around the stoma; Filter: Some bags have filters to help release gas; Closure: Allows for easy emptying and disposal of waste; Clip or clamp: Secures the closure and prevents leakage; Skin barrier: Protects the skin around the stoma from irritation. (Fig. 8.2)

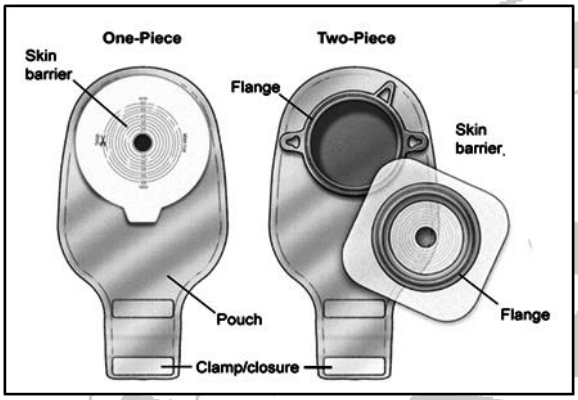


Fig. 8.2 Drainable pouch (One-piece & Two-piece)

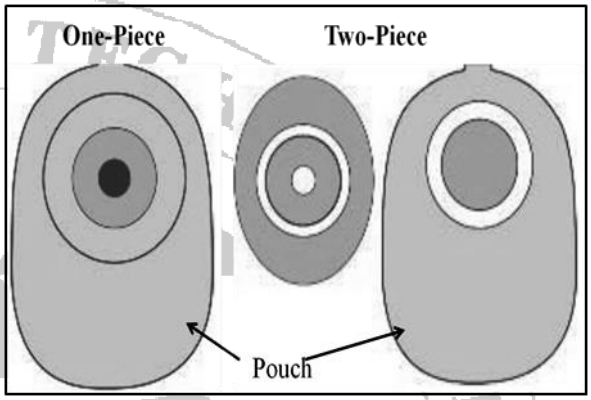


Fig. 8.3 Closed-end pouch (One-piece & Two-piece)

4.4 Types of colostomy bags:

1. **One-piece system:** The pouch and skin barrier are combined in one-piece system.

   Advantages: 1. Simple design, easy to apply. 2. Less bulk and discreet under clothing.

   Disadvantages: 1. Entire unit needs to be replaced when changing the pouch, which may increase costs. 2. Limited flexibility in pouch positioning. (Fig. 8.2 &8.3)

2. **Two-piece system:** The pouch and skin barrier are two separate pieces in a two-piece system, allowing to change the pouch without removing the skin barrier. The pouch and skin barrier are joined together with a plastic ring in this system (flange).

   Advantages: 1. Separate pouch and flange allow for easy changing of the pouch without removing the flange. 2. More flexibility in pouch positioning.

   Disadvantages: 1. Additional components may increase complexity. 2. Potential for leakage between the pouch and flange. (Fig. 8.2& 8.3)

3. **Drainable (Open-end) pouch:** It can be opened at bottom to empty the contents without removing the entire bag. It is available in both one and two piece system.

   Advantages: 1. Bottom opening allows for easy emptying of contents without removing the entire bag. 2. Convenient for patients with frequent emptying needs.

   Disadvantages: 1. Risk of leakage if not closed properly after emptying. 2. May require more frequent emptying compared to closed-end pouches. (Fig.8.2)

4. **Closed-end pouch:** Designed for one-time use and must be discarded when full. It is available in both one and two piece system.

   Advantages: 1. Disposable after one-time use, convenient for short-term wear. 2. Eliminates the need for emptying and cleaning.

   Disadvantages: 1. Not suitable for patients with high output or frequent emptying needs. 2. May be less cost-effective for long-term use compared to drainable pouches. (Fig. 8.3)

4.5 Criteria for selection of colostomy bag:

The selection of a colostomy bag involves several criteria to ensure it meets the specific needs and preferences of the individual such as Stoma size and shape, Skin condition, Output consistency, Activity level, Odor control and consider special needs of patient.

5. Requirements:

Sterile colostomy bag, gloves, mannequin/model, scissor, pen, sizing template/ measuring guide

6. Requirements used:

_____

7. Precautions to be taken:

Perform hand hygiene; wear a sterile hand glove and use aseptic technique during fitting colostomy bag.

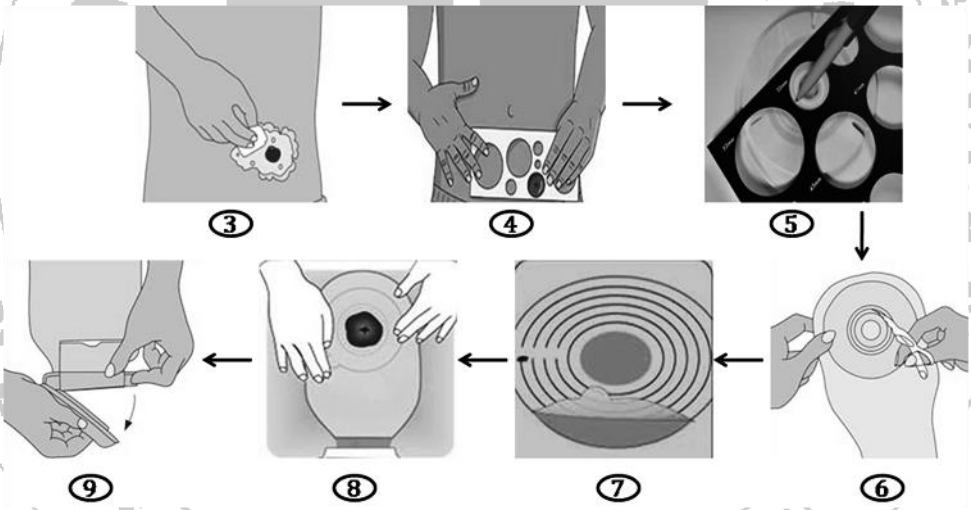
8. Demonstration Procedure:

The subject teacher must show different types of colostomy bags and explain their use, advantages and disadvantages to the students. Thereafter, teacher must demonstrate the procedure of using a colostomy bag on mannequin. Create a stoma on the left lower abdomen of mannequin using a marker or clay or wax.

Procedure of using colostomy bag

1. Collect all necessary supplies, including the colostomy bag, skin barrier or adhesive, scissors, wipes, and any additional accessories or support products.

2. Wash the hands with running water.



3. Clean and dry the skin area around the stoma using warm water. (Avoid using products that contain oils, lotions, or alcohol, as they can irritate the skin.)

4. Measure the size and shape of the stoma using a stoma measuring guide or template.

5. Trace the correct size on the skin barrier.

6. Use scissors to carefully cut the skin barrier of the colostomy bag to match the size and shape of the stoma. Be sure that the edges are smooth.

6. Remove the paper from backside of the barrier, inner release paper removed first and keep the outer release paper backing strips.

7. With adhesive facing the skin (flange side outwards), place the barrier on the skin around the stoma and ensure that the opening aligns properly. Remove the paper backing strips of the barrier and press the sides of the barrier uniformly against the skin to create a secure seal. (If using a two-piece system, securely snap the flange or coupling ring onto the pouch to create a leak-proof connection.)

9. Close the bottom of the pouch and close the opening.

10. For removing pouch, peel away one corner of the barrier. Remove the rest of the barrier by pushing down on the skin and pulling the barrier away.

9. Activity (Role Play):

Create a poster illustrating the attachment of a one-piece or two-piece colostomy bag to the stoma. Gather information from reputable websites and books. The poster aims to function as educational material for counseling purposes.

10. Result:

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11. Conclusion:

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12. References:

i. https://www.ncbi.nlm.nih.gov/books/NBK560503/
ii. https://www.healthline.com/health/colostomy#risks
iii. https://ada.com/colostomy-bag/

13. Practical related questions :

a. Define colostomy and describe the need of colostomy.
b. What is the use of colostomy bag?
c. Enlist the different types of colostomy bags.
d. Write the difference between one piece system and two piece system.
e. Give the advantages and disadvantages of open ended and close ended pouch.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept(Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 9
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, types and use of Ryle's tube.

2. Practical Significance:

Ryle's tubes are utilized for administering nutrition and medications to pediatric and geriatric patients, as well as for removing ingested toxins. It's important to prevent irritation of the nostril skin during tube insertion. Therefore, it is necessary to educate the patient caretaker for proper use of Ryle's tube. In this experiment, the students will learn the appropriate technique to use Ryle's tube.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe Ryle's tube.	CO4	BTL2
2	State and identify various types of Ryle's tube.	CO4	BTL1
3	Demonstrate the technique of using Ryle's tube to the authorized hospital staff.	CO4	BTL3
4	Practice safety protocol and follow ethics in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

Ryle's tube, also known as a nasogastric tube (NG tube), is the narrow bore silicone or polyurethane flexible tube with a radio opaque line inserted through the nose, down the throat, and into the stomach. It is used for both diagnosis and treatment. The nasogastric tube is used to administer medications, to feed nutritious foods and juices, removal of gastric content and diagnosis. The length of the orogastric tube is approximately one metre. The radiopaque line aids in the proper insertion of a tube into the stomach. The size of the NG tube selected depends on factors such as the age of the patient, the intended use of the tube, and the patient's medical condition. NG tube size range from 3.5 FG (French Gauge) for neonates to 14 FG for adults and up to 24 FG for triple-lumen gastric feeding/drainage tubes2. (3FG=1mm).

Uses of Ryle's Tube:

1. It is used to deliver nutrition directly into the stomach when a patient is unable to eat or swallow normally.
2. It is also used to administer drug and enteral feeding when oral ingestion is not feasible.
3. It is used to remove excess fluids, gas, or stomach contents from the gastrointestinal tract, a process known as gastric decompression. This is commonly done in cases of gastric distention, intestinal obstruction, or during surgical procedures.
4. It is used to diagnose gastrointestinal haemorrhage and acute gastric dilatation.
5. It is also used to examine upper gastrointestinal conditions.
6. It is used to perform gastric lavage, a procedure in which the stomach is flushed with fluid to remove ingested toxins or substances.

Types of Ryle's tube:

There are three different types of Ryle's tubes:

a. Levin Tube: It is a single-lumen rubber or plastic tubes that are typically used to provide medication and/or nourishment. (Fig. 9.1)

b. Salem Sump Tube: It is a large bore, double-lumen tube. The larger lumen is utilised for ventilation. Whereas the smaller lumen is used for suction and drainage. (Fig.9.2)

c. Moss Tube/Sengs taken–Blakemore tube: The Moss tube is a radiopaque, triple-lumen tube. The first lumen is placed and inflated in the cardia, the second lumen functions as an oesophageal aspiration port, and the third lumen is a feeding port for the duodenum. (Fig. 9.3)

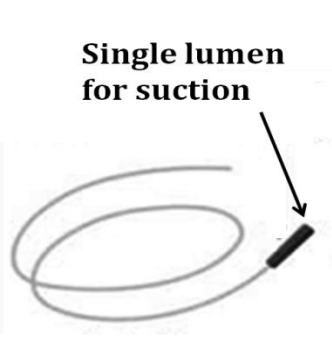

Fig. 9.1 Levin Tube

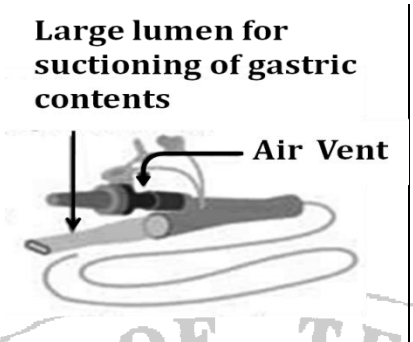

Fig. 9.2 Salem Sump Tube

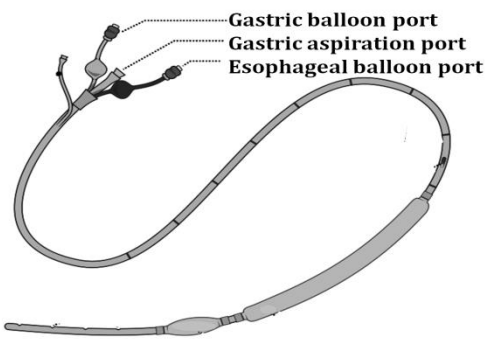

Fig. 9.3 Moss Tube

5. Requirements:

Oral fluid, 60ml syringe, Water-soluble lubricant preferably 2% Xylocaine jelly, adhesive tape, low powered suction device or drainage bag, stethoscope, sterile ryle's tube, sterile gloves, mannequin/model.

6. Requirements used:

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7. Precautions to be taken:

Precautions to be taken before using Ryle's tube at home:

For nasogastric tube care at home, it is crucial to follow the necessary precautions.

- Maintain oral hygiene by brushing teeth twice daily.
- Change the nasal tape every other day or as soon as it becomes free of lint.
- Clean the area around the nose where the tube enters using a cotton-tipped applicator dipped in warm water.
- Use a water-soluble lubricant if your nose has grown sore.
- Always keep the nasal tape in place, and contact physician if the nasogastric tube become loose.
- After each feeding or medication administration, flush the feeding tube with water.
- When tube becomes clogged, flush the nasogastric tube with warm water. Another option is to insert a syringe into the feeding tube and withdraw the plunger.
- Contact physician as soon as possible if the Ryle's tube continues to become obstructed.

Precautions to be taken during use of Ryle's tube:

- Perform hand hygiene.
- Wear a sterile hand gloves.
- Use aseptic technique during insertion.
- Do the documentation or reporting of any events or mishaps involved in insertion of Ryle's tube.

8. Demonstration Procedure:

The subject teacher must explain the purpose of using the Ryle's tube and show different types of it to the students. Thereafter, teacher must demonstrate the procedure of using Ryle's tube with the help of mannequin. YouTube Ryle's tube to the videos can also be used for support.

The process of placing a nasogastric tube down a mannequin's nose, pass the throat, and down into the stomach is known medically as nasogastric intubation. The installation of a ryle's tube, requires careful attention to detail in order to prevent complications and pain.

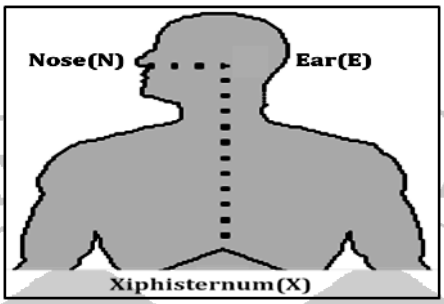
1. Gather equipments.

2. Position the mannequin in a supine position without compressing the oesophagus, lateral position, or flexing the neck with pressure on the arytenoid cartilage.

3. Cover the chest with towel or napkin.

4. Prepare yourself with Ryle's tubes in various sizes, 2% Xylocaine Jelly, and sterile gloves.

5. Measure the length of tube to be inserted to assure that tip enters gastric region. Place exit port of tube at a tip of nose, extend tube around the ear, then to xiphisternum process (This is known as the NEX measurement). Use cm marks on tube for reference.



6. Apply lubricant to the first 2 to 4 inches of the tube.

7. Then pass tube through one of the nostrils and into the throat.

8. Use a 10 ml or 20 ml syringe to inject 5-10 ml of fresh air/fluid to test the potency of the Ryle's tube.

8. Once the tube has passed through the throat, it can be readily put into the stomach.

9. Use a stethoscope to listen to the epigastric area (in actual patient).

10. Secure the tube in place with the help of tape to prevent movement.

9. Activity (Role Play):

Insert Ryle's tube into the stomach of the mannequin using appropriate steps as shown by your teacher. Students are suggested to read theoretical background of experiment before performing activity.

10. Result:

_____

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11. Conclusion:

_____

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12. References:

i. https://emedicine.medscape.com/article/80925-periprocedure

ii. https://www.portea.com/nursing/ryle-tube-insertion/

13. Practical related questions :

a. Write the uses of Ryle's tube.

b. What is the synonym of Ryle's tube?

c. Enlist the various types of Ryle's tube.

d. State precautions to be taken during use of Ryle's tube.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce /Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 10
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, Types and use of Oxygen mask

2. Practical Significance:

An oxygen delivery system is a device which is used to administer, regulate and supplement oxygen to a subject to increase the arterial oxygenation. An oxygen mask transfer oxygen from oxygen cylinder to the lungs of the patient who have difficulty in breathing. It covers nose, mouth or face. Oxygen masks may cover only the nose and mouth (oral nasal mask) or the entire face (full-face mask). In this experiment, students will learn about different types of oxygen masks, selection of appropriate size and type of mask and proper the technique of using the oxygen mask so that they can guide other technical staff of hospital.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe the use and types of oxygen mask.	CO4	BTL2
2	Select appropriate type of oxygen mask as per the need of the patient.	CO4	BTL2
3	Demonstrate the technique of using the oxygen mask.	CO4	BTL3
4	Practice and follow ethics in performing practical.	CO4	BTL6
5	Collaborate and communicate with fellow colleagues.	CO4	BTL6

4. Relevant Theoretical Background:

Oxygen administration may be initiated for a variety of reasons. Increased metabolic demand, maintenance of oxygenation while providing anesthesia, supplementation during treatment of lung illnesses that affect oxygen exchange, treatment of headaches, and carbon monoxide exposure are a few examples of its initiation. Oxygen is necessary for basic metabolic demands in the body, and it is an important part of resuscitation in many acute illnesses, as well as the maintenance of chronic hypoxemic diseases.

An oxygen mask is a mask that provides a method to transfer breathing oxygen gas from a storage tank to the lungs. Oxygen masks may cover only the nose and mouth (oral nasal mask) or the entire face (full-face mask). They may be made of plastic, silicone, or rubber. In certain circumstances, oxygen may be delivered via a nasal cannula instead of a mask.

Maintaining appropriate tissue oxygenation while reducing the stress on the heart and lungs is the overarching goal of oxygen therapy. The amount of oxygen given to the patient might vary significantly depending on the mask's design. Choosing the appropriate oxygen administration mask is based on a number of variables. The most appropriate device can be chosen based on design, but clinical evaluation and performance requirements ultimately determine which mask should be used. Simple oxygen masks supply oxygen in the concentrations of 40%-60%.

Fig. 10.1 Oxygen mask

Uses of Oxygen Mask:

1. Oxygen therapy may provide by using oxygen mask, if the patient is suffering from condition that causes low blood oxygen, such as: COPD (chronic obstructive pulmonary disease), Pneumonia, COVID-19, A severe asthma attack, Late-stage heart failure, Cystic fibrosis, Sleep apnea.
2. During a medical emergency, oxygen masks are frequently used in both the hospital and by first responders in an ambulance while a patient is in transit. High flow oxygen therapy may be used in the pre- hospital situation as part of resuscitation or in the case of allergy, serious trauma, seizure, or hypothermia.

Types of Oxygen Masks:

There are four different types of oxygen masks:

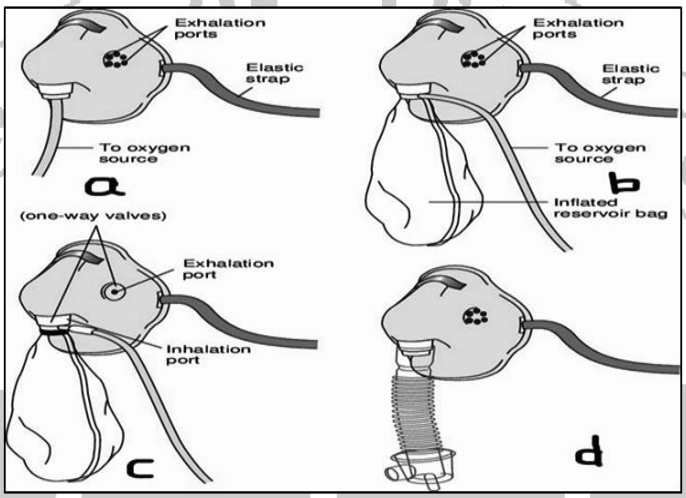

Fig. 10.2 a) Simple mask b) Partial rebreathing mask c) Non-rebreathing mask d) Venturi mask

A. **Simple Masks:** A mask is worn over the patient's mouth and nose and has exhalation ports (holes on the side of the mask) through which the patient exhales CO_2 (carbon dioxide). These gaps must always be left open. The mask has a metal piece that can be bent over the nose to better fit the patient, and it is secured in place by an elastic band around the back of the head. If concentrations of O_2 are making the patient feel dry, humidifier may be appended.

Advantages:

a. It can deliver O_2 concentrations between 40% and 60%.
b. O_2 is delivered by the flow metre at a rate of 6 to 10 L/min.
c. It is employed to supply a moderate oxygen concentration.
d. Its efficiency is based on the patient's respiratory requirements and how well the mask fits. It is accessible on the majority of hospital units.
e. It provides patients with more oxygen.

Disadvantages:

a. It is difficult to eat while wearing a mask.
b. For some patients, wearing a mask may feel restricting and uneasy.

B. **Partial Rebreathing Masks:** The non-rebreather mask and the partial rebreather mask have very similar appearances. A partial rebreather mask does not have one-way valves, so the air exhaled by the patient mixes with their inhaled air, which is how the masks differ from one another. A partial rebreather mask only provides 35-50% FiO_2(Fraction of inspired Oxygen) and requires 10-15 L/min of oxygen.

Advantages:

It can deliver O_2 concentration of 80% to 90%.

Disadvantages:

a. Since there are no one-way valves on the partial rebreather bag, expired air and inhaled air mix.
b. The patient may find the mask to be hot and constricting, which will make eating and speaking difficult.

C. **Non-Rebreathing Masks:** It consists of a simple mask and a small reservoir bag attached to the oxygen tubing that connects to the flow meter. There is no re-breathing of exhaled air when using this mask. It has one-way valves between the mask and the bag, as well as covers on the exhalation ports. Only the reservoir bag is used for inspiration; on exhalation, gases are forced out through the exhalation ports rather than flowing back into the reservoir bag.

Advantages:

The mask can deliver between 60 and 80 percent FiO_2(Fraction of inspired Oxygen)when worn properly.

Disadvantages:

a. Non-rebreather masks have one-way valves, which increase the risk of suffocation if the gas flow is interrupted.
b. The mask needs to be tightly sealed and may make the patient feel hot.
c. The patient cannot eat while wearing the mask, and talking will be difficult.

D. **Venturi Masks:** It is a high-flow system that includes a sterile water bottle, corrugated tubing, a drainage bag, an air/oxygen ratio nebulizer system, and a mask that works with the corrugated tubing. The mask could be a face tent, a T-piece, an aerosol mask, or a mask for tracheostomy. The important factor is that there is little chance for the patient to breathe in air from the room because the oxygen flow exceeds the patient's peak inspiratory flow rate.

Advantages:

a. The system can deliver 24 to 60 percent oxygen at 4 to 12 L/min.
b. It regulates the precise amounts of oxygen delivered and provides a higher level of accuracy.
c. The oxygen concentration is controlled by a port on the corrugated tubing at the mask's base.
d. It provides patients with humidified oxygen for comfort.
e. The mucous membranes remain moist.

Disadvantages:

a. The mask may be hot and confining for some patients, and it interferes with talking and eating.
b. There is a need of properly fitting mask.

5. Requirements:

Oxygen cylinder, a regulator with pressure gauge with a functioning flow adhesive tape, sterile simple oxygen mask, sterile gloves and mannequin.

6. Requirements used:

_____

_____

7. Precautions to be taken:

- Use a Clean oxygen mask every time to avoid contamination.
- Oxygen therapy is generally safe, but it can cause side effects. They include a dry or bloody nose, tiredness, and morning headaches.
- Oxygen poses a fire risk, so you should never smoke or use flammable materials when using oxygen. If you use oxygen tanks, make sure your tank is secured and stays upright. If it falls and cracks or the top breaks off, the tank can fly like a missile.
- Use oxygen only as directed by doctor. Both excess and insufficiency can be dangerous.
- Don't alter the oxygen flow rate, doing so could have negative consequences.

- Never use oxygen tubing that is longer than 50 feet. It dilutes oxygen level.

Precautions to be taken before the use of oxygen masks

- Perform hand hygiene.
- Wear a sterile hand gloves.
- Use aseptic technique during wearing an oxygen mask.

8. Demonstration of Oxygen masks:

The subject teacher must show different types of oxygen masks explain their purpose to the students. Thereafter, the teacher must demonstrate the procedure of oxygen administration using simple oxygen mask with the help of a mannequin (A student can also act as dummy patient in this case).YouTube videos can also be used for support.

Procedure for Oxygen administration using simple Oxygen mask

1. Wash your hands with soap.
2. Inform the patient about the safety precautions related to using oxygen and also emphasize on how oxygen will relieve dyspnoea or discomfort.
3. Help the patient to come in Fowler's position if it is acceptable.
4. Connect the flowmeter to the wall outlet and attach nozzle of the flowmeter with the oxygen tubing.
5. Attach a humidifier a high oxygen flow is being used. In this case, connect the oxygen tube to the humidifier.
6. Activate the oxygen at the recommended rate.
7. Apply the mask to the face, starting from the nose and chin. The elastic strap should be raised until it is behind the head of patient, then it should be brought back down. Keep the strap between the ears and head of the patient.
8. Adjust the metal ring above the nose and shape the mask to the face.
9. Confirm the mask to the face by adjusting the metal rim over the nose.
10. Check the equipment's functionality.

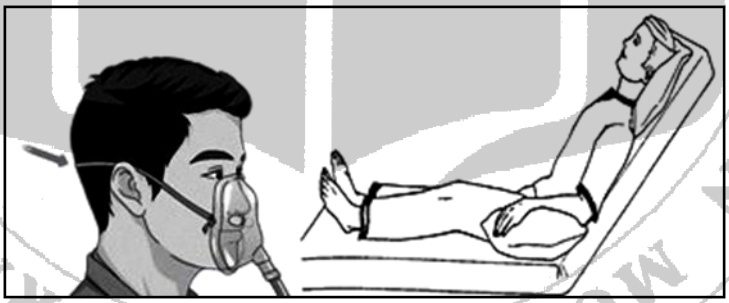

Fig. 10.3 Oxygen Mask application with Fowlers position

9. Activity:

Attach the oxygen mask to the mannequin or your partner following the steps shown by your teacher during the demonstration.

10. Result:

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11. Conclusion:

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12. References:

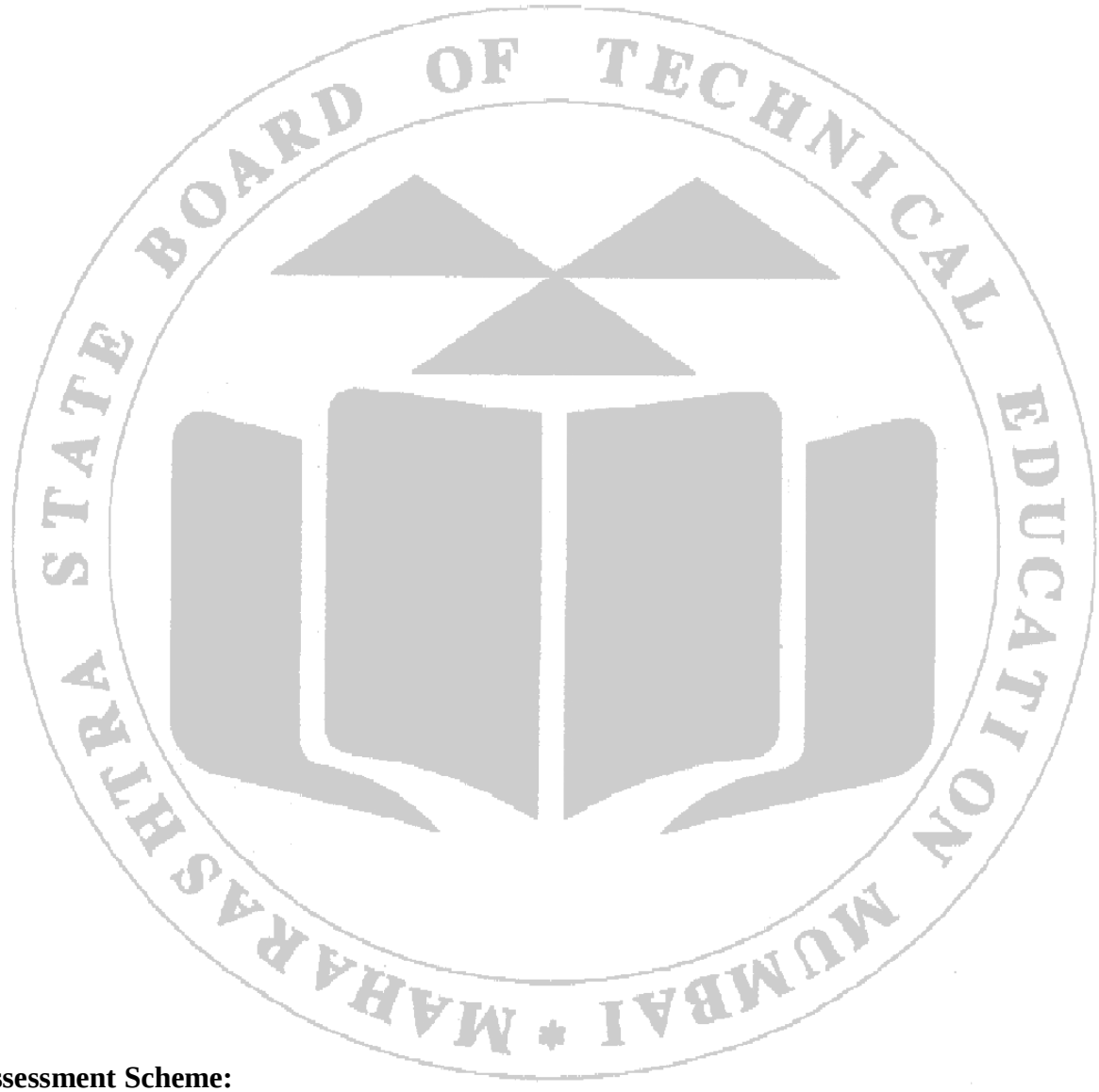
i. https://en.wikipedia.org/wiki/Oxygen_mask

ii. https://dsmedical.co.uk/blog/choosing-the-best-mask-for-oxygen-administration/
iii. https://www.cincinnatichildrens.org/health/o/oxygen-precautions
iv. https://downloads.lww.com/wolterskluwer_vitalstream_com/sample-content/9780781788786craven/samples/mod09/topic2b/text.html
v. https://opentextbc.ca/clinicalskills/chapter/5-5-oxygen-therapy-systems/
vi. https://elsevier.health/en-US/preview/oxygen-therapy-nasal-cannula-or-oxygen-mask
vii. https://medlineplus.gov/oxygentherapy.html
viii. https://www.healthline.com/health/nasal-cannulas-and-face-masks#1

13. Practical related questions :

a. Enlist the various types of oxygen masks.
b. What are the uses of oxygen masks?
c. What is the oxygen concentration for simple oxygen mask?
d. Oxygen is a drug. True or false.

(Space for Answers)



14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 11
Demonstration of Surgical Aids

1. Aim:

To demonstrate the identification, Types and use of Intravenous (IV) set.

2. Practical Significance:

An IV set is a collection of devices used to administer sterile fluid, electrolytes and nutrients, blood components, and medications via an intravenous catheter. Intravenous infusion is the fastest way to deliver medication and replace fluid throughout the body. IV sets are made to optimize the delivery of infusion, reduce the risk of infection to the patient, and keep access sites protected and uncontaminated. In this experiment, students will learn about various components of the IV set and techniques to give IV infusion to the patient.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Select the appropriate type of IV set for the administration of medication and fluids.	CO4	BTL2
2	Identify various components of the IV set.	CO4	BTL2
3	Demonstrate the procedure for the administration of medication and fluids using an IV set.	CO4	BTL3
4	Estimate the drip rate of IV fluid while administering medication and fluids using an IV set.	CO4	BTL4
5	Collaborate and communicate with fellow colleagues	CO4	BTL6

4. Relevant Theoretical Background:

Intravenous (IV) fluids and medications are administered through flexible plastic tubing called an IV administration set or IV set. The IV set connects the bag of solution to the patient's IV access site. IV fluid infusions are sterile preparations administered directly into a patient's circulatory system with the help of needle/ cannula and IV Set. Most infusion sets are made of PVC material, which ensures high strength, ease of sealing, resistance to sterilization procedures, and is less expensive.

Intravenous infusion sets are commonly used for:

- Fluid Replacement: Dehydrated Patients experiencing severe vomiting or not drinking fluids benefit from intravenous fluid administration.
- Medication Delivery: Certain medications, such as antibiotics, chemotherapy drugs, and pain relievers, are administered via IV for rapid and controlled effect.
- Nutritional Support: Patients who cannot eat or absorb nutrients through the gastrointestinal tract may receive parenteral nutrition through IV infusion.
- Blood Transfusions: IV sets deliver blood or blood products, such as platelets and plasma, to patients with blood disorders or in critical conditions.

Components of IV Set:

The fluid types divide intravenous sets into two major categories. One is used to transfer blood, while another is used to administer non-blood products such as TPN, saline solution, medication, etc. There are major variations in these two basic types. However, the fundamental components of intravenous infusion set remain consistent across all variations are spike, tubing, connector, drip chamber and V-track controller.

a. **Spike:** The spike is designed to effortlessly pierce the bottle stopper of the infusion bag or bottle, ensuring a secure connection. This ensures the IV solution remains sterile and free from potential contaminants.
b. **Air Vent cap:** The blue air vent cap of the IV set serves a dynamic purpose, allowing for flexibility in usage. It can be easily opened or closed based on specific requirements. When the air vent cap is opened, it enables air entry into the container holding the IV fluid and facilitating faster flow of the solution. In this way, the air vent cap actively expedites the infusion process.
c. **Air Filter:** The filter inside the air vent helps prevent microorganisms from entering the infusion bag, and the infusion line.
d. **Drip Chamber:** The soft and transparent chamber is located below the base of the spike. The purpose of the drip chamber is to collect the incoming fluid and to act as a vital indicator of its flow rate. The rate of flow can be calculated by counting the number of drops per minute.
e. **Solution Filter:** It removes unnecessary particles and debris from the IV fluid.
f. **Tubing:** The tubing is the central part of the infusion set. Aside from serving as the principal route of the infused fluid, it is the attachment point of all the other IV set parts. Ensuring its quality is crucial for the safe and efficient administration of treatments.
g. **Flow regulator:** The flow regulator includes the roller clamp, side clamp, pinch clamp, micro flow regulator etc., with the function to initiate, terminate, or control fluid flow through the line without any fluid contact.
h. **Injection Port:** An injection port is a small, sealed opening in the tubing that allows healthcare providers to introduce additional medications or fluids into the IV line without interrupting the primary infusion.
i. **Luer Connector:** Luer connector is a device that connects a needle or cannula to plastic tubing. It has two types of Luer lock connectors and a luer slip connector.
j. **Needles:** Hypodermic needle serves the purpose of penetrating the skin, allowing for various medical procedures to be carried out. It allows to inject the fluid into the blood vessels.

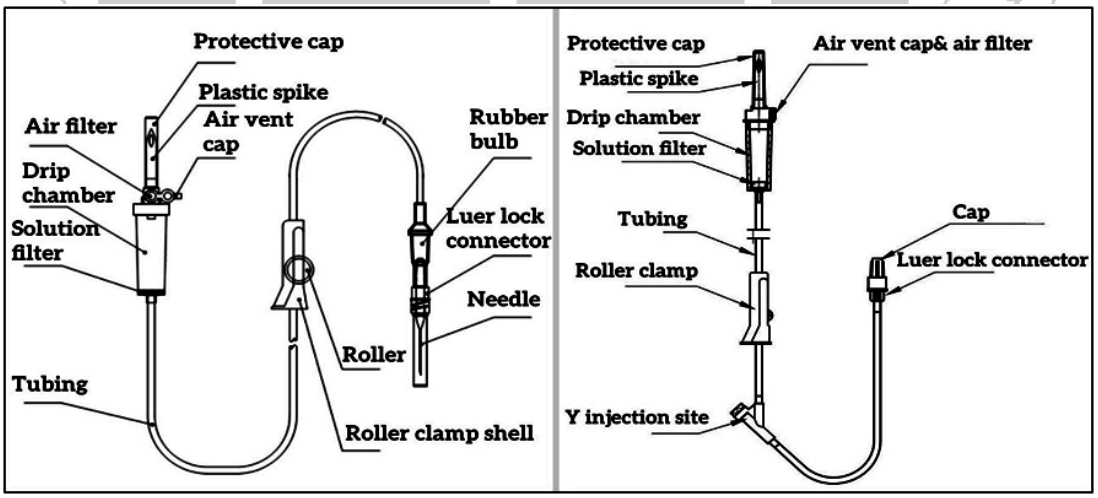


Fig. 11.1 Intravenous Set

Types of Intravenous infusion sets and their applications:

IV sets are used for intravenous therapy and include tubing and the needle or catheter. The type of IV set you need depends on the type of fluid you need to administer, as well as its viscosity and flow rate. There are several different types of IV sets available for use in hospitals and other medical settings, including:

a. **Filtered IV Sets:** A filtered IV set has a filter in the tubing that prevents any foreign matter from entering the bloodstream.
b. **Vented IV Sets:** There is a little blue hole in the side of the vented IV sets. The lid may be opened and closed by medical staff to let air in, displacing the fluid as it exits. The fluid is pushed downward by gravity and the air pressure from the vented IV set.
c. **Non-Vented IV Sets:** A non-vented IV set does not include a removable air vent. Before attaching a non-vented IV set to a patient, the tubing must be filled with IV fluid to eliminate the presence of air. As the IV bag empties, the tubing produces a vacuum, causing the bag to collapse.
d. **Gravity Tubing:** Gravity tubing is the most common type of IV set used in hospitals today. It consists of a plastic bag hung from a pole or hook, which holds it in place at a certain height above the patient's bed. The fluid is pushed through the tube and into the patient's bloodstream by gravity's force.

Types of Intravenous infusion Sets based upon rate of flow & its intended use:

a. **Macro drip set:** The macro drip set is a device with a wider tube diameter in the spike. There are three types of macro drips: 10 gtt/ml, 15 gtt/ml, and 20 gtt/ml, with ten gtt/ml producing ten drops per one mL of the solution. The higher the value of gtt/ml, the smaller the device's diameter; the lower it is, the more significant the device's diameter. Medical staff uses the macro drip sets when precision is not of utmost concern. Hence, hospital staff uses them for routine IV administration.
b. **Micro drip set:** The micro drip set has a device with a narrower tube diameter in the spike. Thus, smaller drops come out from the infusion set. Generally, the micro bead produces 60 gtt/ml, implying that 60 drops of the liquid make up 1.0 mL. Hospital staff uses the micro drip when administration requires high precision, such as administering medications to infants and young children.

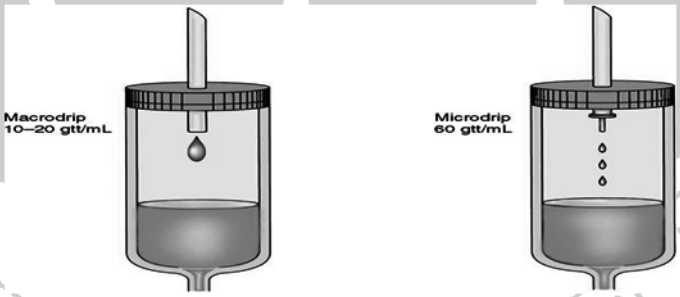


Fig. 11.2 a) Macrodrip IV set b) Microdrip IV set

Advantages of intravenous set

a. Almost 100 percent bioavailability of medication achieved in controlled manner.
b. IV injections are one of the quickest and most controlled ways to deliver medications or other substances into the body.
c. Bolus, drip, or extended infusion are all possible infusion treatment delivery methods.
d. Through the IV set's injection port, it enables the infusion of extra drugs. In other words, it is feasible to take several drugs.
e. It is appropriate for the unconscious and those unable to ingest drugs and nutrition.

Disadvantages of intravenous set

a. The piercing of infusion needs an expert.
b. The infusion piercing action is a painful task.
c. There is a risk of inflammation and infection.

d. There is a possibility of extravasation or infiltration. Extravasation is a condition that occurs unintentionally when therapy is administered outside of a vein.

5. Requirements:

Sterile IV set, Normal Saline solution for IV administration, Cannula/ needle/ IV catheter, alcohol swabs, sterile gloves, and mannequin.

6. Requirements used:

_____

_____

7. Precautions to be taken:

1. Precautions to be taken before using intravenous set

- Check the fluid bag for type of fluid, expiry date of fluid, port for injection.
- Port for insertion of giving spike. Review the features of the intravenous set and the fluid bag or bottle first.
- Look for the ingredients, the expiration date, etc.
- Ensure and confirm that everything about the products is normal, then proceed to the administration.

2. Precautions to be taken during use of intravenous set safely

- Perform hand hygiene.
- Wear a sterile hand glove.
- Use aseptic technique during intravenous insertion.

8. Demonstration of administration of IV infusion using IV set:

The subject teacher must explain the purpose of various components of IV set to the students. Thereafter, a teacher must demonstrate the procedure for the administration of IV infusion to a mannequin. YouTube videos can also be used for support.

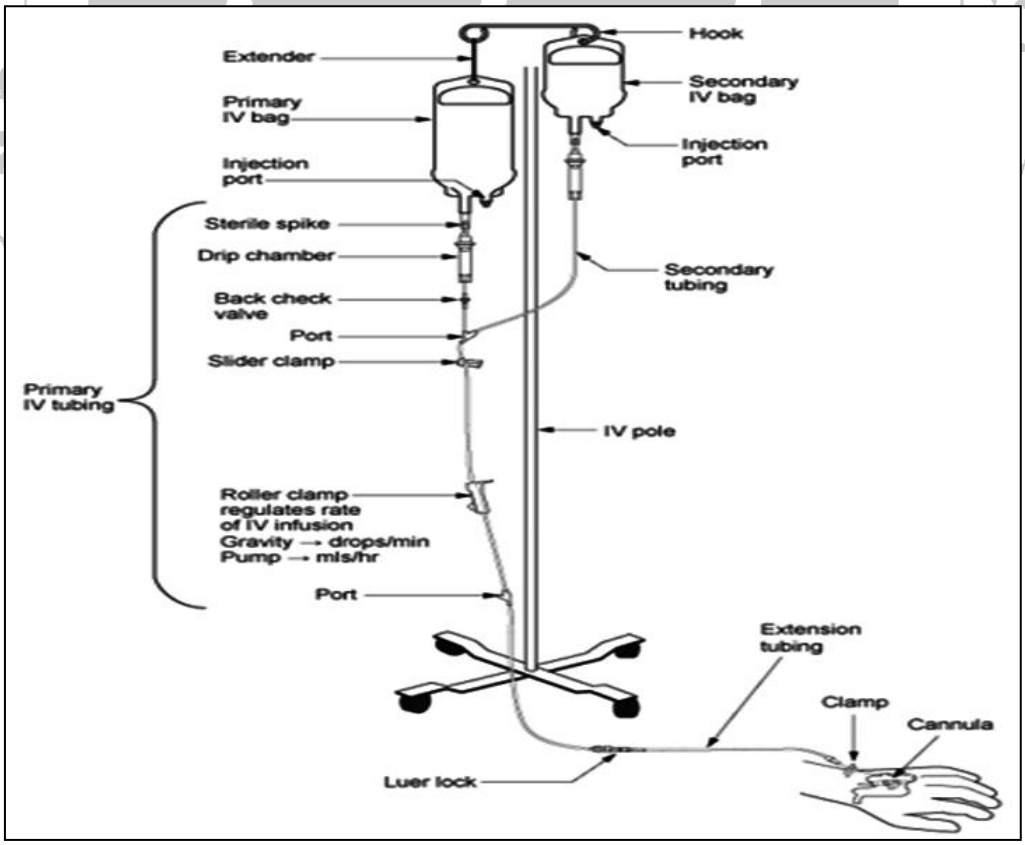


Fig. 11.2 Illustration of the set-up of a primary and secondary tubing for administration of fluids and a secondary medication by gravity

Procedure for administering IV infusion using IV set

(Note: Cannula must be fixed in the blood vessel of the patient using tape before starting the demonstration).

1. Assemble all the requirements to the bedside of the mannequin.
2. Keep the hands clean.
3. Maintain aseptic technique while opening sterile IV infusion solution, cannula and IV set.
4. Clamp the tubing (with regulator), uncap the spike, and insert into entry site on infusion bag as directed by the manufacturer.
5. Squeeze drip chamber and allow it to fill at least one third to halfway with the IV solution.
6. Remove cap at the end of tubing, release clamp, allow fluid to move through tubing. Allow fluid to run until all air bubbles have been removed.
7. Close clamp and attach tubing to the catheter or needle.
8. Release the clamp on the tubing and adjust the drip rate.
   (Note: Place a vessel below the wrist of the mannequin to which cannula is fixed in order to avoid spillage of IV fluid on the bed/platform).

Formula for calculation of Drip rate:

The Drip rate of IV infusion can be adjusted using following formula:

$$\text{Drip rate (Drops per minute)} = \frac{\text{Volume of IV fluid in mL}}{\text{Time in Minutes}} \times \text{Drop factor in gtt/mL}$$

Drop factor depends upon the type of infusion set (Macro or Micro). Once the drip rate is calculated, it can be set using roller clamp while observing watch.

9. **Activity:**

Subject teacher provides values for volume of IV infusion in mL, time in minutes along with drop factor (given on IV set packing) on that basis students have to calculate drip rate. After calculating the drip rate, set the same value on the IV infusion assembly using the roller clamp and wrist watch. (Note: Students are informed to perform activity on set assembly).

Volume of IV fluid to be administered: _____mL (If given in litre then convert it into mL)

Time period for administration :_____min (if given in hour then convert it into minute).

Drop Factor: _____ gtt/mL

Space for Calculation:

Drip rate: _____drops per minute.

10. **Result:**

_____

_____

11. **Conclusion:**

_____

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_____

12. **References:**

i. What Is An IV Infusion Set? Uses, Functions and Components (netmeds.com)
ii. https://paragoncare.com.au/news/understanding-different-types-iv-sets-and-how-they-are-used
iii. Discover types of IV set (kmedhealth.com)

iv. IV Line Parts- KMED (kmedhealth.com)

13. Practical related questions :

a. Define IV set and give its uses.
b. Enlist the different types of IV set and discuss in short.
c. Enlist the different types and components of IV set.
d. Give the advantages and disadvantages of IV set.
e. Give the formula for calculation of drip rate.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Theory

Interpretation of Laboratory Reports to Optimize the Drug Therapy

Haematological and biochemical tests provide useful information for the diagnosis, screening, management, prognosis and monitoring of disease and its response to treatment. However, it is an imperfect science. Laboratory testing may fail to identify abnormalities that are present (false negatives [FNs]) or identify abnormalities that are not present (false positives, [FPs]). Following General Principal may be considered for interpretation of Clinical Laboratory tests:

- The serum, urine, and other fluids of patients are routinely analyzed; however, laboratory tests should be ordered only if the results of the tests will affect decisions about the therapeutic management of the patient.
- Laboratory values must be assessed in the context of the clinical situation. They should not be evaluated in isolation of the subjective and objective findings.
- When interpreting laboratory test results, clinicians should use the normal values listed by their own laboratory facility rather than those published in reference texts, because laboratories may use different methods of assay.
- Laboratory error should always be considered when laboratory results do not correlate with clinical expectations.

Accuracy and Precision:

Accuracy and *precision* are important laboratory quality control measures. *Accuracy* is defined as the extent to which the mean measurement is close to the true value. Accuracy of a qualitative assay is calculated as the sum of the true positives (TPs) and true negatives (TNs) divided by the number of samples tested (accuracy = [(TP + TN) ÷ number of samples tested] × 100%). *Precision* refers to assay reproducibility (i.e., the agreement of results when the specimen is assayed many times). An assay with high precision means that the methodology is consistently able to produce results in close agreement.

Qualitative Tests:

A *qualitative test* is a test whose results are reported as either positive or negative without further characterization of the degree of positivity or negativity. For example, a serum or urine pregnancy test is reported as either positive or negative and an acid-fast stain for *Mycobacterium* is reported as either positive or negative.

Quantitative Tests:

A *quantitative test* is a test whose results are reported as an exact numeric measurement (usually a specific mass per unit measurement) and assessed in the context of a reference range of values. For example, serum potassium is reported in milliequivalents per liter, creatinine clearance is reported in milliliters per minute, and LDH is reported in units per liter.

Reference Range

The *reference range* is a statistically-derived numerical range obtained by testing a sample of individuals assumed to be healthy. The upper and lower limits of the range are not absolute (i.e., normal versus abnormal), but rather points beyond which the probability of clinical significance begins to increase. The term *reference range* is preferred over the term *normal range*.

Qualitative laboratory tests are either negative or positive and without a reference range; any positivity is considered abnormal. For example, any amount of serum acetone, porphobilinogen, or alcohol is considered abnormal. The presence of glucose, ketones, blood, bile, or nitrate in urine is abnormal.

Factors That Influence the Reference Range:

Many factors influence the reference range. Reference ranges may differ between labs depending on analytical technique, reagent, and equipment. The initial assumption that the sample population is

normal may be false. For example, the reference range is inaccurate if too many individuals with covert disease (i.e., no signs or symptoms of disease) are included in the sample population. Failure to control for physiologic variables (e.g., age, gender, ethnicity, body mass, diet, posture, and time of day) introduces many unrelated factors and may result in an inaccurate reference range. Reference ranges calculated from non randomly distributed (non-Gaussian) test results or from a small number of samples may not be accurate. Reference ranges may change as new information relating to disease and treatments becomes available.

Specimen:

A *specimen* is a sample (e.g., whole blood, venous blood, arterial blood, urine, stool, sputum, sweat, gastric secretions, exhaled air, cerebrospinal fluid, or tissues) that is used for laboratory analysis. Plasma is the watery a cellular portion of blood. Serum is the liquid that remains after the fibrin clot is removed from plasma. While some laboratory tests are performed only on plasma (e.g., renin activity and adrenocorticotropic hormone [ACTH] concentration) or serum (e.g., serum electrophoresis and acetaminophen concentration), other laboratory tests can be performed on either plasma or serum (e.g. aldosterone, potassium, and sodium concentrations).

Units of measure:

Most countries, other than the United States, report clinical laboratory values in the metric system (SI units).The basic unit of mass for the SI system is a mole, which is technically and pharmacologically more meaningful than the gram because each physiological reaction occurs on a molecular level. Here, reference ranges for common laboratory tests are presented in both conventional and SI units.

Table 1: Various Laboratory Tests performed to diagnosed Different Disorders

Disorders	Tests
Renal Disorders	i. Creatinine ii. Blood urea nitrogen (BUN) iii. Uric acid iv. Protein
Diabetes Mellitus	i. Glucose, ii. Oral glucose tolerance tests (OGTT) iii. Insulin iv. C-Peptide v. Glycosylated Hemoglobin
Cardiovascular Disorders	i. Creatine Kinase ii. Lactate Dehydrogenase iii. Troponin
Liver Disorders	i.Transaminase: a. Aspartate transaminase (SGOT) b. Alanine aminotransferase (SGPT) ii.Gamma glutamyl transpeptidase iii. Phosphatase, iv. Bilirubin
General	i.Proteins, ii. Water/Electrolyte Balance, iii. Haematological Data

Table 2: Reference Values Showing Haematological Parameters:

Laboratory Test	Normal Reference Values		Comments/ Significances
	Conventional units	SI units	
RBC Count			
Male	4.3-5.9 X 10^6/µL	4.3-5.9 X 10^{12} /L	↓with anemias, bleeding, hemolysis.
Female	3.5-5.0 X 10^6/µL	3.5-5.0 X 10^{12} /L	↑with polycythemia, chronic hypoxia.
Hematocrit (Hct)			
Male	39 % -49 %	0.39 - 0.49	↓with anemias, bleeding, hemolysis.
Female	33 % - 43 %	0.33 – 0.43	↑with polycythemia, chronic hypoxia.
Hemoglobin (Hgb)			
Male	14 -18 g/dL	140 -180 g/L	↓with anemias, bleeding, hemolysis.
Female	12 -16 g/dL	120 -160 g/L	↑with polycythemia, chronic hypoxia

Mean cell volume (MCV)	76-100 μm^3	76-100 fL[a]	Describes average RBC size; ↑ MCV =macrocytic, ↓ MCV = microcytic.
Mean Corpuscular Hemoglobin MCH	27-33 pg	1.66-2.09fmol/cell	Measures average weight of Hgb in RBC.
Mean Cell Hemoglobin Concentration (MCHC)	33–37 g/dL	330-370 g/L	More reliable index of RBC hemoglobin than MCH. Measures average concentration of Hgbin RBC. Concentration will not change with weight or size of RBC.
Reticulocyte count (Adult)	0.1 % -2.4 %	0.001- 0.024	Indicator of RBC production; increase suggests ↑ number of immature erythrocytes released in response to stimulus (e.g., iron in iron-deficiency anemia)
Erythrocyte Sedimentation Rate (ESR) Male Female	 0–20 mm/hour 0–30 mm/hour	 0–20 mm/hour 0–30 mm/hour	Nonspecific ↑ with inflammation, infection, neoplasms, connective tissue disorders, pregnancy, nephritis. Useful monitor of temporal arteritis and polymyalgia, rheumatica.
WBC Count	4–11 × $10^3/\mu L$	4–11 × $10^9/\mu L$	Consists of neutrophils, lymphocytes, monocytes, eosinophils, and basophils; ↑ in infection and stress.
Absolute Neutrophil count (ANC)	2,000 cells/µL		ANC = WBC × (% neutrophils + % bands)/100; if <500 ↑ risk of infection, if >1,000 ↓ risk of infection.
Neutrophils	40 % -70 %	0.4 -0.7	Increase in neutrophils suggests bacterial or fungal infection. Increase in bands suggests bacterial infection.
Lymphocytes	20% -40%	0.2 – 0.4	↑ bacterial infection, viral infection, whooping cough, blood cancer, etc
Monocytes	0% - 11%	0 – 0.11	↑in bacterial infections or malaria
Eosinophils	0%- 8%	0-0.08	Eosinophils ↑ with allergies and parasitic infections.
Basophils	0% - 3%	0-0.03	↑in granulocytic leukemia or autoimmune disease
Platelets	150-450X10^3/ µL	150-450 X 10^9/L	<100× $10^3/\mu L$ = thrombocytopenia; <20×$10^3/\mu L$= ↑ risk for severe bleeding.
Coagulation Studies			
Activated partial thromboplastin time (a PTT)	22-37 seconds	22-37 seconds	↑in inherited disorders including classic haemophilia A (factor VIII deficiency) and haemophilia B (factor IX deficiency, or Christmas disease).
Prothrombin Time	10-13 seconds	10-13 seconds	It converts to thrombin in blood clotting process, which is critical event

			in the haemostatic process. Measures the activity of the clotting factor VII and X.

Table 3: Reference Values Showing Liver function test Parameters:

Laboratory Test	Normal Reference Values		Comments/ Significances
	Conventional units	SI units	
Aspartate aminotransferase (AST) SGOT	0-35 units/L	0 - 0.58 µkat / L	Large amounts in heart and liver, moderate amounts in muscle, kidney, and pancreas. ↑with MI and liver injury. Less liver specific than ALT.
Alanine transaminase (ALT) SGPT	0-35 units/L	0 - 0.58 µkat / L	From heart, liver muscle, kidney, pancreas. ↑ negligible unless parenchymal liver disease. More liver specific than AST.
Alkaline phosphatase (ALP)	30-120 units/L	0.5-2.0 µkat/L	Large amounts in bile ducts, placenta, bone. ↑ in bile ductobstruction, obstructive liver disease, rapid bone growth (e.g. Paget disease), pregnancy.
Serum Bilirubin Total	0.0-1.2 mg / dL	0 – 17 µmol / L	Breakdown product of hemoglobin, bound to albumin, conjugated in liver. Total bilirubin includes direct (conjugated) and indirect bilirubin. ↑ with hemolysis, cholestasis, liver injury.
Serum Bilirubin Direct	0.0-0.3 mg / dL	0 – 5.1 µmol / L	
Serum Bilirubin Indirect	0.0-1.0 mg / dL	0 – 12 µmol / L	
Thyroid Function Test			
Thyroid-stimulating hormone (TSH)	0.4-5µunits/mL	0.4-5 munits/L	↑ in primary hypothyroidism requires exogenous thyroid supplementation. ↓in hyperthyroidism.
Serum FT4	4.5-11.5 µg/dL		↑T4 levels typically indicate hyperthyroidism or Thyrotoxicosis. ↓T4 levels typically indicate hypothyroidism.
Serum FT3	75-200 ng/dL		↑T3 levels typically indicate hyperthyroidism. ↓T3 levels typically indicate hypothyroidism.
Lipid Profile			
Cholesterol	<200 mg/dL	<5.2 mmol/L	Desirable = Total <200; ↑ levels increase the risk of heart diseases
Low density Lipoprotein (LDL)	70-160 mg/dL	<4.13 mmol/L	↑ levels increase the risk of heart diseases, diabetes, and stroke. This is one of the reasons for formation of plaque in the arteries.
High density Lipoprotein (LDL)	>50 mg/dL >40 mg/dL	>1.29 mmol/L >1.03 mmol/L	Known as complete cholesterol test. ↓levels increase the risk of heart diseases,

			diabetes, and stroke.
Triglycerides (fasting)	<150 mg/dL	<1.70 mmol/L	↑levels increase the risk of heart diseases, diabetes, and stroke. ↑ by alcohol, saturated fats.

Table 4:Reference values for Tests associated with Cardiac disorders:

Laboratory Test	Normal Reference Values		Comments/ Significances
	Conventional units	SI units	
Creatine kinase Male Female	 20-170 IU/L 30-220 IU/L	 0.33-2.83 µkat/L 0.5-3.67 µkat/L	Present in high energy tissues like brain, skeletal muscle, myocardium.↑by IM injections, MI, acute psychotic episodes, isoenzyme in skeletal muscle, brain and myocardium.
Lactate dehydrogenase	100-250 IU/L	1.67-4.17 µkat/L	High in heart, kidney, liver, and skeletal muscle. Five isoenzymes:LDH1 and LDH2 mostly in heart,LDH5 mostly in liver and skeletal muscle. LDH3 and LDH4 are nonspecific. ↑ in malignancy, extensive burns, pulmonary embolism, and renal diseases.
C-reactive protein (CRP)	0 – 2.0 mg / dL	0 – 16 mg/L	Nonspecific indicator of acute inflammation. Similar to ESR, but more rapid onset and greater elevation. CRP >3 mg/dL increases risk of CVS disease.

Table 5: Reference Values Showing Electrolytes in blood and Renal Function Tests:

Laboratory Test	Normal Reference Values		Comments/ Significances
	Conventional units	SI units	
Sodium	135 - 145mEq / L	135-147 mmol/L	Low level is usually caused by excess water and is treated with water restriction. Increased levels observed in dehydration, diabetes insipidus, significant renal and GI losses.
Potassium	3.5 - 5mEq / L	3.5-5 mmol/L	↑with renal dysfunction, acidosis, K-sparing diuretics, haemolysis, burns, crush injuries, by diuresis, alkalosis, severe vomiting and diarrhoea, heavy nasogastric suctioning.
Chloride	95 – 110mEq / L	95-110 mmol/L	Important for acid-base balance. by GI loss of chloride-rich fluid(vomiting, diarrhoea, GI suction, intestinal fistulas, over diuresis).
BUN(Blood Urea Nitrogen)	8 – 20mg / dL	2.8-7.1 mmol/L	End product of protein metabolism, produced by liver, transported in blood, excreted renally. ↑ in renal dysfunction, high protein intake, upper

			Gl bleeding, volume contraction.
Creatinine	0.6–1.2 mg/dL	53–106μmol/L	Major constituent of muscle; rate of formation constant; affected by muscle mass (lower with aging); excreted renally.↑ in renal dysfunction. Used as a primary marker for renal function (GFR).
Creatinine clearance	90–130 mL/minute	1.5–2.16mL/sec	Reflects GFR; ↓ in renal dysfunction. Used to adjust dosage of renally eliminated drugs.
Estimated GFR	90–120 mL/ minute/1.73 m^2	NA	Possibly a more accurate reflection of renal function than CrCl. Still influenced by muscle mass.
Glucose (fasting)	65 – 115mg / dL	3.6-6.3 mmol/L	↑ in diabetes or by adrenal corticosteroids.
Calcium—total	8.6 - 10.3mg / dL	2.2-2.74 mmol/L	Regulated by body skeleton redistribution, parathyroid hormone, vitamin D, calcitonin. Affected by changes in albumin concentration.↓ in hypothyroidism, loop diuretics, vitamin D deficiency; ↑ in malignancy and hyperthyroidism.
Calcium—unbound	4.5–5.6 mg/dL	1.13–1.4 mmol/L	Physiologically active form. Unbound "free" calcium remains unchanged as albumin fluctuates. Total calcium ↓ when albumin ↓.
Magnesium	1.3 - 2.2mEq / L	0.65-1.1 mmol/L	↓ in malabsorption, severe diarrhea, alcoholism, pancreatitis, diuretics, hyperaldosteronism (symptoms of weakness, depression, agitation, seizures, hypokalemia, arrhythmias). ↑ in renal failure and hypothyroidism, and with magnesium-containing antacids.
Phosphate (Inorganic)	2.5–4.5 mg/dL	0.8–1.45 mmol/L	↑ in renal dysfunction, hypervitaminosis D, hypocalcemia, hypoparathyroidism. ↓ with excess aluminum antacids, malabsorption, renal losses, hypercalcemia, refeeding syndrome.
Uric acid	3-8 mg/dL	<0.42 mmol/L	↑in gout, neoplastic, or myeloproliferative, disorders, and with drugs (diuretics, niacin, low-dose salicylate, cyclosporin).

Urinalysis: It includes physical, chemical and microscopic evaluations to assist with the diagnosis not only in urological conditions but also in certain infections or altered physiology.

Gross appearance of the urine sample: The concentrated morning first urine sample is usually analysed (Eliminates dilution effects due to water intake)

Table 6: Showing examination of urine.

Category	Normal	Abnormal
Colour	Slightly yellow (depends on degree of dilution)	Red: Presence of blood, porphyria or ingestion of phenolphthalein. Brown: Presence of acid hematin of blood or melanin pigments.
Appearance	Clear	Cloudy: Presence of bilirubin, blood, porphyrins, proteins, food, or drug colourings. Discoloured: Abnormal.
pH	4.5-8 (mostly acidic)	Alkaline: An aged sample, metabolic alkalosis, failure of renal acidifying mechanism or infection in the urinary tract.
Specific gravity	1.003-1.030	A value of 1.010 or less indicates relative hydration, whereas a value greater than 1.020 indicates relative dehydration.
Proteins	Healthy adults excrete 30-130 mg/day of protein into the urine.	Presence greater than this indicates renal injury. Some nonrenal causes are also tested like, CHF, seizures or febrile illnesses.
Microscopic examination (sample examined for RBCs, WBCs, casts, yeast, crystals, and epithelial cells)	RBCs- not present WBCs- virtually absent Casts- not present Crystals- not present	Presence of RBCs indicates bleeding or clotting disorders, collagen diseases, and bladder, urethral and prostatic conditions. WBCs presence indicates acute infection of urinary tract. RBC casts indicate glomerular injury. WBC casts indicate tubular or interstitial injury. Lipid casts with proteinuria indicates nephrotic syndrome or hypothyroidism. Crystals appears in cloudy urine, pH dependent. If urine is acidic then crystals are of uric acid or calcium oxalate. If urine is alkaline the crystals are of phosphates.

References:

i. Laboratory data, Clinical Pharmacy and Therapeutics 6th edition - Cate Whittlesea and Karen Hodson, Elsevier publication, Page no 81-104

ii. Basic skills in interpreting laboratory data 5th edition by Mary lee -American Society of Health System Pharmacists Inc.

iii. A Textbook of Clinical Pharmacy Practice - Essential concepts and skills - Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata. Orient Longman Pvt. Ltd. Hyderabad.

iv. Handbook of Applied Therapeutics, 9th edition, by Burgunda Sweet, Wolters Kluwer publication, Page no. 5-15

v. A Comprehensive Guide To Normal Lab Values GlobalRPH

Experiment No. 12
Interpretation of Laboratory Report

1. Aim:

To interpret the given laboratory reports for optimization of drug therapy:Case-1.

2. Practical Significance:

Laboratory findings can be helpful in assessing clinical disorders, establishing a diagnosis, assessing drug therapy, or evaluating disease progression. Laboratory values must be assessed in the context of the clinical situation. They should not be evaluated in isolation of the subjective and objective findings. Laboratory error should always be considered when laboratory results do not correlate with clinical expectations. Clinicians should use the normal reference values listed by their own laboratory facility rather than those published in reference texts, because laboratories may use different methods of assay. The importance of understanding the principles for selecting and ordering the most rational laboratory test(s) on a specific patient is heightened in the current age of managed care, medical necessity, and outcome-oriented medicine. In this practical, the student will be able to interpret the given laboratory reports and choose appropriate drug therapy, and optimize the drug therapy.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Select the most appropriate Laboratory test based on signs and symptoms.	CO2	BTL2
2	Compare the clinical laboratory test with normal reference values	CO2	BTL2
3	Interpret Laboratory reports for effective diagnosis of disease or patient recent condition.	CO2	BTL3
4	Optimize the drug therapy by evaluating the literature.	CO2	BTL4
5	Collaborate and communicate with fellow colleagues	CO2	BTL6

4. Relevant Theoretical Background:

Laboratory reports: The serum, urine, and other fluids of patients can be tested in clinical laboratory to obtain relevant data with subjective and objective of the patient. However, laboratory tests should be ordered only if the results of the tests will affect decisions about the therapeutic management of the patient. Certain laboratory data gives direct identification of diseased condition whereas, some are indirect measures and required to be correlate with the signs and symptoms of the patient. Compare the specimen test results with normal reference values to interpret clinical laboratory reports for the diagnosis or evaluating disease progression.

5. Resources Required:

Patient Laboratory reports, Subjective and Objective notes of the patient, Normal reference range and online resources to interpret results, access to the internet.

6. Resources used:

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7. Precautions to be taken:

- Verify clinical laboratory reports are performed in licensed laboratory or not.
- The clinicians must also evaluate the result from the knowledge of biological variation and be aware of the potential risk of false interpretation.
- Always compare the reference values and units given in the reports.

8. Procedure:

Follow the five-steps systematic approach guidelines to interpret the laboratory reports and provide the information to requester.

Step 1: Obtain the laboratory reports

Step 2: Compare the laboratory data with the reference range and check the units critically.

Step 3: Conduct an Efficient Search Using Available References.

Key websites are: i. http://www.mayomedicallaboratories.com/mobile-apps/

ii. http://www.merkmanuals.com/professional/appendixes/normal laboratory values/normal laboratory- values

iii. A Comprehensive Guide To Normal Lab Values Global RPH

Step 4: Correlate it with the patient's condition

Step 5: Select the drug therapy and optimize it.

Case: Miss ABC is a 26-year-old woman, previously fit and well, admitted with a 2-dayhistory of shaking chills, accompanied by a high fever and pain in the joints and muscles including flank pain, which is made worse on movement. She also complains of nausea, loss of appetite and headache. On examination:

- Temperature = 38.5°C
- Urinalysis – signs of frank haematuria, and unpleasant odour
- Serum creatinine = 136 micromol/L (normal range 65–115 micromol/L)
- serum urea = 8.4 mmol/L (normal range 3.0–6.5 mmol/L).

The doctor ordered a full set of blood tests, including U&E, full blood count, blood cultures, urine sample for urinalysis and culture, and a renal ultrasound. A diagnosis of acute bacterial pyelonephritis was made, which was later confirmed when urine culture grew *Escherichia coli.*

Miss ABC is prescribed ciprofloxacin, initially 400 mg twice daily by intravenous infusion, converting after 48 hours to a dose of 500 mg twice a day orally for a total of 14 days' treatment.

9. Response:

Interpretation of Laboratory reports:

Step 1: Laboratory values obtained from report

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Step 2: Compare Laboratory values with reference values (Highlight only changed values in comparison with reference values)

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Step 3: Conducting an efficient search using available references.

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Step 4: Correlation between Laboratory findings and patient condition.

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Step 5: Optimize drug therapy: (If treatment is given then optimize the drug and doses as per condition. If treatment is not given then select the appropriate drug therapy and optimize it).

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10. Result:

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11. Conclusion:

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12. References:

i. https://acutecaretesting.org/en/articles/diagnostic-accuracy--part-2brpredictive-value-and-likelihood-ratio
ii. A Comprehensive Guide To Normal Lab Values Global RPH
iii. Pharmacy case studies by S. Dhillon and Rebekah Raymond Published by the PhP Press An imprint of RPS Publishing.

13. Practical related questions :

a. Give the advantages or benefits of performing clinical laboratory tests.
b. How Laboratory tests are helpful for the diagnosis of disease and monitoring of drug therapy?
c. Discuss the importance of Good Laboratory practices (GLP).
d. Name any two diseases and suggest laboratory tests for the diagnosis of these diseases.
e. Which laboratory test would you recommend, if the patient suffers from fever with chills?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 13
Interpretation of Laboratory Report

1. Aim:

To interpret the given laboratory reports for optimization of drug therapy: Case-2.

2. Practical Significance:

Laboratory findings can be helpful in assessing clinical disorders, establishing a diagnosis, assessing drug therapy, or evaluating disease progression. Laboratory values must be assessed in the context of the clinical situation. They should not be evaluated in isolation of the subjective and objective findings. Laboratory error should always be considered when laboratory results do not correlate with clinical expectations. Clinicians should use the normal reference values listed by their own laboratory facility rather than those published in reference texts, because laboratories may use different methods of assay. The importance of understanding the principles for selecting and ordering the most rational laboratory test(s) on a specific patient is heightened in the current age of managed care, medical necessity, and outcome-oriented medicine. In this practical, the student will be able to interpret the given laboratory reports and choose appropriate drug therapy, and optimize the drug therapy.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Select the most appropriate Laboratory test based on signs and symptoms.	CO2	BTL2
2	Compare the clinical laboratory test with normal reference values	CO2	BTL2
3	Interpret Laboratory reports for effective diagnosis of disease or patient recent condition.	CO2	BTL3
4	Optimize the drug therapy by evaluating the literature.	CO2	BTL4
5	Collaborate and communicate with fellow colleagues	CO2	BTL6

4. Relevant Theoretical Background:

Laboratory reports: The serum, urine, and other fluids of patients can be tested in clinical laboratory to obtain relevant data with subjective and objective of the patient. However, laboratory tests should be ordered only if the results of the tests will affect decisions about the therapeutic management of the patient. Certain laboratory data gives direct identification of diseased condition whereas, some are indirect measures and required to be correlate with the signs and symptoms of the patient. Compare the specimen test results with normal reference values to interpret clinical laboratory reports for the diagnosis or evaluating disease progression.

5. Resources Required:

Patient Laboratory reports, Subjective and Objective notes of the patient, Normal reference range and online resources to interpret results, access to the internet.

6. Resources used:

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7. Precautions to be taken:

- Verify clinical laboratory reports are performed in licensed laboratory or not.
- The clinicians must also evaluate the result from the knowledge of biological variation and be aware of the potential risk of false interpretation.
- Always compare the reference values and units given in the reports.

8. Procedure:

Follow the five-steps systematic approach guidelines to interpret the laboratory reports and provide the information to requester.

Step 1: Obtain the laboratory reports

Step 2: Compare the laboratory data with the reference range and check the units critically.

Step 3: Conduct an Efficient Search Using Available References.

Key websites are: i. http://www.mayomedicallaboratories.com/mobile-apps/

ii. http://www.merkmanuals.com/professional/appendixes/normal-laboratoryvalues/normalaboratory- values

iii. A Comprehensive Guide To Normal Lab Values Global RPH

Step 4: Correlate it with the patient's condition

Step 5: Select the drug therapy and optimize it.

Case: Mrs. HJ, a 60-year-old woman, has been admitted to hospital following a number of falls. She is complaining of numbness and tingling in her legs and is having some difficulty walking. Mrs. HJ's daughter also mentioned that she has become a little confused recently. When the doctor examines her, he observes that she is pale and has glossitis. The doctor performs a blood count and the results are as follows:

Laboratory tests	Results	Normal Reference Values
WBC	4×10^9/L	($4.0–11.0 \times 10^9$/L)
RBC	2.5×10^9/L	($3.8–4.8 \times 10^9$/L)
Hb	7.2 g/dL	(12.0–15.0 g/dL)
Hct	0.28	(0.36–0.46)
MCV	110 fL	(83.0–101.0 fL)
MCH	34 pg	(27.0–32.0 pg)

A blood film is also done for Mrs HJ and this shows oval macrocytes, hypersegmental neutrophils, megaloblasts, anisocytosis and poikilocytosis.

Mrs HJ is prescribed Hydroxocobalamin injection. Dose: by intramuscular injection, pernicious anaemia and other macrocytic anaemias without neurological involvement, initially 1 mg three times a week for two weeks then 1 mg every three months.

9. Response:

Interpretation of Laboratory reports:

Step 1: Laboratory values obtained from report

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Step 2: Compare Laboratory values with reference values (Highlight only changed values in comparison with reference values)_____

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Step 3: Conducting an efficient search using available references.

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Step 4: Correlation between Laboratory findings and patient condition.

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Step 5: Optimize drug therapy: (If treatment is given then optimize the drug and doses as per condition. If treatment is not given then select the appropriate drug therapy and optimize it).

10. Result:

11. Conclusion:

12. References:

i. https://acutecaretesting.org/en/articles/diagnostic-accuracy--part-2brpredictive-value-and-likelihood-ratio
ii. A Comprehensive Guide To Normal Lab Values Global RPH
iii. Pharmacy case studies by S. Dhillon and Rebekah Raymond Published by the PhP Press An imprint of RPS Publishing Page. No. 218-231.

13. Practical related questions

a. Which of Mrs. HJ's results are out of range? Explain what the de-ranged results signify.
b. What signs and symptoms does Mrs. HJ have that could be attributed to herpernicious anaemia?
c. What is the difference between Iron deficiency Anaemia and Pernicious anaemia ?
d. Explain the terms glossitis, megaloblast, anisocytosis and poikilocytosis.
e. What is the cause of sickle cell anaemia?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Theory

Drug Interactions

Drug interaction can be defined as "the effects of drugs altered by another drug or food that is prior or concurrent administration with it". Or Drug interaction may be broadly defined as a change in either the duration or the magnitude of the pharmacological response or both of one drug by another one. The drug whose activity effected by such an interaction is called object drug and the agents which precipitate such an interaction are referred to as the precipitant.

The change may be harmful or it may result in enhancing or decreasing the effect of a drug. Thus, for example, useful interactions result when a drug that lowers cardiac output is combined with another which decreases peripheral vascular resistance to treat a patient hypertension. Likewise, concomitant use of probenecid with penicillin will increase the blood level of penicillin by decreasing its renal excretion. Interactions may be deliberately sought in treating tuberculosis, leprosy etc. or in treating morphine withdrawal with naloxone. Use of single antitubercular or antileprosy drug hastens development of resistance of the organism to the particular drug. There are various types of drug interaction based upon with whom drug interact.

Types of Drug interactions:

a. Drug-Drug interaction
b. Drug-Food interaction
c. Chemical Drug interaction
d. Drug Laboratory interaction
e. Drug-Disease interaction

Pharmacists play a valuable role in screening for interactions and advising on management when interactions occur. This may be at the patient's bedside, as part of the dispensing process or during the sale of a nonprescription medicine. A role of current and emerging importance is the detection of interactions between medicines and other pharmacologically active therapies, food, herbal and alternative remedies.

Frequently interacting drugs:

Clinically important drugs interactions are more likely with the following:

a) Drugs which have a narrow dose range for therapeutic action i.e. when minor changes in the concentration of a drug, results in either an abolition of effect or in profound toxicity, e.g. digoxin or lithium.
b) Drugs which can induce or inhibit enzymes.
c) Drugs which exhibit zero order kinetics. Such drugs show saturable metabolism and once saturated, any small change in the amount may lead to a marked alteration in plasma concentration e.g. phenytoin, theophylline
d) Drugs intended to be used for prolonged period and for which precise plasma concentration is desired e.g. oral contraceptives, antiepileptics, antiarrhythmics.
e) In severely ill patients.
f) In patients with impaired hepatic and renal function and in the elderly.

Classification of Drug-Drug Interactions: For convenience, the mechanisms of interactions can be subdivided into those that involve the Pharmaceutical, pharmacokinetics of a drug, and those that are pharmacodynamic.

1. Drug interaction occurring outside the body: During drug formulation, during in vitro mixing.
2. Pharmacokinetic interactions:
    a) Interaction at the site of absorption/GIT Absorption
    b) Interaction during distribution phase/Distribution alteration

c) Interaction during biotransformation/Metabolism or Biotransformation alteration
d) Interaction during excretion/Excretion alteration

3. Pharmacodynamics interaction:

1. **Drug interaction occurring outside the body:** During formulation and mixing of drugs: thiopentone and succinylcholine reacts chemically and therefore, should not be withdrawn in the same syringe. Heparin is incompatible with drugs like hydrocortisone, tetracycline and the sympathomimetics.

2. Pharmacokinetics interaction:

A. GIT Absorption: Drug interaction may reduce the total amount of drug absorbed. This reduces the therapeutic activity of the drug. Sometimes there is delayed absorption process and onset of action is prolonged. One oral drug may interfere with absorption of other drug in the G.I.T. by altering number of variables.

a. **pH:** Non-ionisable Drug (the more lipid soluble) and Acidic drug (low PH) is readily absorbed. If antacid is administered with acidic drug, it will raise the pH of GI content and inhibits the absorption. The enteric coated Bisacodyl (oral dosage form of laxative) should not be given with antacid or milk because increase in pH and cause disintegration of drug in stomach. Causing vomiting and irritation.

b. **Complexation:** Avoid tetracycline, fluoroquinolones (ciprofloxacin, and norfloxacin) with metal ions like Ca, Mg, Al, iron to avoid complexation which are poorly absorbed.

c. **Adsorption:** Antidiarrhoel mixtures contain the adsorbent like kaolin which adsorb the other medications, if administer decreases the absorption of these drugs.

d. **Change in GI motility:** Drugs like cathartics increases GI motility decrease absorption of drugs. Anticholinergic drug decreases GI motility resulting in increased absorption of drugs. Barbiturates reduce absorption of other drugs – e.g.
   i. The absorption of warfarin is inhibited by Hepatobarbitone.
   ii. Griseofulvin by Phenobarbitone.

e. **Food:** The presence of Food in stomach reduces the absorption of Drugs by binding with it, or by changing the PH of GI contents it reduces the dissolution rate of drug. Absorption of antibiotics in presence of food. Hence penicillin and Tetracycline Derivatives should be given 1 hr before meal or 2 hrs after meal. Some drug like Diazepam achieves higher serum level following food. Cimetidine needs slower absorption; hence it is advantageous to take it with meal.

f. **Inhibition of GI Enzyme:** Folic acid – phenytoin Interaction Phenytoin inhibits the enzyme intestinal conjugate which is responsible for conversion of poorly absorbed form of folic acid i.e. polyglutamate into readily absorbed form of folic acid. i.e. monoglutamate. This results into deficiency of Folic acid (Anaemia).

B. Distribution alteration:

a. **Displacement from Receptor or plasma protein binding Sites:** Upon introduction of a drug which can displace another drug bound extensively to plasma proteins, the plasma concentration of the former, may be raised even to a toxic level. The displaced drug is, however, available for biotransformation and excretion. Warfarin is about 98%bound to plasma protein and 2% is found free in plasma. Administration of another drug like Phenylbutazone which competes for the plasma protein binding sites can, therefore displace warfarin, raising its plasma concentration. Since it is the free unbound drug which is pharmacologically active such as interactions result in profound anticoagulant effect of warfarin.

b. **Displacement from tissue binding sites:** Quinidine can displace digoxin from the tissue (as also plasma) binding sites leading to an increase in concentration of free digoxin and, consequently lead to digoxin toxicity. Quinidine also impairs renal excretion of digoxin.

Bound Drug	Displacing Drug	Result
1. Tolbutamide	Salicylates; Phenylbutazone	Hypoglycemia
2. Warfarin	Salicylates; Clofibrate	Haemorrhage
3. Thiopentone	Sulphonamides	Prolong anaesthesia
4. Methotrexate	Sulphonamides	Agranolocytasis

C. Metabolism or Biotransformation alteration: Many drugs are metabolized by microsomal enzymes in liver. Metabolism, in most instances, changes a drug to a polar metabolite which can readily excrete.

a) Stimulation of metabolism: The agent or compound or drug increases the activity of hepatic microsomal enzymes and stimulate metabolism are called enzyme inducers.

Drug	Inducing agent	Result
1. Tolbutamide	Alcohol; Phenytoin; Rifampicin	Decreased hypoglycemia
2. Warfarin	Barbiturates, Glutethimide	Decreased anticoagulant effect
3. Oral Contraceptive	Rifampicin	Pregnancy
4. Quinidine	Phenytoin; Barbiturates	Reduced Quinidine level

b) Inhibition of Enzyme: The agent or compound or drug decreases the activity of hepatic microsomal enzymes and stimulate metabolism are called enzyme inhibitors.

Drug	Inhibiting agent	Result
1. Tolbutamide	Phenylbutazone	Hypoglycemia
2. Warfarin	Allopurinol; Nortryptiline	Increased anticoagulant effect Haemorrhage
3. Phenytoin	Isoniazid, Phenobarbitone	Phenytoin intoxication

D. Excretion Alteration: Changes in glomerular filtration rate, tubular reabsorption, pH of urine and tubular secretion can alter the renal clearance of a drug. Probenecid decreases the renal clearance of penicillin by competing with the same transport mechanism for secretion of penicillin by the renal tubules.

a) **Changes in urinary pH**:

Urine acidifiers increase the excretion of alkaline drugs and decrease the excretion of acidic drugs.

Urinary Acidifiers	Drugs whose excretion is enhanced in Acidic urine.
Ascorbic acid, PAS, Ammonium chloride, Calcium chloride, Phenylbutazone	Amphetamine, Fenfluramine, Quinidine, Pethidine, Procainamide

Urine alkalizers increase the excretion of acidic drugs and decrease the excretion of alkaline drugs.

Urinary Alkalizer	Drugs whose excretion is enhanced in Alkaline urine.
Sodium Citrate	Acyclovir, Cephalosporins, Penicillin and Thiazides

b) **Interferes with urine excretion**:

Primary drug	Drug Compete for excretion	Result
Indomethacin	Probenecid	Indomethacin Toxicity
Salicylates	Probenecid	Salicylate Toxicity
PAS	Probenecid	PAS Toxicity

Digoxin	Spironolactone	Digoxin Toxicity
Chlorpropamide	Phenylbutazone	Hypoglycemia
Methotrexate	Salicylates; Sulphonamide	Bone-marrow suppression

3. **Pharmacodynamics drug interactions:** Pharmacodynamic interaction results in an altered drug response due to an interaction between two or more drugs at the same receptor site, or involving the same organ or system. It involves interaction at pharmacodynamics aspect of the drug. There may be direct interaction between the drugs or drug effects or interaction at receptor level. This may enhance or inhibit the total effect.
   a. **Interaction enhancing the effect:** e.g. synergistic effect of trimethoprim and sulphamethoxazole. MAOI and sympathomimetic enhance sympathetic activity.
   b. **Interactions inhibiting the effect:** e.g. Acetylcholine and atropine by competitive antagonism oppose the action of each other. E.g. Alcohol and amphetamine have opposite effects on CNS.
   c. **Alteration of electrolyte levels:** Drugs which cause alterations in fluid and electrolyte balance may modify the responses of tissues to drugs. e.g. Diuretics losing potassium, may cause hypokalemia, inturn making the heart more sensitive to digitalis.
   d. **Drug interactions at receptor sites:**
      i. Drug interactions at same receptors: Drugs that act at the same receptor site, if prescribed together, may produce additive effects or antagonize one another; e.g. respiratory depression and other central effects of morphine are antagonized by nalorphine.
      ii. Drug interactions at different receptors: Drugs may interact on the same target organ, but at different receptor sites. E.g. Adrenaline activates the adenylcyclase system and causes an increase in cyclic 3-5 AMP which then acts as the mediator in a number of beta effects of adrenaline for relaxation of bronchial smooth muscles. Theophylline produces the same effect, an increase in cyclic 3-5 AMP, by inhibiting phosphodiesterase, and also causes bronchial smooth muscle relaxation. Thus, drugs that inhibit different enzymes may show synergistic effect.

Drug-Food interaction:

Interaction between foods and drugs can have profound influence on the effects of drugs. Such interactions are not always detrimental, but can be used to improve drug absorption or to minimize adverse effects. Most of these interactions occur through pharmacokinetic mechanism, i.e., reduced rate or extent of absorption, increased rate or extent of absorption, or through chemical/pharmacologic effects. These also include interaction of drug with herbal medicines and dietary supplements, e.g. ephedra is a stimulant that can cause hypertensive crises in patients taking monoamine oxidase inhibitors.

Food affects the absorption of the drug. It may be attributed to

1) Dilution of the drug
2) Adsorption or complexation of drug
3) The alteration of gastric emptying

Examples-

a) Food reduces the absorption of aspirin, isoniazide, tetracyclines, benzylpenicillin, amoxicillin, Ampicillin, levodopa and Rifampicin.

b) Food increases the absorption of hydralazine, nitrofurantoin, lithium citrate, riboflavin, carbamazepine, metoprolol, propanolol, spironolactone,

c) Iron absorption is reduced if food has been taken within the previous two hours. On the other hand, nausea is more likely if iron is taken on empty stomach so iron tablets are often given with food.

d) Nitrofurantoin is given with food to avoid GIT irritation.

e) Meals containing high fat increase the absorption of fat-soluble drug Griseofulvin. Fat containing drug increases degree of ionization of Griseofulvin, so increases its absorption.

f) The diuretic effect of tea takes place rapidly if given before meals but diuresis is delayed if it is given after food.

g) The absorption of nitrazepam, glibenclamide, metronidazole, oxazepam, theophylline is unchanged by food.

h) Monoamine oxidase (MAO) is an enzyme which breaks down catecholamine's such as norepinephrine. When the enzyme is inhibited, there are increased levels of norepinephrine in adrenergic neurons. Thus, MAO inhibitors are used as antihypertensive. Certain food like cheese, chocolate, alcoholic beverages, liver, yeast extract contain tyramine. Tyramine is metabolized by MAO. When the patient being treated by MAO inhibitors also take tyramine-containing food, tyramine reaches the systemic circulation causing severe hypertension.

i)Milk reduces absorption of tetracycline by forming an insoluble complex.

Steps involved in the identification of Drug-drug interactions:

Step 1: Identification of drugs used in treating conditions using the https://clinicaltrials.gov/(database), and literature data.

Step 2: Searching for potential DDIs that involved each drug identified in step 1 using the following drug interaction checkers: LexiComp, Medscape, and WebMD.

Step3: A systematic literature review to identify articles that reported adverse clinical outcomes and/ or ADRs related to DDIs among prescribed condition treatments and with co-administered drugs.

Step 4: Evaluation of whether the DDIs identified in step 3 could have been identified by using the tools listed in step 2.

Management of Drug Interactions:

It is the duty of the prescriber and pharmacist that they should have detailed knowledge of medicines, their side effects, drug interactions, or unexpected symptoms experienced by other patients in the past pharmacist should play an important role in the prevention, detection, and reporting of drug interactions

1. **Avoiding the combination or polypharmacy:** Sometimes drug classes are heterogeneous with regard to drug interactions that may cause high risk hence the drug combinations should be avoided.
2. **Adjust the dose of the object drug:** If possible, the dose of the object drug should be adjusted to ensure the safety of interacting drugs.
3. **Spacing dosing times to avoid the interaction:** Drug interaction can be avoided by adjusting the dosing time of administration of object drug and precipitant drug. Generally, the drug should be at least 2 h before or 4 h after the precipitant drug. In this way, the object drug can be absorbed into circulation before the precipitant drug appears.
4. **Monitoring for early detection:** Drug interactions should be monitored early through close laboratory or clinical monitoring before administration of drug combinations to check the drug interaction. Accordingly, changes in dosage can be made or drugs can be discontinued.

5. **Provide information on patient risk factors that increase the chance of an adverse outcome:** On the basis of the clinical experience of physicians and pharmacists, most patients who take interacting drug combinations do not manifest adverse consequences. Substantial evidence from both the clinical experience of physicians and pharmacists as well as published studies suggests that the risk of statin-induced myopathy increases with increasing serum concentrations of the statin. Accordingly, it has been recommended that simvastatin should not exceed 20 mg daily in patients receiving verapamil concurrently.
6. **Improve computerized screening systems:** Since the computerized drug interaction screening systems are not proven to be successful it is necessary to improve their computerized screening systems.
7. **Excessive number of drug interactions on the systems:** The computerized drug interaction screening systems detect a large number of DDIs which are difficult to recognize and hence do not have clinical significance.
8. **Drug class differences not handled correctly:** Almost all drug classes interact heterogeneously, because individual members of a drug class are often not metabolized by the same cytochrome P450 isozymes or ABC (ATP-binding cassette) transporters as other members of the class. The statins are a good example, because simvastatin and lovastatin are extensively metabolized by CYP3A4, atorvastatin is moderately metabolized by CYP3A4, fluvastatin is metabolized by CYP2C9, and pravastatin and rosuvastatin are not metabolized by cytochrome P450 isozymes. Thus, combining all members of this drug class together is rarely justified when considering drug interactions.

Current Indian Scenario of Drug Interactions and its Management:

The prescribing information for most drugs contains a list of potential drug interactions. Many of the listed interactions may be rare, minor, or only occur under specific conditions and may not be important. Drug interactions that cause important changes in the action of a drug are of the greatest concern.

Drug interactions are complex and chiefly unpredictable. A known interaction may not occur in every individual. This can be explained because there are several factors that affect the likelihood that a known interaction will occur. These factors include differences among individuals in their; genes,physiology,age,lifestyle (diet, exercise),underlying diseases, drug doses, the duration of combined therapy, andthe relative time of administration of the two substances (Sometimes, interactions can be avoided if two drugs are taken at different times).

Management:

1. Consult your primary health care physician or pharmacist before beginning any new prescription or over-the-counter medication.
2. Read the patient information leaflet that was given to you at the drugstore.
3. Look for any cautions on the labels of your drugs, especially the "Drug Interaction Precaution."
4. Please read the following warnings carefully.
   a. Make a list of all of your prescription and over-the-counter medications, as well as vitamins and supplements.
   b. Discuss this list with all of your healthcare professionals, as well as your pharmacist.
   c. If at all feasible, get all of your prescription and over-the-counter medications from the same pharmacy.
5. Some Useful Internet Web Resources
   a. www.drugs.com/fda-consumer

b. Medline Plus
c. MIMS interaction checker

References:

i. A Textbook of Clinical Pharmacy Practice - Essential concepts and skills -Parthasarathi G,K Nyfort-Hansen and M Nahata. Orient Longman Pvt. Ltd.Hyderabad Page no. 228-252.
ii. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2964764/#:~:
iii. Baxter, Karen, and Claire L. Preston, eds. Stockley's drug interactions. Vol. 495. London: Pharmaceutical Press, 2010.

Experiment No. 14
Drug-Drug Interaction

1. Aim:

To identify the type of drug-drug interaction in the given Case-1.

2. Practical Significance:

A drug interaction occurs whenever the diagnostic, preventive or therapeutic action of a drug is modified in or on the body by another exogenous chemical or drug or food. Now a days the availability of number of drugs are increases in market and that increases the risk of drug interaction. Pharmacist will be able to identify suspected adverse interactions should be reported to the appropriate regulatory authority as for other adverse drug reactions. In this experiment, the students will learn to identify and manage the drug-drug interaction.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Define Drug-Drug Interaction	CO5	BTL1
2	Explain various mechanism of drug-drug interaction	CO5	BTL2
3	Identify and classify the drug-drug interaction.	CO5	BTL3
4	Manage the drug-drug interactions safely.	CO5	BTL5
5	Collaborate and communicate with fellow colleagues	CO5	BTL6

4. Relevant Theoretical Background:

Drug interaction may be broadly defined as a change in either the duration or the magnitude of the pharmacological response or both of one drug by another one. Drug interactions can cause significant patient harm and are an important cause of morbidity. The Most clinically important drug interactions occur as a result of either decreased drug activity with diminished efficacy or increased drug activity with exaggerated or unusual effects.

Drug interaction may be pharmacokinetic or pharmacodynamic. Appropriate identification of drug interactions is necessary. Drug interaction can be prevented by avoiding polypharmacy, by adjusting dose, by changing route and time of administration or using computerized screening system for object drug and preparatory drug.

5. Resources Required:

Drug interaction checkers such as LexiComp, Medscape, WebMD, ClinicalTrials.gov database,drugs.com and literature data.

6. Resources used:

_____

_____

7. Precautions to be taken:

- Read the case critically and categories it.
- Recognize the strategies to be applied for the prevention of drug-drug interaction.
- Use the appropriate drug interaction checkers and database.

8. Activity:

Read the following case, fill the following information and state the type of drug interaction in the conclusion.

Case: A 32 year old mother of two children weighing 58 kg was taking oral contraceptives pill containing Levonorgestrel 0.15 mg and Ethinylestradiol 30 µg for day cyclically (3 week treatment- 1 week gap).

She developed fever with cough and was diagnosed as a case of pulmonary tuberculosis after sputum smear examination. She was put on Isoniazid (300 mg) + Rifampin (600 mg) + Pyrazinamide (1.5 g)+ Ethambutol (1 gm) daily for 2 months, followed by Isoniazid (600 mg) + Rifampin (600 mg) thrice weekly.

In the 3rd month she failed to have the menstruation during the gap period of contraceptive cycle. After 10 days her urinary pregnancy test was found to be positive.

9. Drug-Drug interaction Identification and response:

Patient's History

_____

_____

_____

Previous treatment (if any)

_____

_____

_____

Prescribed medication

_____

_____

_____

Possible Drug interaction (What could be the reason for failure of the oral contraceptives?)

_____

_____

_____

_____

Preventive measures to be taken:

_____

_____

_____

Advice for management of Drug interaction (if any):

_____

_____

Identify the type of drug interaction: (Pharmacokinetics/Pharmacodynamic)

_____

10. Result:

_____

_____

11. Conclusion:

It can be concluded that the drug-drug interaction in the given case was _____(Pharmacokinetics/Pharmacodynamic).

12. References:

i. A Textbook of Clinical Pharmacy Practice - Essential concepts and skills -Parthasarathi G,K Nyfort-Hansen and M Nahata. Orient Longman Pvt. Ltd.Hyderabad Page no. 228-252.

ii. Baxter, Karen, and Claire L. Preston, eds. Stockley's drug interactions. Vol. 495. London: Pharmaceutical Press, 2010.

13. Practical related questions :

a. Define Drug-Drug interaction. Enlist the types of Drug interactions.

b. How the drug interaction occurs at the site of absorption? Discuss with example.

c. Give the useful resources for studying drug-drug interaction.

d. Give the factors responsible for drug interaction.

(Space for Answers)

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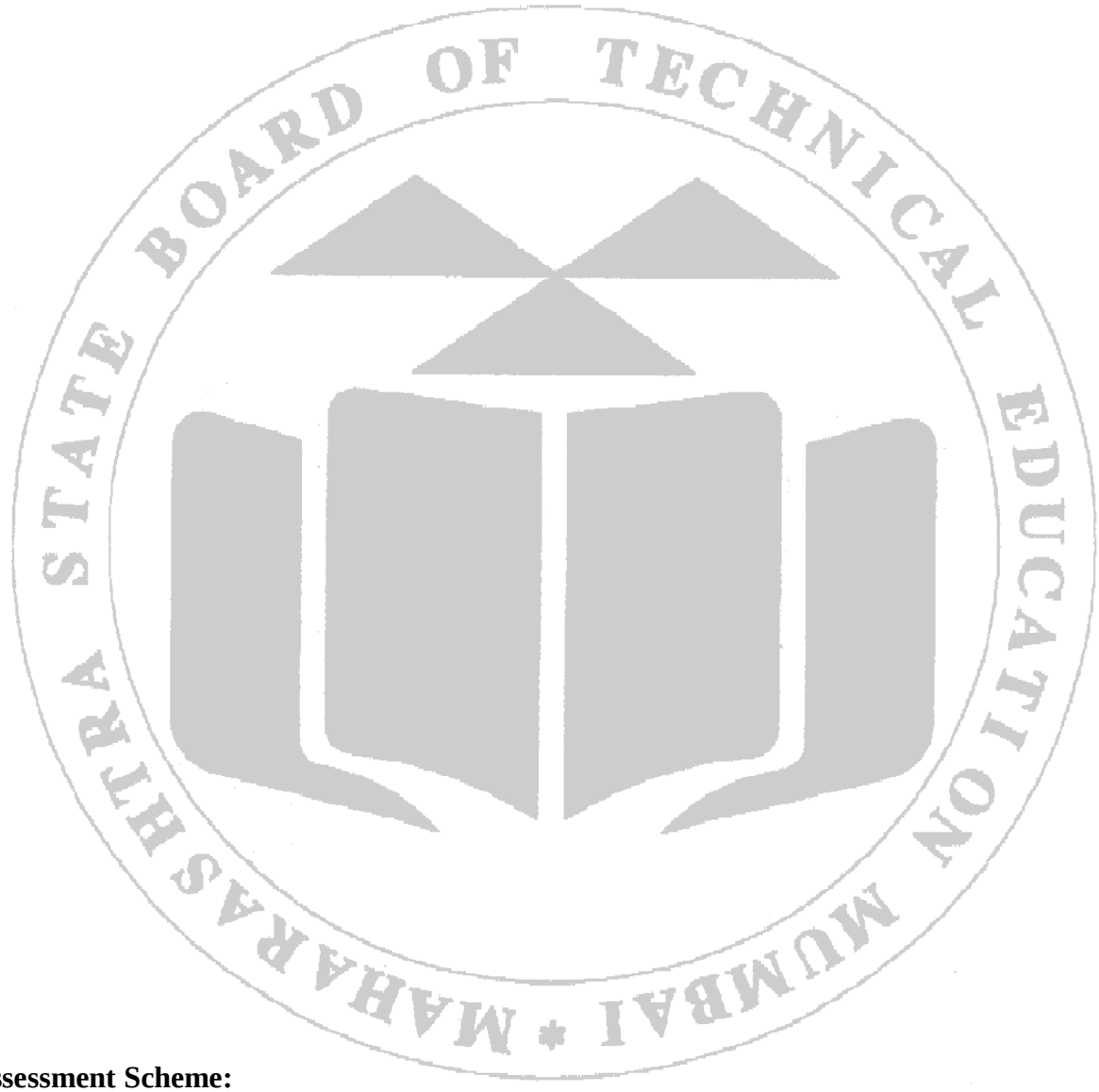


14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 15
Drug-Drug Interaction

1. Aim:

To identify the type of drug-drug interaction in the given Case-2.

2. Practical Significance

A drug interaction occurs whenever the diagnostic, preventive or therapeutic action of a drug is modified in or on the body by another exogenous chemical or drug or food. Now days the availability of number of drugs are increases in market and that increases the risk of drug interaction. Pharmacist will be able to identify suspected adverse interactions should be reported to the appropriate regulatory authority as for other adverse drug reactions. In this experiment, the students will learn to identify and manage the drug-drug interaction.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Define Drug-Drug Interaction	CO5	BTL1
2	Explain various mechanism of drug-drug interaction	CO5	BTL2
3	Identify and classify the drug-drug interaction.	CO5	BTL3
4	Manage the drug-drug interactions safely.	CO5	BTL5
5	Collaborate and communicate with fellow colleagues	CO5	BTL6

4. Relevant Theoretical Background:

Drug interaction may be broadly defined as a change in either the duration or the magnitude of the pharmacological response or both of one drug by another one. Drug interactions can cause significant patient harm and are an important cause of morbidity. The Most clinically important drug interactions occur as a result of either decreased drug activity with diminished efficacy or increased drug activity with exaggerated or unusual effects.

Drug interaction may be pharmacokinetic or pharmacodynamic. Appropriate identification of drug interactions is necessary. Drug interaction can be prevented by avoiding polypharmacy, by adjusting dose, by changing route and time of administration or using computerized screening system for object drug and preparatory drug.

5. Resources Required:

Drug interaction checkers such as LexiComp, Medscape, WebMD, ClinicalTrials.gov database, drugs.com and literature data.

6. Resources used:

_____

_____

7. Precautions to be taken:

- Read the case critically and categories it.
- Recognize the strategies to be applied for the prevention of drug-drug interaction.
- Use the appropriate drug interaction checkers and database.

8. Activity:

Read the following case, fill the following information and state the type of drug interaction in the conclusion.

Case: A 48-year-old man with depression and panic disorder was maintained on tab Fluoxetine 20 mg once daily for the last 6 months. He came across a car accident and hence his physician prescribed Tramadol tab 100 mg twice a day to manage severe pain. After taking tramadol for two

days patient feels agitation or restlessness, insomnia, confusion, rapid heart rate and high blood pressure, loss of muscle coordination, or twitching muscles.

9. Drug-Drug interaction Identification and response:

Patient's History

_____

_____

_____

Previous treatment (if any)

_____

_____

_____

Prescribed medication

_____

_____

_____

Possible Drug interaction (What could be the reasons for the above-stated signs and symptoms?)

_____

_____

_____

_____

Preventive measures to be taken

_____

_____

_____

Advice for management of Drug interaction (What could be the reasons for the above-stated signs and symptoms?)

_____

_____

Identify the type of drug interaction: (Pharmacokinetics/Pharmacodynamic)

_____

10. Result:

_____

_____

11. Conclusion

It can be concluded that the drug-drug interaction in the given case was _____(Pharmacokinetics/Pharmacodynamic).

12. References:

i. A Textbook of Clinical Pharmacy Practice - Essential concepts and skills -Parthasarathi G,K Nyfort-Hansen and M Nahata. Orient Longman Pvt. Ltd. Hyderabad Page no. 228-252

ii. https://sci-hub.se/https://doi.org/10.1002/ddr.10338

13. Practical related questions :

a. Give the difference between Pharmacokinetic and Pharmacodynamic drug-drug interaction.

b. Write any two examples of drug-food interaction with possible effects.

c. Discuss synergistic and antagonistic drug interactions with examples.

d. Identify the drug interaction between Sulphonylureas and Propranolol.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 16
Wound Dressing

1. Aim:

To perform wound dressing in knee injury Case-1.

2. Practical Significance:

Wound dressing is a term applied to wide range of materials used for dressing wound to promote healing and prevent further harm. Dressing wounds plays a crucial role in preventing infections, promoting healing, controlling pain and exudates, protecting and supporting the wound, enhancing patient comfort and autonomy, and ultimately enhancing the overall quality of life for patients with acute or chronic wounds. The risk to patient increases as wound dressing is not done properly. Therefore, it is crucial for healthcare providers to evaluate wounds, choose suitable dressing materials, and conduct wound dressing for preventing high risk to the patient. In this experiment, students will learn to evaluate wounds, select suitable dressing materials and perform wound dressing.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe the purpose and application of wound dressings for the patient.	CO4	BTL2
2	Select appropriate wound dressings for different type of wounds.	CO4	BTL5
3	Apply wound dressing properly.	CO4	BTL3
4	Follow ethics and cleanliness in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 A wound can be defined as an injury or disruption to anatomical structure and function resulting from simple or severe break in the skin.

4.2 Classification of wound

Wound can be classified on the basis of healing time, anatomical disruptions, Depth of injury.

4.2.1 Based on Healing time/duration

i. Acute: An acute wound is an injury to the skin that occurs suddenly rather than over time. It heals at a predictable time without complications.

ii. Chronic: A chronic wound develops when any acute wound fails to heal in the expected time frame, which might be a couple of weeks or up e.g. pressure, venous, diabetic, and arterial insufficiency ulcers, burn wound.

4.2.2 Based on anatomical disruption

i. Open wounds: An open wound is broken skin with exposed body tissue to the external environment. Thus, it is more prone to bacterial colonization. It can be classified as,

- **Incision or incised wound:** caused by a clean, sharp-edged object such as a knife, razor, or glass splinter resulting in clean straight cut.
- **Laceration:** irregular tearing of the skin that can be caused by some blunt trauma or tearing forces.
- **Abrasion (Scrape):** superficial wounds in which the topmost layer of the skin is scraped off caused by friction or scraping against a rough surface.
- **Avulsion:** injuries in which a body structure is forcibly detached from its normal point of insertion.
- **Puncture wound:** caused by sharp, pointed object puncturing the skin.

- **Penetration wound:** caused by an object i.e. a knife entering and coming out from the skin.
- **Gunshots:** caused by a bullet.

ii. Closed wounds: It is caused by damage to the internal tissue under intact skin. It includes, Hematomas(or blood tumor): caused by damage to a blood vessel that in turn causes blood to collect under the skin; Crush injury: caused by a great or extreme amount of force applied over a long period of time; Blister: caused by fluid fills a space between layers of skin.

4.2.3 Based on depth of injury

i. Penetrating wounds: these results from trauma that breaks through the full thickness of skin; reaching down to the underlying tissue and organs. It includes Stab wounds: trauma from sharp objects, such as knives; Skin cuts; Surgical wound: intentional cuts in the skin to perform surgical procedures; Gunshot wounds: wounds resulting from firearms.

ii. Non-penetrating wounds (Blunt trauma): It occurs due to friction with other surfaces, and may include Abrasions, Lacerations, Contusions: swollen bruises due to accumulation of blood and dead cells under skin; Concussions: damage to the underlying organs and tissue with no significant external wound.

4.3 Selection of Wound dressing

Selection is based on degree of exudation, presence of infection, presence of necrotic tissue, anatomical site and stage of repair. The ideal wound dressing should have ability to protect the wound from the environment, not adhere to the wound, maintain a moist environment, controlling exudates, protecting the surrounding skin, optimize patient compliance and minimize cost.

4.4 Classification of wound dressing

It is based on the contact with the wound; the dressing is categorized as a primary and secondary dressing. Primary dressings directly contact with the wound providing absorption of exudates, prevent infection and adhesion of secondary dressing to the wound. Secondary dressings placed over primary dressings providing further protection, absorptive capacity and compression to the primary dressing.

4.5 Types of wound dressings

4.5.1 Primary wound dressings

- **Gauze:** It is a cost effective dressing widely used at early stages of deeper wounds.
- **Films:** Used for shallow wounds, split-thickness skin graft donor sites, minor wounds, intravenous access sites, and secondary dressings.
- **Alginate:** Used for moderate to heavy exudative wounds.

4.5.2 Primary/Secondary wound dressings

- **Hydrogels:** Used for venous or arterial ulcers and surgical wounds; also prevent tissue desiccation.
- **Hydrocolloids:** Use these for pressure wounds and minimal to moderate exudative wounds.
- **Foams:** Use foam for moderate to heavy exudative and chronic wounds and pressure injuries.
- **Antimicrobial:** Used on superficially infected wounds or those with a high risk of infection.

4.5.3 Secondary wound dressings

Surgical cotton and gauze is used as secondary wound dressings.

5. Requirements:

Mannequin, Variety of wound dressings (e.g., gauze pads, adhesive tapes), Antiseptic solution, Disposable gloves, Cotton swabs, Scissors, Sterile saline solution, Waste bin for disposal of used materials

6. Requirements used:

_____

7. Precautions to be taken:

- Follow aseptic techniques while wound dressing.
- Use disposable gloves when handling wounds and dressing materials.
- Dispose of used materials properly to maintain cleanliness and prevent cross-contamination.
- Avoid using sharp objects near participants and ensure scissors are handled with care.

8. Demonstration Procedure:

The teacher must demonstrate the method of dressing a scraped knee injury with a gauze roller bandage/ triangular bandage using a mannequin or, alternatively, a student acting as a simulated patient. Additional support from YouTube videos can be used if needed. Below are the step-by-step instructions for wound dressing on a scraped knee injury.

1. Gather all necessary supplies and ensure a clean, well-lighted workspace.
2. Wash hands thoroughly with soap and water, and wear sterile hand gloves.
3. Assess the wound, noting its size, depth, and any signs of inflammation.
4. Gently remove any surface debris from the wounded region with cool, flowing water. Use tweezers if required.
5. Determine whether the wound contains any embedded objects.
6. Clean the wound using a gentle saline solution or wound cleanser, and pat dry with sterile gauze.
7. Apply a small layer of topical antiseptic cream, to the affected region gently.
8. Cover the bleeding wound with a sterile gauze pad. Ensure it covers the entire wound.
9. Secure the gauze pad with the help of adhesive tape or gauze roller bandage or triangular bandage (select suitable bandaging technique as given in experiment no.05)
10. Dispose of any used materials properly and wash hands again thoroughly.
11. Allow the wound to heal for 24 hours before removing the bandage to check for symptoms of infection or inflammation. If there is no infection, apply a new bandage to the scraped knee.
12. Repeat daily until the wound is totally healed.
13. Patient education: 1. If the wound scabs and adheres to the bandage as you try to remove it, bathe the region in warm water to assist ease the bandage off. 2. Pulling will remove the scab and postpone healing.

9. Activity (Role Play):

Patient: Mrs. ABC, 35-year-old female sustained a superficial abrasion on her knee while hiking. The wound is clean but requires dressing to protect it from dirt and irritation.

Role Play: One student acts as Mrs. ABC, describing the incident and her discomfort. Another student, playing the role of a healthcare provider, assesses the wound, cleans it gently, applies an appropriate dressing, bandage and instructs Mrs. ABC on wound care and dressing changes.

Following points consider before role play,

Cause of wound:_____

Type of wound (Acute/ chronic. Open/ closed):_____

Selection of wound dressing material (gauze pad/ Hydrogel):_____

Selection of bandage (Guaze roller bandage/ adhesive bandage/ triangular bandage):_____

Instruction to patient:_____

10. Result:

_____

_____

11. Conclusion:

_____

_____

12. References:

i. https://www.can-sim.ca/accessjama/wound-care-toolkit/#/ (Free Virtual simulation case studies)
ii. https://www.ncbi.nlm.nih.gov/books/NBK470199/
iii. Sanjay P Sonar et al. "A comprehensive review on wound dressing usage in clinical settings" International Journal of Surgery and Medicine.2021. 8(3):16-26.
iv. https://www.biosanas.com.br/uploads/outros/artigos_cientificos/39/fbd0ab65f32286644ee7c39a3d8557d2.pdf (Types of wound dressings)

13. Practical related questions :

a. What is wound and wound dressing?
b. Why wound dressing is require in wound treatment?
c. Write the difference between open and closed wound.
d. Name the various types of acute and chronic wounds.
e. What are the ideal properties of wound dressings?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 17
Wound Dressing

1. Aim:

To perform wound dressing in diabetic foot ulcer Case-2.

2. Practical Significance:

Wound dressing is a sterile material pad or compressed applied to a wound to promote healing and prevent further harm. Dressing wounds plays a crucial role in preventing infections, promoting healing, controlling pain and exudates, protecting and supporting the wound, enhancing patient comfort and autonomy, and ultimately enhancing the overall quality of life for patients with acute or chronic wounds. The risk to patient increases as wound dressing is not done properly. Therefore, it is crucial for healthcare providers to evaluate wounds, choose suitable dressing materials, and conduct wound dressing for preventing high risk to the patient. In this experiment, students will learn to evaluate wounds, select suitable dressing materials and perform wound dressing.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe the purpose and application of wound dressings for the patient.	CO4	BTL2
2	Select appropriate wound dressings for different type of wounds.	CO4	BTL5
3	Apply wound dressing properly.	CO4	BTL3
4	Follow ethics and cleanliness in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

Diabetic foot ulcers are among the most common complications of patients who have diabetes mellitus which is not well controlled. Infection, ulceration or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular diseases in the lower limb is called as Diabetic foot ulcer. It is the most common type of chronic ulcer.It affects about 18.6 million people worldwide. Approximately half of diabetic foot ulcers become infected, and about 20% of these infections result in amputation of part of the foot or the whole foot. It is an open wound on the foot. Ulcers commonly occur when bleeding (hemorrhage) develops under callus, then the callus wears away, exposing deeper tissue of foot. (Fig.17.1)

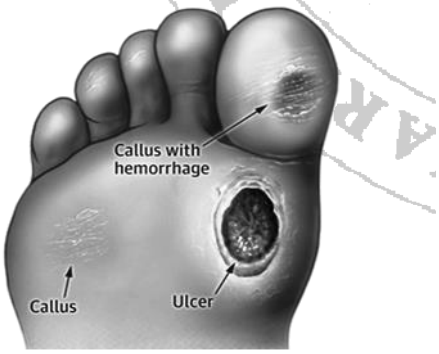


Fig. 17.1

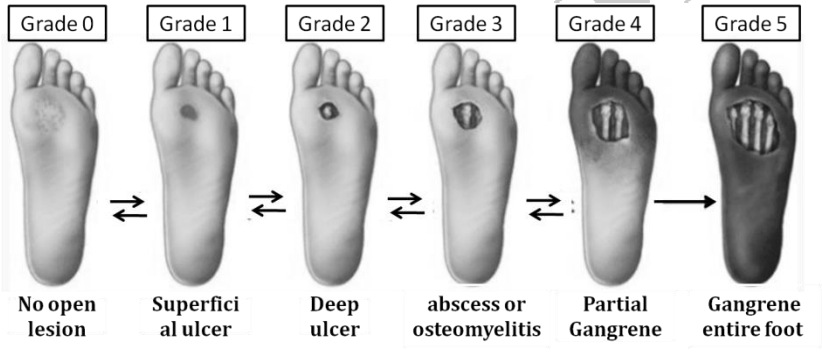


Fig. 17.2

Cause of diabetic foot ulcer:

Ulcers in people with diabetes are most commonly caused by: poor blood circulation, high blood sugar (hyperglycemia), nerve damage, wounds or injuries on foot.

Various stages of diabetic foot ulcer:

It classifies wounds into six grades based on the depth, (Fig. 17.2)

Grade 0	No open lesion
Grade 1	Superficial ulcer
Grade 2	Deep ulcer involving tendon bone or joint
Grade 3	Deep ulcer with abscess or osteomyelitis
Grade 4	Partial gangrene in foot
Grade 5	Gangrene involving the entire Foot

Treatment:

- Analyse the cause and stage of the foot ulcer before proceeding with the treatment.
- Surgical removal of callus and application of wound dressing that can help heal the wounds and inhibit bacterial growth.
- Antibiotic medication for infected ulcers.
- Use of protecting gear specially designed for people with foot ulcers. Such as: Shoes, compression wraps, foot braces or foot inserts.
- Foot bath and enzymes treatments
- Amputation of part or all of the foot (in severe cases)

5. Requirements:

Sterile gloves, Sterile saline solution, Sterile gauze pads or swabs, Wound dressings/ appropriate for diabetic foot ulcers (e.g., foam dressings, hydrocolloid dressings), Adhesive tape or bandages, Sterile ruler or measuring tool

6. Requirements used:

---

7. Precautions to be taken:

- Follow aseptic techniques while wound dressing.
- Dispose of used materials properly to maintain cleanliness and prevent cross-contamination.
- Avoid using harsh antiseptics or alcohol-based solutions for wound cleaning, as they can damage healthy tissue and delay healing.

8. Demonstration Procedure:

The teacher must demonstrate the method of dressing a diabetic foot ulcer with a roller bandage using a mannequin or, alternatively, a student acting as a simulated patient. Additional support from YouTube videos can be used if needed. Following are the step-by-step instructions for wound dressing on a diabetic foot ulcer.

1. Gather all necessary supplies and ensure a clean, well-lighted workspace.
2. Wash hands thoroughly with soap and water, and wear sterile hand gloves.
3. Carefully inspect the diabetic foot ulcer, noting its size, depth, and characteristics. Measure the dimensions of the ulcer using a sterile ruler.
4. Clean the ulcer and surrounding skin using a gentle saline solution or wound cleanser.
5. Select an appropriate wound dressing based on the characteristics of the ulcer such as size, depth, exudate level, and presence of infection (guaze roller bandage, foam dressings, hydrocolloid dressings).
6. Apply the selected dressing gently to the wound, ensuring it covers the entire ulcer and extends slightly beyond the wound margins.
7. Secure the dressing in place using adhesive tape or bandages, taking care not to apply too much tension (select suitable bandaging technique as given in experiment no.05)
8. Dispose of any used materials properly and wash hands again thoroughly.
9. Repeat daily until the wound is totally healed.
10. Patient education: 1. Provide the patient with education on diabetes management, foot care, and

lifestyle modifications to minimize the risk of future foot ulcers. 2. Emphasize the importance of maintaining good glycemic control, wearing suitable footwear, daily feet inspection, and try to obtain prompt medical attention for any signs of foot problems.

9. Activity (Role Play):

Patient: Mr. ABC, a 58-year-old male, presents to the clinic with a chief complaint of a non-healing ulcer on his right foot. He has a medical history significant for type 2 diabetes mellitus, diagnosed 15 years ago. Mr. ABC reports poor glycemic control in recent months and limited sensation in his lower extremities. He works as a delivery driver and spends long hours on his feet. Clinical Presentation: Upon examination, Mr. ABC's right foot reveals a 2 cm x 2 cm ulcer located on the plantar aspect of the metatarsal head. The ulcer appears shallow with surrounding erythema and moderate serosanguinous drainage. Sensation in the foot is diminished, and pulses are palpable bilaterally. Diagnosis: Based on clinical findings and medical history, Mr. ABC is diagnosed with a diabetic foot ulcer, likely secondary to peripheral neuropathy and poor glycemic control.

Treatment Plan:

Role Play: One student acts as Mr. ABC, describing the incident and his discomfort. Another student, playing the role of a healthcare provider, assesses the wound, cleans it gently, applies an appropriate dressing, bandage and instructs Mr. ABC on wound care and dressing changes.

Following points consider before role play,

Type of wound (Acute open/ chronic open/ Acute closed/ chronic closed):_____

Selection of wound dressing material (gauze pad/ Hydrogel/ foam/ Antimicrobial dressing):_____

Selection of bandage (Guaze roller bandage/ adhesive bandage/ triangular bandage):_____

Instruction to patient:_____

10. Result:

_____

_____

11. Conclusion:

_____

_____

12. References:

i. https://www.can-sim.ca/accessjama/wound-care-toolkit/#/ (Free Virtual simulation case studies)

ii. Remington-The science and practice of pharmacy.21st Ed. Vol. I/II. Lippincott Williams & Wilkins; 2006:2342-2348.

iii. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4127589/

iv. Armstrong DG, Tan TW, Boulton AJM, et al. Diabetic foot ulcers: a review. *JAMA.* 2023;330(1):62-75. doi:10.1001/jama.2023.10578

v. https://axiobio.com/diabetic-foot-ulcer-stages-and-treatment/

13. Practical related questions :

a. What is diabetic foot ulcer?

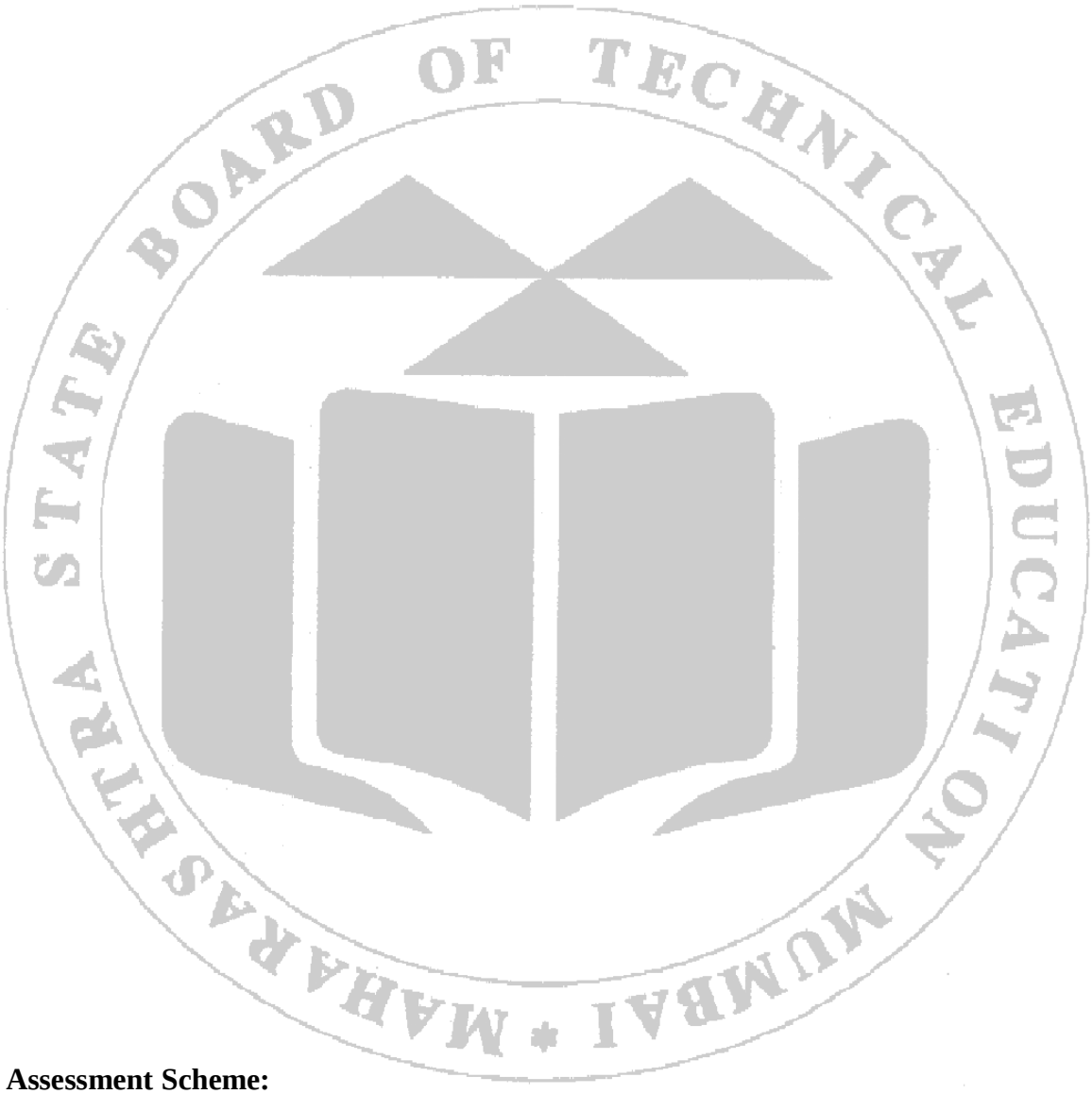
b. Which precautions should be taken by diabetic foot ulcer patient?

c. Write the difference between acute and chronic wound.

d. Name the various types of open and closed wounds.

e. Enlist the different wound dressing materials used in wound dressing.

(Space for Answers)



14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Theory

Adverse Drug Reaction Reporting and Casualty Assessment

WHO define adverse drug reaction is a response which is noxious and unintended, and which occurs at doses normally used in humans for the prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function.

Adverse drug reactions are classified into six types:

1. Type A dose-related (Augmented): It is a predictable reactions constitutes approximately 80% of ADRs, are usually a consequence of the drug's primary pharmacological effect e.g. bleeding from warfarin, Anticholinergic effects of tricyclic antidepressants and they are therefore predictable. They are dose-related and usually mild, although they may be serious or even fatal (e.g. intracranial bleeding from warfarin).

2. Type B non-dose-related (Bizarre): These reactions are not predictable from the drug's main pharmacological action, are not dose-related and are severe, with a considerable mortality.

3. Type C dose-related and time-related (Chronic): These reactions are due to long-term drug use (e.g. neuroleptic-related analgesic nephropathy).

4. Type D: time-related (Delayed): These reactions appear sometime after the use of a medicine (e.g. alkylating agents leading to carcinogenesis).

5. Type E withdrawal (End of use): These reactions are associated with the withdrawal of a medicine. Eg. withdrawal syndromes following discontinuation of treatment with benzodiazepines.

6. Type F: Failure of therapy.

ADRs are a major cause of morbidity, hospital admission and even death. Hence it is essential to recognize ADRs and to establish a causal relationship between the drug and the adverse events. It is difficult to track adverse drug reactions due to a vast population base. ADR reporting rate in India is below 1% as compare to world rate 5% due to lack of awareness about PV and ADR monitoring among healthcare providers and patients. It is important to monitor the safe use of medicine to improve public health through an effective pharmacovigilance (PV) system. PV is defined as the science and activities relating to the detection, assessment, understanding and prevention of adverse effects, or any other possible drug-related problems. The Pharmacovigilance Programme of India (PvPl) is coordinated by the Indian Pharmacopoeia Commission (IPC), Ghaziabad working as a National Coordination Centre (NCC). 150 ADR monitoring centres (AMCs) were established by IPC in various medical institutions/hospitals across India to monitor and collect ADR reports under PvPI.

Advice while filling ADR reporting Form:

- **What to report?**

  All adverse events should be reported Report non-serious, known or unknown, frequent or rare adverse drug reactions due to Medicines, Vaccines & Herbal Products. Report every serious adverse drug reactions. A reaction is serious when the patient outcome is: Death, Life-threatening, Hospitalization (initial or prolonged), Disability (significant, persistent or permanent), Congenital anomaly, Report intervention to prevent permanent impairment or damage. NOTE: Serious Adverse Event following immunization can also be reported in Serious AEFI case Notification Form available on http://www.ipc.gov.in

- **Who can report?**

  All healthcare professionals (Clinicians, Dentists, Pharmacists and Nurse etc.) can report adverse drug reactions.

- **Where to report?**
  Duly filled in Suspected Adverse Drug Reaction Reporting Form can be sent to the nearest Adverse Drug Reaction Monitoring Centre (AMC) or directly to the National Coordination Centre (NCC) for PvPI. Call on Helpline (Toll Free) 1800 180 3024 to report ADRs or directly mail this filled form to pvpi.ipc@gov.in; ADR Mobile App: "ADRPvPI". A list of nationwide AMCs is available at: http://www.ipc.gov.in, http://www.ipc.gov.in/PvPI/pv_home.html
- **What happens to the submitted information?**
  - Information provided in this form is handled in strict confidence. The causality assessment is carried out at AMCs by using WHO-UMC scale. The analyzed forms are forwarded to the NCC-PvPI through ADR database. Finally the data is analyzed and forwarded to the Global Pharmacovigilance Database managed by WHO Uppsala Monitoring Centre in Sweden.
  - The reports are periodically reviewed by the NCC-PvPI. The information generated on the basis of these reports helps in continuous assessment of the benefit-risk ratio of medicines.
  - The Signal Review Panel of PvPI reviews the data and suggests any interventions that may be required.
- **Mandatory fields for suspected ADR Reporting Form:** Patient initials, age at onset of reaction, reaction term(s), date of onset of reaction, suspected medication(s) & reporter information.
- **Confidentiality:** The patient's identity is held in strict confidence and protected to the fullest extent. Submission of a report does not constitute an admission that medical personnel or manufacturer or the product caused or contributed to the reaction. Submission of an ADR report does not have any legal implication on the reporter.

Casualty assessment:

It is defined as the evaluation of the possibility that a medicine was the causative agent of an observed adverse drug reaction.

Casualty assessment and severity of ADR is evaluated by standard algorithms and rating scales like "Naranjo algorithm" and "modified Hart wig scale". Casualty is assessed on the basis of:

- **Temporal relationship:** How the time-sequence of the ADR is related to drug administration? (Consider Timing between drug administration and the onset of adverse effects)
- **Previous knowledge:** Has the drug consistently caused this ADR in previous patients?
- **De challenge:** Does the adverse drug reaction disappear when the drug is discontinued?
- **Re challenge:** Does the adverse drug reaction reappear when the drug is administered again?

Assessed on the basis of the above criteria, casualty has been graded as:

1. **Definite/ Certain**: Casualty is proven
2. **Probable:** Though not proven, drug is responsible for ADR
3. **Possible:** Drug as well as other causes could be responsible for the ADR
4. **Doubtful:** Drug unlikely to be the cause but cannot be ruled out.

Assessment categories / Casualty grade	**Time sequence (Temporal relationship)**	**Drug consistently caused ADR in previous patients (Previous knowledge)**	**De challenge**	**Re challenge**
Definite	Yes	Yes	Yes	Yes
Probable	Yes	Yes	Yes	No
Possible	Yes	No	No	No
Doubtful	No	No	No	No

Solved Case Study:

Case: Mr. ABC, a 60-years old male patient admitted to hospital on 24/04/2024 with chief complaints of pain in upper abdomen and nausea since last 5 days. On physical examination, he had yellowish discoloration of palm, conjunctiva and nail bed. His weight was 70 kg. He had few episodes of psychotic attacks, for which he was on Chlorpromazine therapy since last 4 weeks.

On enquiry, he told that he was taking Tab. Largactil (Chlorpromazine) 100 mg, 4 tablets at bed time. He was also taking Tab. Diclofenac 50 mg twice-a-day (self-medication) for abdominal pain for three days before admitting to hospital.

He was investigated on the day of admission for laboratory parameters which are as follows: –

Alkaline Phosphatase: 180 U/L (Normal range: 25 – 100 U/L)

ALT: 205 U/L (Normal range: 10 – 40 Units/L)

Total Bilirubin: 5.0 mg/dL (Normal range: 0.8 – 1.2 mg/dL)

On admission, Chlorpromazine and Diclofenac therapy was stopped. After 7 days of stopping the medications, the intensity of pain decreased. Also, he was reinvestigated for above parameters which are as follows: –

Alkaline Phosphatase: 110 IU/L

ALT: 98 Units/L

Total Bilirubin: 1.8 mg/dL

Note: Tab. Chlorpromazine Brand Name: LARGACTIL, Manufacturer: Wedley labs Batch number: LAL0734, Expiry date: Dec 2026

Response: ADR reporting form of above case study filled on next page.

Casualty assessment:

Assessment categories / **Casualty grade**	**Time sequence (Temporal relationship)**	**Drug consistently caused ADR in previous patients (Previous knowledge)**	**De challenge**	**Re challenge**
Definite	Yes	Yes	Yes	Yes
Probable	**Yes**	**Yes**	**Yes**	**No**
Possible	Yes	No	No	No
Doubtful	No	No	No	No

As per the evaluation of casualty assessment ADR due to medicine is **probable**.

References:

i. https://who-umc.org/media/1079/jordan.pdf

ii. Amrita P., Simar P.S., Vineet K. Status of Adverse Drug Reaction Reporting by Health Care Professionals of Delhi. Indian Journal of Pharmacy Practice Volume 5 Issue 4 Oct - Dec, 2012. 42-50.

iii. Zaki SA. Adverse drug reaction and casualty assessment scale. Lung India. Vol 28 Issue 2: Apr-Jun 2011. 152-153.

Version 1.4

SUSPECTED ADVERSE DRUG REACTION REPORTING FORM

For **VOLUNTARY** reporting of ADRs by Healthcare Professionals

INDIAN PHARMACOPOEIA COMMISSION (National Coordination Centre-Pharmacovigilance Programme of India)

Ministry of Health & Family Welfare, Government of India, Sector-23, Raj Nagar, Ghaziabad-201002

PvPI Helpline (Toll Free) :1800-180-3024 (9:00 AM to 5:30 PM, Monday-Friday)

Initial Case ☐ ✔ Follow-up Case ☐

A. PATIENT INFORMATION *

1. Patient Initials: Mr ABC
2. Age or date of birth: 60
3. Gender: M ✔ F ☐ Other ☐
4. Weight (in Kg.) 70

B. SUSPECTED ADVERSE REACTION *

5. Event / Reaction start date (dd/mm/yyyy): 24/04/2024
6. Event / Reaction stop date (dd/mm/yyyy): 01/05/2024
7. Describe Event/Reaction management with details , if any

Patient was taking Chlorpromazine since 24/03/2024. He developed pain in abdomen and nausea since 19/04/2024. Examination revealed yellowish discoloration of conjunctiva, palm and nails. patient was admitted on 24/04/2024 and investigated. Liver function tests indicated raised serum bilirubin, ALT and alkaline phosphatase. Drugs were discontinued on 24/04/2024. On discontinuation of drug, reaction diminished in one week.

FOR AMC / NCC USE ONLY

Reg. No. / IPD No. / OPD No. / CR No. :

AMC Report No. :

Worldwide Unique No. :

12. Relevant investigations with dates :
24/04/2024: Alkaline Phosphatase: 180 U/L; ALT: 205 U/L ; Total Bilirubin: 5.0 mg/dL
30/04/2024: Alkaline Phosphatase: 110 IU/L; ALT: 98 Units/L;Total Bilirubin: 1.8 mg/dL

13. Relevant medical / medication history (e.g. allergies, pregnancy, addiction, hepatic, renal dysfunction etc.)

14. Seriousness of the reaction : No ☐ if Yes ✔ (*please tick anyone*)
☐ Death (dd/mm/yyyy) ☐ Congenital-anomaly
☐ Life threatening ☐ Disability
✔ Hospitalization-Initial/Prolonged ☐ Other Medically important

15. Outcome:
☐ Recovered ✔ Recovering ☐ Not Recovered
☐ Fatal ☐ Recovered with sequelae ☐ Unknown

C. SUSPECTED MEDICATION(S) *

S. No.	8. Name (Brand/ Generic)	Manufacturer (if known)	Batch No. / Lot No.	Expiry Date (if known)	Dose	Route	Frequency	Therapy Dates		Indication	Causality Assessment
								Date Started	Date Stopped		
i	Tab. Chlorpromazine (Largactil)	Wedley labs	LAL0734	Dec 2026	400 mg	Oral	OD	24/03/2024	24/04/2024	Psychosis	Probable
ii											
iii											
iv#											

9. Action taken after reaction (*please tick*)

S. No. as per C	Drug withdrawn	Dose increased	Dose reduced	Dose not changed	Not applicable	Unknown
i	✔					
ii						
iii						
iv						

10. Reaction reappeared after reintroduction of suspected medication (*please tick*)

Yes	No	Effect unknown	Dose (if re-introduced)

11. Concomitant medical product including self-medication and herbal remedies with therapy dates (Exclude those used to treat reaction)

S. No.	Name (Brand / Generic)	Dose	Route	Frequency (OD, BD, etc.)	Therapy Dates		Indication
					Date Started	Date Stopped	
i	Tab. Diclofenac	50 mg	Oral	BD	21/04/2024	24/04/2024	Pain in abdomen
ii							
iii#							

Additional Information :

D. REPORTER DETAILS *

16. Name & Address : Dr B N Poul
MPDI Hospital, Nilanga Dist. Latur
Pin : 413521 Email : mpdinilanga@gmail.com
Contact No- : 02384242693
Occupation : Physician Signature : BNP

17. Date of this report (dd/mm/yyyy) :03/05/2024

Signature and Name of Receiving Personnel :

Confidentiality : The patient's identity is held in strict confidence and protected to the fullest extent. Submission of a report does not constitute an admission that medical personnel or manufacturer or the product caused or contributed to the reaction. Submission of an ADR report does not have any legal implication on the reporter.

Use separate page for more information

* Mandatory Fields for suspected ADR Reporting Form

Experiment No. 18

Adverse Drug Reaction reporting form filling and casualty assessments

1. Aim:

To fill correctly IPC's ADR reporting form and perform casualty assessments using various scales in the given Case-1.

2. Practical Significance:

ADRs are a major cause of morbidity, hospital admission and even death. Hence it is essential to recognize ADRs and to establish a causal relationship between the drug and the adverse events. Ensuring the safe use of pharmaceutical products is a shared responsibility among all stakeholders, including physicians, nurses, pharmacists, and patients/consumers. It is crucial for anyone using medications to report adverse drug reactions (ADRs) promptly to the nearest National Coordinating Centre (NCC) or Adverse Drug Reaction Monitoring Centre (AMC) using accessible reporting methods. In this practical, the students will be able to fill the ADR reporting form and perform casualty assessments using various scales.

3. Practical Outcomes (PrOs):

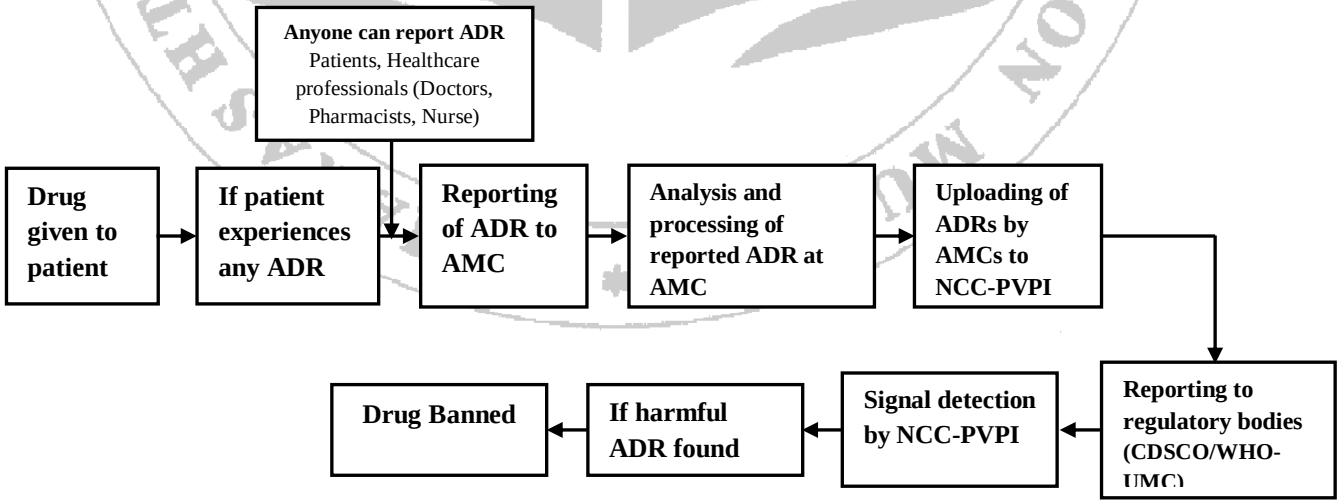
After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Discuss the process of ADR reporting to the NCC or AMC.	CO3	BTL2
2	Use various methods to report ADR.	CO3	BTL3
3	Fill IPC's ADR reporting form.	CO3	BTL3
4	Evaluate the causality assessment.	CO3	BTL5
5	Collaborate and communicate with colleague students.	CO3	BTL6

4. Relevant Theoretical Background:

The purpose of this initiative is to gather information on all adverse events resulting from drug use at therapeutic doses. This data will be valuable for making decisions regarding the continued use of the drug. ADR reporting is to evaluate benefit risk ratio of a medicine and thereby ensuring safe use of medicine.

ADRs reporting mechanism



5. Required resources:

Case of ADR, Laboratory reports, online resources to report ADR, ADR reporting form.

6. Resources used:

_____

_____

7. Precautions to be taken:

- Write complete details of the patient like age, sex, habits and reporters information.
- Take the information of concomitant administration of OTC/ herbal drugs.

8. Procedure:

Case: Mr ABC, a 40-years old male with 70 kg weight was diagnosed as a case of bacterial meningitis. He was started empirically with Inj. Ceftriaxone 1 g IV BD and Inj. Vancomycin 500 mg IV QID on 25/04/2023. First dose of Inj. Ceftriaxone was given at 8 am and Inj. Vancomycin was given at 9 am on 25/04/2023. After 10 minutes of second drug administration, he started developing chills, rigors, fever, urticaria and intense flushing. He was treated with Inj. Pheniramine 25 mg IM, following which the reactions completely diminish. Inj. Ceftriaxone was continued. However, next doses of Inj. Vancomycin scheduled on day 1 were not given. On day 2, the Inj. Vancomycin was re-introduced at 9 am to the patient. Similar symptoms developed again and quickly resolved after Inj. Pheniramine 25 mg IM.

Note: * Inj. Vancomycin Brand Name: Vanzid, Manufacturer: SWACH Healthcare, Batch number: VNC056, Expiry date: Mar 2025. * Inj. Ceftriaxone Brand Name: Taximax, Manufacturer: Wedley Labs, Batch number: CFT0786, Expiry date: Dec 2025.

9. Response:

Step-1: Observe and identify the ADR or any type of untoward effect of drug

_____

_____

Step-2: Fill correctly the ADR in IPC's ADR reporting form

Fill ADR reporting form which is given on separate page.

Step-3: Identify the concomitant drugs taken (OTC/Herbal drugs) and fill details in ADR form

_____

_____

Step-4: Perform casualty assessment (tick in the casualty assessment table) and fill the details of drug responsible for the ADR

_____

_____

Assessment categories / Casualty grade	Time sequence (Temporal relationship)	Drug consistently caused ADR in previous patients (Previous knowledge)	De challenge	Re challenge
Definite	Yes	Yes	Yes	Yes
Probable	Yes	Yes	Yes	No
Possible	Yes	No	No	No
Doubtful	No	No	No	No

10. Result:

_____

_____

11. Conclusion:

_____

_____

12. References :

i. https://www.ipc.gov.in/PvPI/pv_home.html
ii. Kalaiselvan V., Kumar P., Mishra P., and Singh G. System of adverse drug reactions reporting: What, where, how, and whom to report? Indian J Crit Care Med. 2015 Sep; 19(9): 564–566.
iii. https://www.ipc.gov.in/PvPI/adr.html

13. Practical related questions :

a. Define ADR and write the types of ADR.
b. Which precautions should take while filling ADR reporting form?
c. What are the reasons for predictable and non-predictable ADR?
d. Who can report ADR?
e. Give the reasons for ADRs.
f. What is de challenge and re challenge?

(Space for Answers)

Version 1.4

SUSPECTED ADVERSE DRUG REACTION REPORTING FORM

For **VOLUNTARY** reporting of ADRs by Healthcare Professionals

INDIAN PHARMACOPOEIA COMMISSION (National Coordination Centre-Pharmacovigilance Programme of India)

Ministry of Health & Family Welfare, Government of India, Sector-23, Raj Nagar, Ghaziabad-201002

PvPI Helpline (Toll Free) :1800-180-3024 (9:00 AM to 5:30 PM, Monday-Friday)

Initial Case ☐ Follow-up Case ☐

FOR AMC / NCC USE ONLY

Reg. No. / IPD No. / OPD No. / CR No. :

AMC Report No. :

Worldwide Unique No. :

A. PATIENT INFORMATION *

1. Patient Initials:

2. Age or date of birth:

3. Gender: M ☐ F ☐ Other ☐

4. Weight (in Kg.)

B. SUSPECTED ADVERSE REACTION *

5. Event / Reaction start date (dd/mm/yyyy)

6. Event / Reaction stop date (dd/mm/yyyy)

7. Describe Event/Reaction management with details , if any

12. Relevant investigations with dates :

13. Relevant medical / medication history (e.g. allergies, pregnancy, addiction, hepatic, renal dysfunction etc.)

14. Seriousness of the reaction : No ☐ if Yes ☐ (*please tick anyone*)

☐ Death (dd/mm/yyyy) ☐ Congenital-anomaly
☐ Life threatening ☐ Disability
☐ Hospitalization-Initial/Prolonged ☐ Other Medically important

15. Outcome:

☐ Recovered ☐ Recovering ☐ Not Recovered
☐ Fatal ☐ Recovered with sequelae ☐ Unknown

C. SUSPECTED MEDICATION(S) *

S. No.	8. Name (Brand/ Generic)	Manufacturer (if known)	Batch No. / Lot No.	Expiry Date (if known)	Dose	Route	Frequency	Therapy Dates		Indication	Causality Assessment
								Date Started	Date Stopped		
i											
ii											
iii											
iv#											

9. Action taken after reaction (*please tick*)

S. No. as per C	Drug withdrawn	Dose increased	Dose reduced	Dose not changed	Not applicable	Unknown
i						
ii						
iii						
iv						

10. Reaction reappeared after reintroduction of suspected medication (*please tick*)

Yes	No	Effect unknown	Dose (if re-introduced)

11. Concomitant medical product including self-medication and herbal remedies with therapy dates (Exclude those used to treat reaction)

S. No.	Name (Brand / Generic)	Dose	Route	Frequency (OD, BD, etc.)	Therapy Dates		Indication
					Date Started	Date Stopped	
i							
ii							
iii#							

Additional Information :

D. REPORTER DETAILS *

16. Name & Address : _____

_____

Pin : _____ Email : _____

Contact No- : _____

Occupation : _____ Signature : _____

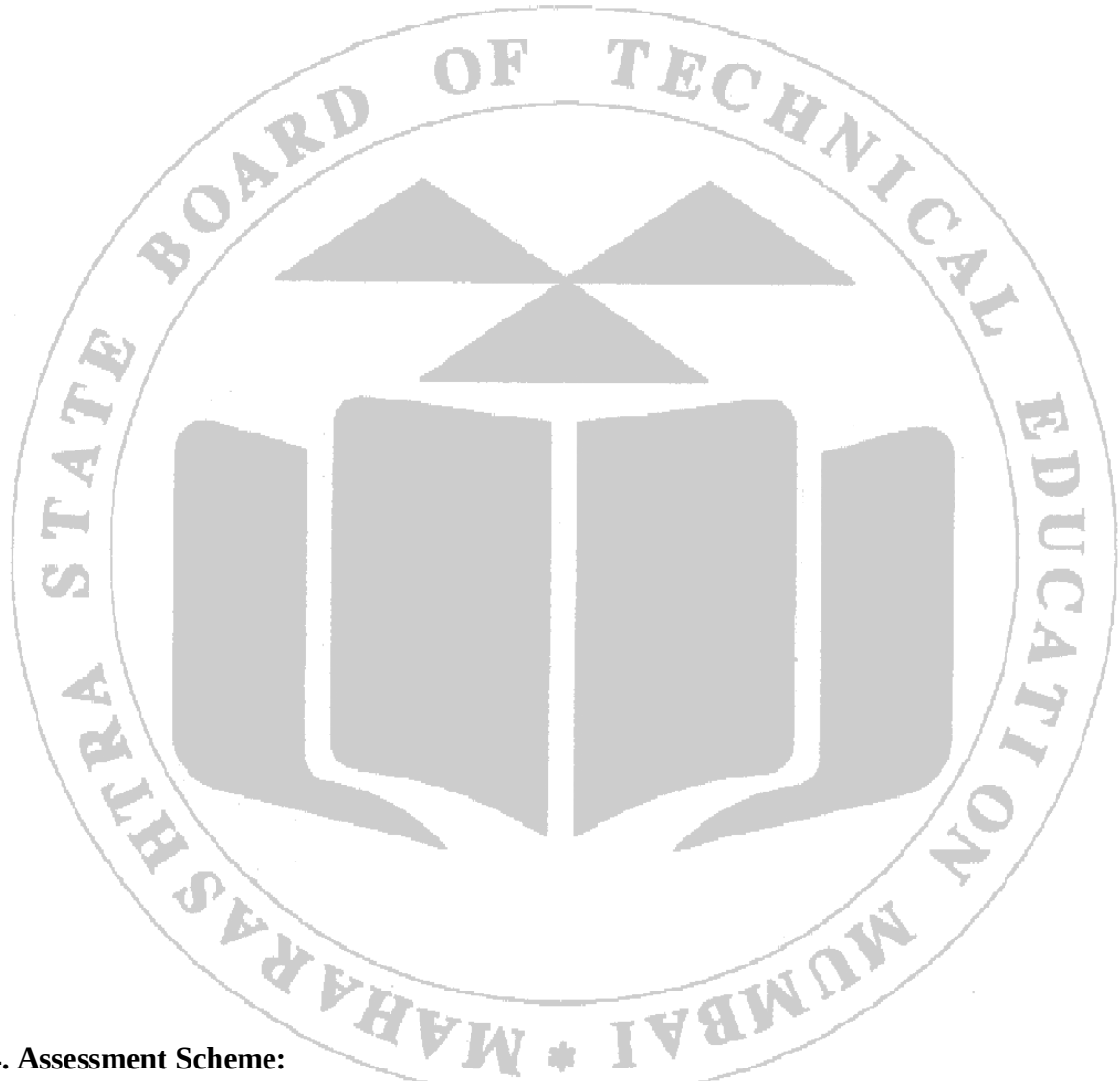
17. Date of this report (dd/mm/yyyy) :

Signature and Name of Receiving Personnel :

Confidentiality : The patient's identity is held in strict confidence and protected to the fullest extent. Submission of a report does not constitute an admission that medical personnel or manufacturer or the product caused or contributed to the reaction. Submission of an ADR report does not have any legal implication on the reporter.

\# Use separate page for more information

* Mandatory Fields for suspected ADR Reporting Form



14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 19

Adverse Drug Reaction reporting form and casualty assessments

1. Aim:

To fill correctly IPC's ADR reporting form and perform casualty assessments using various scales in the given Case-2.

2. Practical Significance:

ADRs are a major cause of morbidity, hospital admission and even death. Hence it is essential to recognize ADRs and to establish a causal relationship between the drug and the adverse events. Ensuring the safe use of pharmaceutical products is a shared responsibility among all stakeholders, including physicians, nurses, pharmacists, and patients/consumers. It is crucial for anyone using medications to report adverse drug reactions (ADRs) promptly to the nearest National Coordinating Centre (NCC) or Adverse Drug Reaction Monitoring Centre (AMC) using accessible reporting methods. In this practical, the students will be able to fill the ADR reporting form and perform casualty assessments using various scales.

3. Practical Outcomes (PrOs):

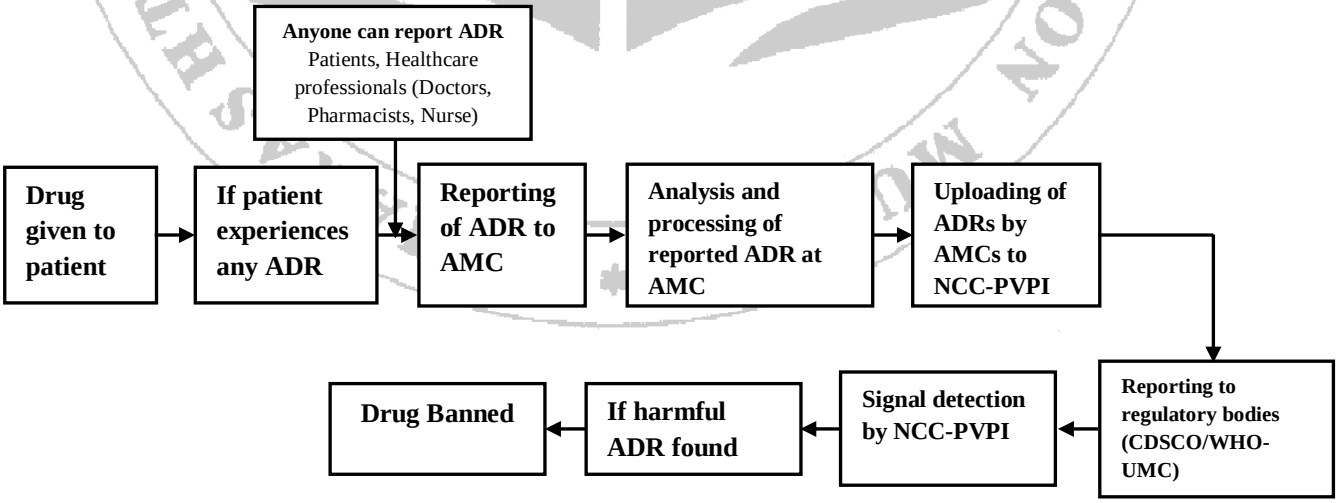
After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Discuss the process of ADR reporting to the NCC or AMC.	CO3	BTL2
2	Use various methods to report ADR.	CO3	BTL3
3	Fill IPC's ADR reporting form.	CO3	BTL3
4	Evaluate the causality assessment.	CO3	BTL5
5	Collaborate and communicate with colleague students.	CO3	BTL6

4. Relevant Theoretical Background:

The purpose of this initiative is to gather information on all adverse events resulting from drug use at therapeutic doses. This data will be valuable for making decisions regarding the continued use of the drug. ADR reporting is to evaluate benefit risk ratio of a medicine and thereby ensuring safe use of medicine.

ADRs reporting mechanism



5. Required resources:

Case of ADR, Laboratory reports, online resources to report ADR, ADR reporting form.

6. Resources Used:

_____

_____

7. Precautions to be taken:

- Write complete details of the patient like age, sex, habits and reporters information.
- Take the information of concomitant administration of OTC/ herbal drugs.

8. Procedure:

Case: Mrs. ABC, 52 year-old patient with 65kg weight, commenced on allopurinol 300mg for the prevention of another acute attack of gout that recently occurred. Mrs. ABC is known to have moderate to severe renal impairment, but no liver impairment present. Other concomitant medicines: Iron sorbitol 100mg OD, Insulin (short and long acting) 10 IU OD before meal and Calcium carbonate 1000mg OD.

In the 6th week after starting the medicine, the patient developed severe aplastic anaemia and died on date 25/04/2024.

9. Response:

Step-1: Observe and identify the ADR or any type of untoward effect of drug

_____

_____

Step-2: Fill correctly the ADR in IPC's ADR reporting form

Fill ADR reporting form which is given on separate page.

Step-3: Identify the concomitant drugs taken (OTC/Herbal drugs) and fill details in ADR form

_____

_____

Step-4: Perform casualty assessment (tick in the casualty assessment table) and fill the details of drug responsible for the ADR

_____

_____

Assessment categories / Casualty grade	**Time sequence (Temporal relationship)**	**Drug consistently caused ADR in previous patients (Previous knowledge)**	**De challenge**	**Re challenge**
Definite	Yes	Yes	Yes	Yes
Probable	Yes	Yes	Yes	No
Possible	Yes	No	No	No
Doubtful	No	No	No	No

10. Result:

_____

_____

11. Conclusion:

_____

_____

12. References :

i. https://www.ipc.gov.in/PvPI/pv_home.html

ii. Kalaiselvan V., Kumar P., Mishra P., and Singh G. System of adverse drug reactions reporting: What, where, how, and whom to report? Indian J Crit Care Med. 2015 Sep; 19(9): 564–566.

13. Practical related questions :

a. Where to report ADR?
b. What happens to the submitted information of ADR?
c. Which are the mandatory fields for suspected ADR reporting form?
d. List out any four drugs with their ADRs.
e. Give the preventive measures to be taken to avoid ADR.

(Space for Answers)

Version 1.4

SUSPECTED ADVERSE DRUG REACTION REPORTING FORM

For **VOLUNTARY** reporting of ADRs by Healthcare Professionals

INDIAN PHARMACOPOEIA COMMISSION (National Coordination Centre-Pharmacovigilance Programme of India)

Ministry of Health & Family Welfare, Government of India, Sector-23, Raj Nagar, Ghaziabad-201002

PvPI Helpline (Toll Free) :1800-180-3024 (9:00 AM to 5:30 PM, Monday-Friday)

Initial Case ☐ Follow-up Case ☐

FOR AMC / NCC USE ONLY

Reg. No. / IPD No. / OPD No. / CR No. :

AMC Report No. :

Worldwide Unique No. :

A. PATIENT INFORMATION *

1. Patient Initials:

2. Age or date of birth:

3. Gender: M ☐ F ☐ Other ☐

4. Weight (in Kg.)

B. SUSPECTED ADVERSE REACTION *

5. Event / Reaction start date (dd/mm/yyyy)

6. Event / Reaction stop date (dd/mm/yyyy)

7. Describe Event/Reaction management with details , if any

12. Relevant investigations with dates :

13. Relevant medical / medication history (e.g. allergies, pregnancy, addiction, hepatic, renal dysfunction etc.)

14. Seriousness of the reaction : No ☐ if Yes ☐ (*please tick anyone*)

☐ Death (dd/mm/yyyy) ☐ Congenital-anomaly

☐ Life threatening ☐ Disability

☐ Hospitalization-Initial/Prolonged ☐ Other Medically important

15. Outcome:

☐ Recovered ☐ Recovering ☐ Not Recovered

☐ Fatal ☐ Recovered with sequelae ☐ Unknown

C. SUSPECTED MEDICATION(S) *

S. No.	8. Name (Brand/ Generic)	Manufacturer (if known)	Batch No. / Lot No.	Expiry Date (if known)	Dose	Route	Frequency	Therapy Dates		Indication	Causality Assessment
								Date Started	Date Stopped		
i											
ii											
iii											
iv#											

9. Action taken after reaction (*please tick*)

S. No. as per C	Drug withdrawn	Dose increased	Dose reduced	Dose not changed	Not applicable	Unknown
i						
ii						
iii						
iv						

10. Reaction reappeared after reintroduction of suspected medication (*please tick*)

Yes	No	Effect unknown	Dose (if re-introduced)

11. Concomitant medical product including self-medication and herbal remedies with therapy dates (Exclude those used to treat reaction)

S. No.	Name (Brand / Generic)	Dose	Route	Frequency (OD, BD, etc.)	Therapy Dates		Indication
					Date Started	Date Stopped	
i							
ii							
iii#							

Additional Information :

D. REPORTER DETAILS *

16. Name & Address : _____

_____

Pin : _____ Email : _____

Contact No- : _____

Occupation : _____ Signature : _____

17. Date of this report (dd/mm/yyyy) :

Signature and Name of Receiving Personnel :

Confidentiality : The patient's identity is held in strict confidence and protected to the fullest extent. Submission of a report does not constitute an admission that medical personnel or manufacturer or the product caused or contributed to the reaction. Submission of an ADR report does not have any legal implication on the reporter.

\# Use separate page for more information

* Mandatory Fields for suspected ADR Reporting Form

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 20
Vaccination and Injection Technique

1. Aim:

To study the techniques for administration of intravenous (IV) infusion/Injection using a mannequin.

2. Practical Significance:

An intravenous (IV) injection is an injection of a medication or fluid or another substance into a vein and directly into the bloodstream. It is one of the fastest way to get a drug into the body, often through a vein. Intravenous injections or infusions are used to administer in unconscious, unresponsive, surgical procedures or emergency patients. In this experiment, students will learn about techniques for administration of IV infusion/Injection using a mannequin.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Identify intravenous sites for the administration of injection or infusion.	CO4	BTL2
2	Discuss the technique of administration of intravenous infusion.	CO4	BTL2
3	Demonstrate the procedure for the administration of IV injection or infusion to mannequin.	CO4	BTL3
4	Practice ethical behavior and cleanliness.	CO4	BTL6
5	Collaborate and communicate with fellow colleagues	CO4	BTL6

4. Relevant Theoretical Background:

The simplest form of intravenous access is by passing a hollow needle through the skin directly into a vein with an angle of 15^0 to 30^0.The intravenous route is the fastest way to deliver medications and fluid replacement throughout the body as they are introduced directly into the circulatory system and thus quickly distributed. Many therapies are administered as a "bolus" or one-time dose (small amounts of solutions up to 1 to 20 cc),to be administered. Alternatively, the needle may be placed and then connected to a IV set, may also be administered as an extended infusion or drip.

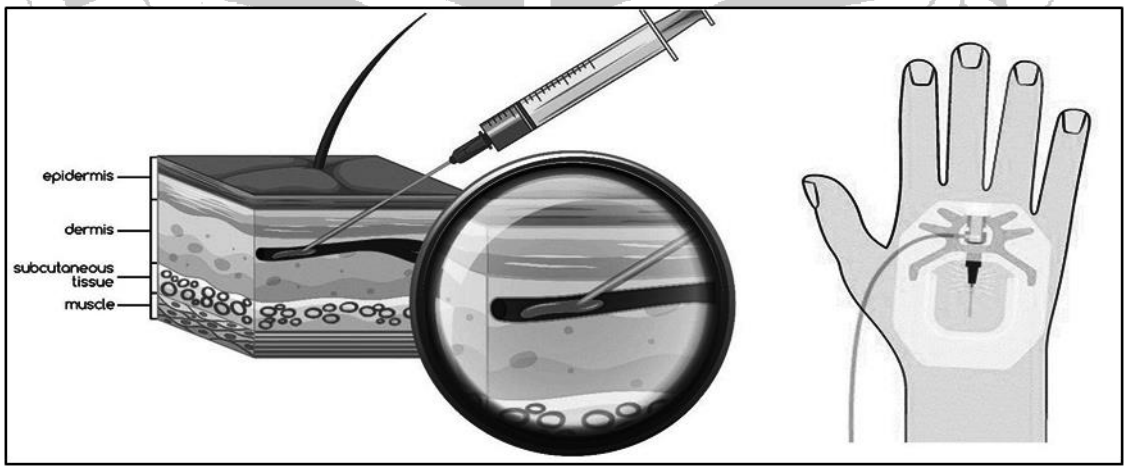


Fig 20.1 Intravenous injection or infusion

The indications for the administration of solutions directly into the blood stream may be classified as follows:

1. To obviate a period of absorption
   A. When immediate or early effect is desired, as in
   i. Drug therapy (epinephrine, insulin, dextrose, morphine, barbiturates, and antisera).

ii. Fluid therapy (saline, dextrose, buffer, or acacia solutions used to restore effective circulating blood volume in shock or hemorrhage and to correct dehydration, alkalosis or acidosis).

B. When a definite amount of a substance is wanted in the blood stream (kidney and liver function tests and gallbladder visualization).

C. When the moment of entrance of a substance or solution into the blood stream must be known (as in determinations of circulation time).

D. Potentially lifesaving medication in very accurate dose and quick onset of action.

2. To allow parenteral administration of substances which would cause pain or damage to the tissues if given subcutaneously or intramuscularly (hypertonic saline, dextrose, or sucrose Solutions, arsenical preparations, calcium chloride or calcium gluconate).
3. To introduce substances for the purpose of damaging the wall of a vein, as in varicose veins (sodium morrhuate, concentrated sugar solutions, quinine and urethane, monolate, quinine and urea hydrochloride).
4. Medication by mouth would be impractical or ineffective or cannot eat or drink and requires fluids through an IV line.

Sites for the administration of Intravenous injection or infusion

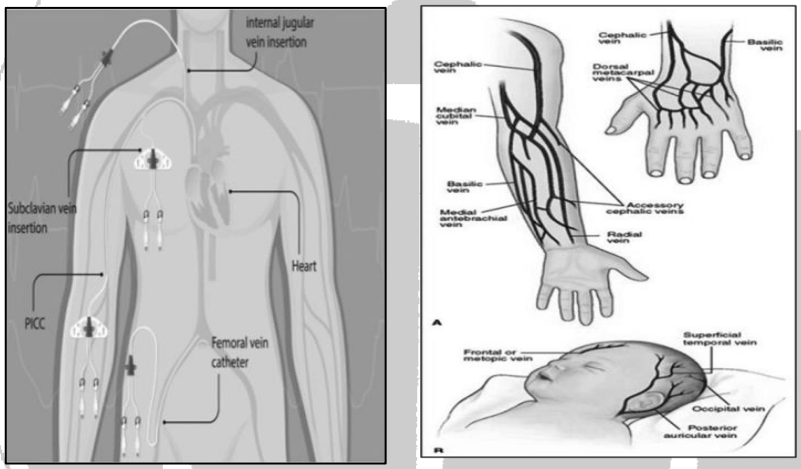


Fig 20.2 Central Lines and Peripheral lines for administration of IV injection or infusion.

A healthcare professional may deliver IV drugs or other substances through IV lines and these are classified as "central lines" if they end in a large vein close to the heart, or as "peripheral lines" if their output is to a small vein in the periphery, such as the arm.

A. Peripheral lines

A peripheral line, or a peripheral venous catheter, is a common form of IV injection that is suitable for short-term treatment.

When placing a peripheral IV line, a healthcare professional will:

1. Inject a needle into the person's vein.
2. Push a small plastic catheter over the needle and into the vein.
3. Remove the needle, leaving the catheter in place.
4. Place an access cap over the catheter, which allows them to administer medications without having to re-inject a needle.

A peripheral line may be useful for both rapid injections and time-based infusions. The following sections look at each of these in more detail.

i. **Rapid IV injections:** These involve inserting a dose of a drug directly into the person's bloodstream. Healthcare professionals may also refer to a rapid injection as a push or a bolus.

ii. **Time-based IV infusions:** These involve delivering a medication into a person's bloodstream gradually over time. This method involves administering medications through an IV line attached to a catheter.

B. Central lines

A central line, or a central venous catheter, accesses a more central vein within the torso, such as the vena cava. The vena cava is a large vein that carries blood back to the heart.

There are four types of central line:

i. **Percutaneous central venous catheter:** A healthcare professional inserts the catheter directly through the skin to reach the internal or external jugular, subclavian vein, or femoral vein.

ii. **Peripherally inserted central catheter (PICC):** A PICC line involves inserting a catheter from a peripheral vein on the outer body and carefully feeding it toward the heart.

iii. **Tunneled line:** A tunneled line involves inserting a needle under the skin and feeding it a significant distance before penetrating the central vein.

iv. **Port:** A port is a small reservoir covered in silicone. Implants the port under the skin of the arm or chest, where it feeds into the central vein. Then inject each dose of the medication through the skin and into the reservoir.

Risk with the administration of IV injection or IV infusion

- Placement of an IV line may cause pain, as it necessarily involves piercing the skin.
- Infections and inflammation (termed phlebitis) are also both common side effects of an IV line.
- Phlebitis may be more likely if the same vein is used repeatedly for intravenous access, and can eventually develop into a hard cord which is unsuitable for IV access.
- Unintentional administration of an IV needle outside a vein, termed extravasations or infiltration , may cause other side effects.

Advantages of Intravenous medication

- It provides an immediate and fast-acting therapeutic effect.
- Medication can be prepared quickly and given over a shorter period.
- There is minimal or no discomfort for the patient in comparison to SC and IM injections.
- They provide an alternative to the oral route for drugs that may not be absorbed by the GI tract, and they are ideal for patients with GI dysfunction or malabsorption, and patients who are NPO (nothing by mouth) or unconscious.
- IV direct route provides a more accurate dose of medication because none is left in the intravenous tubing.

Disadvantages of Intravenous medication

- Once an intravenous medication is delivered, it cannot be retrieved.
- Any toxic or adverse reaction will occur immediately and may be exacerbated by a rapidly injected medication.
- Extravasations of certain medications into surrounding tissues can cause sloughing, nerve damage, and scarring.
- There is an increased risk of phlebitis with highly concentrated medication, especially with small peripheral veins or a short venous access device.
- Not all medications can be given via the direct IV route.

5. Requirements:

Sterile IV set, Normal Saline solution for IV administration, Cannula/ needle/ IV catheter, Syringe, alcohol swabs, sterile gloves, and mannequin.

6. Requirements used:

_____

_____

7. Precautions to be taken:

1. Precautions to be taken while using IV infusion
   - Carefully read the labels on the infusion bottle to avoid mistakes.
   - Indicate on the label any drugs added to the infusion as well as the patient's name and/or bed number.
   - If drugs are added to the intravenous fluid, think of the risks of:
     – Physical and chemical incompatibilities
     – Microbial contamination: aseptic technique
   - Examine each bottle against the light to check clearness. Discard any bottles that show particles in suspension or cloudiness.
2. Precautions to be taken while handling of intravenous needle or cannula
   - Perform hand hygiene.
   - Wear a sterile hand glove.
   - Use aseptic technique during intravenous insertion.

8. **Demonstration of administration of IV infusion using IV set:**

The subject teacher must demonstrate the technique for administration of IV injection or infusion.

Procedure for administering IV infusion using IV set

a. **Preparation of intravenous technique:** Assess the patient's overall condition;
b. Check vital signs; Patient position is appropriate, convenient for intravenous technique.
c. Prepare medicine and tools(Gloves, Disinfectant, Tourniquet, Compressed gauze, Empty syringe (for collection), sharps container, garbage bag, etc.
d. **Prepare patient to administer Intravenous injection**

The patient lies in a comfortable supine position on the bed with arms outstretched, pulls sleeves close to shoulders, exposes injection site, and places patient elbows on thin knees (if intravenous injection is in a flexed position such as elbows, forearm), pull the patient'spants up over the knee if the internal ankle vein is to be administered.

e. **Intravenous injection procedure**

1. Place the armrest under the injection site.
2. Tie the upper tourniquet about 3-5cm away from the injection site.
3. Remind the patient to clench their fists, stretch in and out a few times to make the veins more prominent.
4. Identify the vein and prepare to insert the needle.
5. Disinfect the site of intravenous injection with alcohol/iodine in the direction from the inside to the outside, then disinfect with alcohol cotton swab.
6. Disinfect your hands with alcohol cotton swab.
7. The left hand uses the thumb to stretch the skin surface to try stabilize the vein to support displacement and to facilitate percutaneous needle insertion into the vein.
8. The right hand holds the syringe that has been smoked to be injected with the beveled tip facing up, pushing all the air bubbles out.
9. The index finger holds the needle part, the thumb rests on the syringe body; the middle and ring fingers are next to the syringe body, and the little finger is to support the syringe.
10. Insert the needle (bevel side up) at an angle of $10\text{-}30^0$ to the skin.

11. When the needle is inserted into the vein, the blood will automatically flow into the syringe or rotate the syringe slightly counterclockwise to see the blood flow into the syringe.
12. The left hand gently loosens the string while reminding the patient to relax the hand, at the same time the index finger of the left hand holds the needle bar; thumb on the syringe body; middle, ring, and little fingers are kept beside the syringe in place when injecting medication.
13. Right hand index and middle finger grasp the edge of the syringe, thumb put into the syringe and slowly inject the drug into the vein.
14. If the patient complains of pain and stinging: check the injection site, if it is swollen, the needle has gone out of the blood vessel, readjust the needle by inserting the needle deep into the vessel or withdrawing the needle a little and gently sucking the pump.
15. If the drug continues to flow in, it means the needle is still in the vein; the pump is not inflated, and then slowly continues to inject the drug very slowly, while pumping, monitor the patient.
16. After pumping almost all the medicine, it is necessary to withdraw the needle carefully, absolutely do not let air enter the blood vessel, it will cause a blood vessel blockage, which is dangerous to the patient's life.
17. After injection, withdraw the needle: pull the left thumb to the side and stretch the skin of the injection area so that blood and medicine do not flow out along the needle.
18. Re-sterilize the injection site with alcohol-soaked cotton, put alcohol on the injection site and keep it for a few seconds;
19. Do not ask the patient to flex the arm. Have the patient lie down in a comfortable position.
20. Clean up tools.

Fig. 20.3 IV injection administration

9. **Activity:**

Administer intravenous injection to the mannequin as per the above procedure demonstrated by your teacher.

10. Result:

_____

_____

11. Conclusion:

_____

_____

_____

12. References:

i. https://opentextbc.ca/clinicalskills/chapter/6-9-iv-main-and-mini-bag-medications/
ii. https://www.medicalnewstoday.com/articles/intravenous-injection
iii. https://abilitatipracticecluj.ro/pdf/eng/ATI_eng_01_Intravenous_injection.pdf
iv. Keeley, J. L. (1940). Intravenous injections and infusions. The American Journal of Surgery, 50(3), 485–490. doi:10.1016/s0002-9610(40)90418-4.

v. https://en.wikipedia.org/wiki/Intravenous_therapy

vi. https://www.vinmec.com/en/news/health-news/general-health-check/instructions-for-intravenous-injection-procedures/

13. Practical related questions :

a. Give the difference between IV injection and infusion.

b. Give name and dose of drug administered by IV injection.

c. Give the advantages and disadvantages of IV injection.

d. Give the name of peripheral veins in IV injection can be administered.

e. Why intravenous infusion is needed?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 21
Vaccination and Injection Technique

1. Aim:

To study the techniques for administration of intramuscular (IM) Injection using a mannequin.

2. Practical Significance:

Intramuscular injection (IM) is installing medications into the depth of specifically selected muscles. The bulky muscles have good vascularity and therefore the injected drug quickly reaches the systemic circulation, long duration of action and thereafter into the specific region of action, bypassing the first-pass metabolism. In this experiment, students will learn about techniques for administration of IM injection using a mannequin.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Identify muscles for the administration of the injection.	CO4	BTL2
2	Discuss the technique of administration of Intramuscular injection.	CO4	BTL2
3	Demonstrate the procedure for the administration of IM injection to the mannequin.	CO4	BTL3
4	Practice ethical behavior and cleanliness.	CO4	BTL6
5	Collaborate and communicate with fellow colleagues	CO4	BTL6

4. Relevant Theoretical Background:

The simplest form of intramuscular access is by passing a hollow needle through the skin directly into a muscle. The needle is inserted at a 90-degree angle perpendicular to the patient's body, or at as close to a 90-degree angle as possible. Use a quick, darting motion when inserting the needle. It may be curative, diagnostic or recreational purposes. Due to their rich blood supply, IM injection sites can absorb larger volumes of solution, which means a range of medications, such as sedatives, anti-emetics, hormonal therapies, analgesics, and immunizations, can be administered intramuscularly in the community and acute care setting. An IM site is chosen based on the age and condition of the patient and the volume and type of medication injected. When choosing a needle size, the weight of the patient, age, amount of adipose tissue, medication viscosity, and injection site all influence the needle selection.

Intramuscular Injection Sites:

Sites for intramuscular injections include the ventrogluteal, vastus lateralis, and the deltoid site.

A. **Ventrogluteal Site:**

The site involves the gluteus medius and minimus muscle and is the safest injection site for adults and children. The site provides the greatest thickness of gluteal muscles, is free from penetrating nerves and blood vessels, and has a thin layer of fat.

An aqueous solution can be given with a 20 to 25 gauge needle. Viscous or oil-based solutions can be given with 18 to 21 gauge needles. The needle length is based on patient weight and body mass index. A thin adult may require a 16 mm to 25 mm (5/8 to 1 inch) needle, while an average adult may require a 25 mm (1 inch) needle, and a larger adult (over 70 kg) may require a 25 mm to 38 mm (1 to 1 1/2 inch) needle. For the ventrogluteal muscle of an average adult, give up to 3 ml of medication.

B. Vastus lateralis:

The vastus lateralis is commonly used for immunizations in children from infants through to toddlers. The muscle is thick and well developed. This muscle is located on the anterior lateral

aspect of the thigh and extends from one hand's breadth above the knee to one hand's breadth below the greater trochanter. The middle third of the muscle is used for injections.

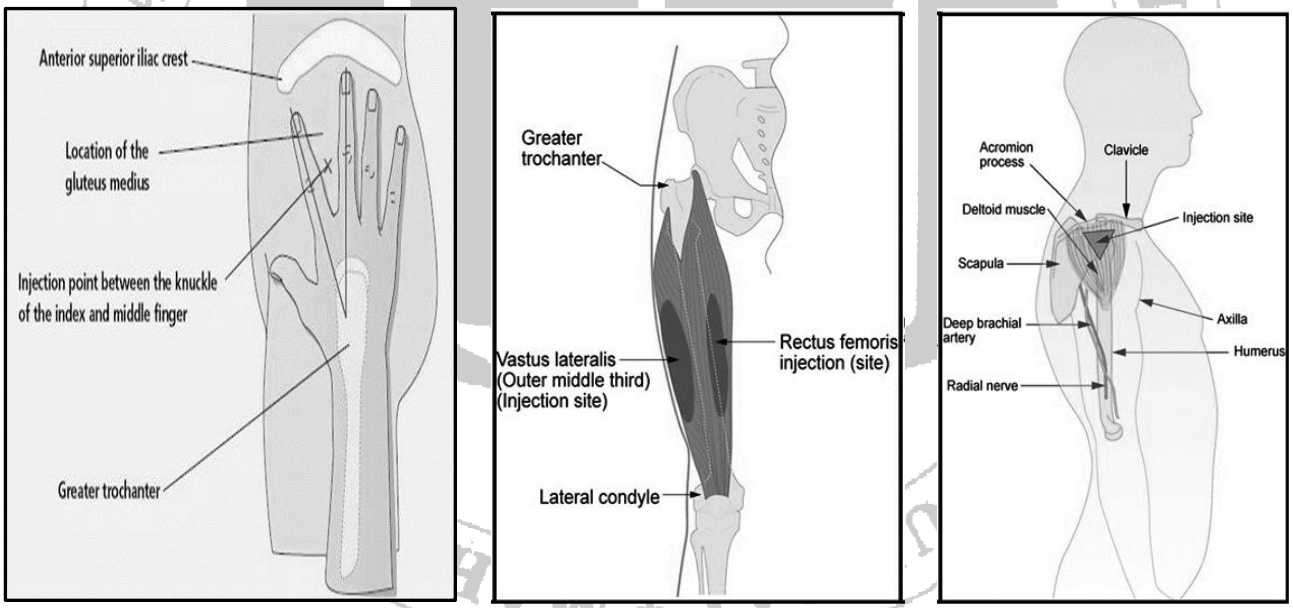
The length of the needle is based on the patient's age, weight and body mass index. In general, the recommended needle length for an adult is 25 mm to 38 mm (1 to 1 1/2 inch). The gauge of the needle is determined by the type of medication administered. Aqueous solutions can be given with a 20 to 25 gauge needle; oily or viscous medication should be administered with 18 to 21 gauge needles. A smaller gauge needle (22 to 25 gauge) should be used with children. The length will be shorter for infants and children. The maximum amount of medication for a single injection is 3 ml.

C. Deltoid muscle:

The deltoid muscle has a triangular shape and is easy to locate and access, but is commonly underdeveloped in adults. Begin by having the patient relax the arm. The patient can be standing, sitting, or lying down. To locate the landmark for the deltoid muscle, expose the upper arm and find the acromion process by palpating the bony prominence. The injection site is in the middle of the deltoid muscle, about 2.5 to 5 cm (1 to 2 inches) below the acromion process.

Select needle length based on age, weight, and body mass. In general, for an adult male weighing 60 to 118 kg (130 to 260 lbs), a 25 mm (1 inch) needle is sufficient. For women under 60 kg (130 lbs), a 16 mm (5/8 inch) needle is sufficient, while for women between 60 and 90 kg (130 to 200 lbs), a 25 mm (1 inch) needle is required. A 38mm (1 1/2 inch) length needle may be required for women over 90 kg (200 lbs) for a deltoid IM injection.

The maximum amount of medication for a single injection is generally 1 ml. For immunizations, a smaller 22 to 25 gauge needle should be used.



A] Ventrogluteal site **B] Vastus lateralis site** **C] Deltoid muscle site**

Fig. 21.1 IM injection sites

IM for therapeutic purposes is indicated for the following patients:

- Noncompliant
- Uncooperative
- Reluctant
- Unable to receive drugs through other common routes
- Do not tolerate oral medications

Contraindications of IM injections:

- Active infection, cellulitis, or dermatitis at the site of administration.
- Known allergy or hypersensitivity to the drug.
- Acute myocardial infarction- the release of muscle enzymes complicate the management strategy.

- Thrombocytopenia.
- Coagulation defects.
- Hypovolemic shock - the drug's absorption may be hampered due to compromised vascularity of the muscle.
- Myopathies.
- Associated muscular atrophy - leads to delayed drug absorption and increases the risk of neurovascular complications.

Common complications with IM injections:

- Persistent pain at the site of injection
- Muscle fibrosis and contracture.
- Abscess at the injection site
- Gangrene
- Nerve injury
- Skin slough
- Periostitis, osteomyelitis
- Transmission of HIV, hepatitis virus
- Inadvertent injection of glass particles while using glass vials and ampoules.
- Vascular injury

Advantages

- Rapid and uniform absorption of the drug, especially the aqueous solutions.
- Rapid onset of the action compared to that of the oral and the subcutaneous routes.
- IM injection bypasses the first-pass metabolism of the drug.
- Has efficacy and potency comparable to that of the intravenous drug delivery system.
- Highly effective for emergency scenarios such as acute psychosis and status epilepticus.
- Depot injections allow slow, sustained, and prolonged drug action.
- A large volume of the drug can be administered compared to the subcutaneous route.

Disadvantages

- An expert and a trained person are necessary for administrating the drug by IM route.
- The absorption of the drug is determined by the bulk of the muscle and its vascularity.
- The onset and duration of the action of the drug are not adjustable
- IM injection at the appropriate site may be difficult in a child as well as in patients requiring physical restrains.
- Painful procedure.
- Suspensions, as well as oily drugs, cannot be administered

5. Requirements:

Sterile Syringe and Needle of required size, alcohol cotton swabs, sterile gloves, and mannequin.

6. Requirements used:

_____

_____

7. Precautions to be taken:

- Perform hand hygiene.
- Wear a sterile hand glove.
- Use an aseptic technique during intravenous insertion.
- Select an appropriate muscular site for injection.
- Select an appropriate size and length of the needle.
- Avoid muscle, nerve and vascular injury.

8. Demonstration of administration of IV infusion using IV set:

The subject teacher must show various sites of intramuscular injections and demonstrate the IM injection administration technique.

Procedure to administer intramuscular injection

8.1 Preparation for administration of IM injection

Assess the patient's overall condition;

a. Check vital signs; Patient position is appropriate and convenient for IM technique.
b. Prepare medicine and tools **(**An appropriately sized syringe with a correct needle length, Alcohol-based antiseptic solution, correct drug in an appropriate dose, Dry cotton swab, Self-adhesive bandage, safe needle and waste disposal unit)

8.2 Intramuscular injection procedure:

1. Clean your hands and wear gloves.
2. Apply an antiseptic swab for 30 seconds at the administration site and allow the skin to dry.
3. Use the needle and change the needle before injection under aseptic precautions.
4. Fill the syringe with medication.
5. Insert the needle at an angle of 90 degrees.
6. Quick darting movement while inserting the needle.
7. Slow injection (10 seconds per milliliter) allows stretching of the muscle fibers for retention of the drug, which minimizes the risk of leakage along the needle track.
8. Wait for 10 seconds to allow the drug to diffuse within the muscle bulk.
9. Withdraw the needle with a smooth and steady movement. The needle should be drawn out at the same angle that it was inserted.
10. Hold a sterile cotton swab at the injection site for some time.
11. Safe disposal of the needles and other wastes.
12. Assess the site of injection for probable early and late complications.

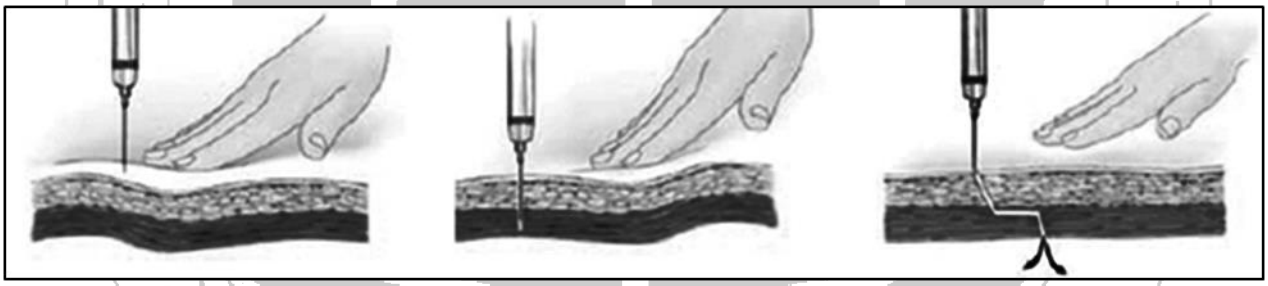


Fig. 21.2 IM injection administration

9. Activity:

Administer intravenous injection to the mannequin as per the above procedure demonstrated by your teacher.

10. Result:

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11. Conclusion:

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12. References:

i. https://opentextbc.ca/clinicalskills/chapter/6-8-iv-push-medications-and-saline-lock-flush/
ii. https://www.ncbi.nlm.nih.gov/books/NBK556121/

13. Practical related questions :

a. Define Intramuscular injection and give its benefits.
b. Give the name and dose of any two drugs administered by the IM route.

c. Give the advantages and disadvantages of IM injection.
d. Enlist the various sites for intramuscular injection.
e. What are the complications associated with the IM injection?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 22
Vaccination and Injection Technique

1. Aim:

To study the administration technique of subcutaneous (SC) injection in the mannequin.

2. Practical Significance:

A subcutaneous injection is a method of administering medication in the fatty layer of tissue just under the skin. Studying the administration technique of subcutaneous injection in a mannequin lies in its direct application to clinical practice and patient care. Subcutaneous injections are commonly used in various healthcare settings for the administration of medications, such as insulin, anticoagulants, and vaccines. Therefore, mastering the correct technique is crucial for healthcare professionals. In this experiment, students will learn the technique of administration of subcutaneous injection in the mannequin.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain the technique of administration of subcutaneous injection.	CO4	BTL2
2	Manage the assembly for subcutaneous injections.	CO4	BTL5
3	Administer the subcutaneous injection to mannequin.	CO4	BTL3
4	Follow ethics and cleanliness in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 Subcutaneous injection

It is a method of injecting medication into the subcutaneous tissue, the layer of fat in between the layer of skin and muscle. (Fig. 22.1)

4.2 Need for SC injection

- This type of injection is used when other methods of administration might be less effective. For example, some medications can't be taken orally because they may get destroyed by digestive enzymes.
- As subcutaneous tissue has few blood vessels, the injected drug is diffused very slowly at a sustained rate of absorption. Therefore, it is highly effective in administering vaccines, growth hormones and insulin which require continuous delivery at low dose rate.
- Subcutaneous injections are quick and easy to administer. It can be administered by the individual themselves or their caregiver. Only certain medications in prescribed doses can be injected subcutaneously.

4.3 Drugs given by using SC route

Medications administered by subcutaneous injection include drugs that can be given in small volumes (usually less than 1 ml but up to 2 ml is safe). Medications given by subcutaneous route include: insulin, heparin, epinephrine, morphine, hydromorphone, dexamethasone, metoclopramide, some vaccines etc.

4.4 Site of administration

Recommended sites for subcutaneous injection include the upper outer arm and thigh, and the umbilical region of the abdomen (Fig. 22.2).

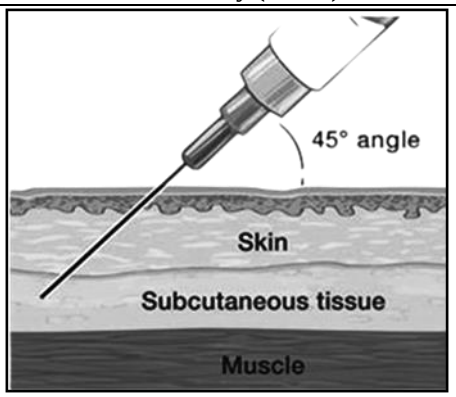

Fig. 22.1 Subcutaneous injection

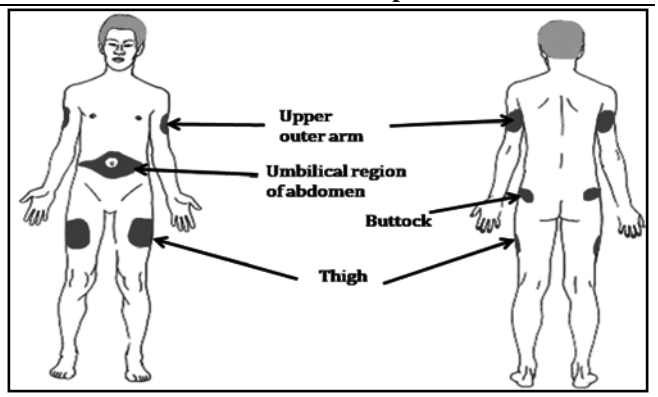

Fig. 22.2 SC Inj. Sites

4.5 Size of Needle & Syringe

The needle required is small and short to inject a medicine into the tissue layer between the skin and muscle. 25 to 30G, 3/8 to 5/8 inch needle used to provide as SC injection.

4.6 Complication in administration of SC injection

It may cause pain near the injection site when the needle is inserted at wrong angle, or when there is slight movement during the injection. Some medication may cause redness, swelling, stinging, bruise or irritation at injection sight.

5. Requirements:

Mannequin, Syringes (with needles), Sterile alcohol swabs, Cotton balls or gauze pads, Vial of simulated medication or saline solution, Waste bin for disposal of used materials

6. Requirements used:

_____

7. Precautions to be taken:

- Subcutaneous injections are not given if the skin is burned, hardened, inflamed, swollen, or damaged by a previous injection.
- Don't massage the site as it may cause damage to the underlying tissues.

8. Demonstration Procedure:

The subject teacher must introduce the purpose of the experiment, show various sites of subcutaneous injections to the students and demonstrate the procedure of subcutaneous injection using a mannequin. YouTube videos can also be used for support.

Procedure to administer subcutaneous injection

1. Wash your hands thoroughly with a disinfectant solution.
2. Collect all of the necessary supplies.
3. Locate the proper injection site on the mannequin.
4. Cleanse the injection site on the mannequin with a sterile alcohol swab and allow it to dry. Do not touch this area until the injection has been administered.
5. Draw up the required amount of simulated medication or saline solution into the syringe. Remove any air bubbles from the syringe by gently tapping it and expelling the air.
6. Hold the syringe in your dominant hand with a firm grip, similar to holding a pencil.
7. Grasp the skin with your thumb and first finger of other hand.
8. Hold the syringe barrel tightly and insert the needle into the skin at 45° angle with your wrist. (Subcutaneous injections can be administered either at a 90^0 angle or a 45^0 angle. Inject at a 90^0 angle if you can grip 2 inches of skin between your thumb and first finger; if only 1 inch of skin can be grasped, administer the injection at a 45^0 angle.)
9. Once the needle is inserted, release the skin fold and administer the medication or saline solution by slowly pushing the plunger with your thumb or forefinger.

10. Put a gauze pad/ cotton swab on skin near the injection site and press down gently on skin. Quickly pull out the needle and syringe.
11. Hold a sterile gauze pad/ cotton swab at the site of injection for some time.
12. Dispose of the used syringe and needle.

9. Activity (Role Play):

Give subcutaneous injection at a specific site as directed by your teacher. Follow the steps as demonstrated by your teacher.

10. Result:

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_____

11. Conclusion:

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12. References:

i. https://www.nursingtimes.net/clinical-archive/assessment-skills/injection-technique-2-administering-drugs-via-the-subcutaneous-route-28-08-2018
ii. https://www.medicalnewstoday.com/articles/types-of-injections#subcutaneous

13. Practical related questions :

a. Why subcutaneous injection is required?
b. What is subcutaneous injection?
c. Which drugs to be administered by subcutaneous route?
d. Give the needle size used in subcutaneous injection.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 23
Vaccination and Injection Technique

1. Aim:

To study the administration technique of intradermal (ID) injection in the mannequin.

2. Practical Significance:

Intradermal injections (ID) are injections administered into the dermis, just below the epidermis. Studying the administration technique of intradermal injection in a mannequin lies in its direct application to clinical practice and patient care. It is commonly used for sensitivity tests, such as TB, allergy, and local anesthesia tests. In this experiment, students will learn the technique of administration of intradermal injection in the mannequin.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Explain the technique of administration of intradermal injection.	CO4	BTL2
2	Manage the assembly for intradermal injections.	CO4	BTL5
3	Administer the intradermal injection to mannequin.	CO4	BTL3
4	Follow ethics and cleanliness in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 Intradermal injection

It is injections administered into the dermis, just below the epidermis. (Fig. 23.1)

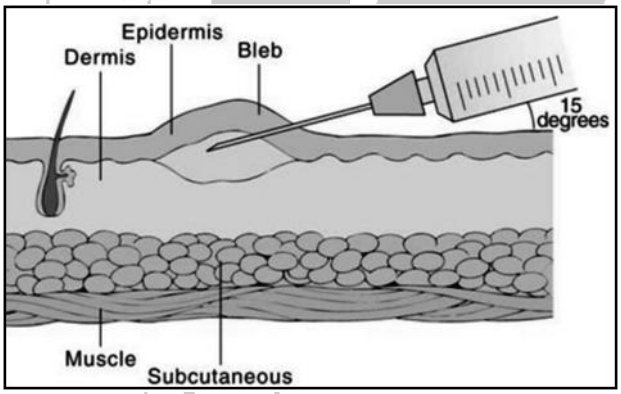

Fig. 23.1 Intradermal injection

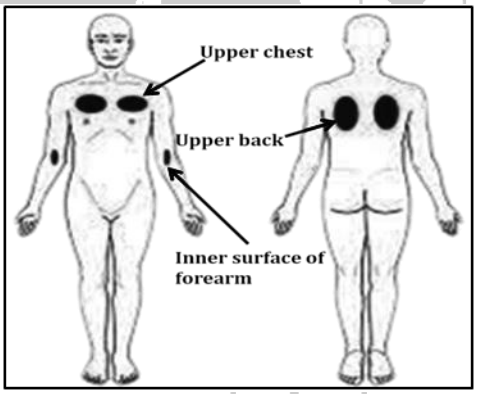

Fig. 23.2 ID Inj. Sites

4.2 Need for ID injection

The intradermal injection route has the longest absorption time of all the different types of injections because there are fewer blood vessels and no muscle tissue. These types of injections are used for sensitivity testing because the patient's reaction is easy to visualize, and the degree of reaction can be assessed. Examples of intradermal injections include tuberculosis (TB) and allergy testing.

Common uses of intradermal injections may include:

- Allergy testing- Identify skin allergy to any drug.
- Tuberculosis (TB) screening (tuberculin/ Montux test)
- Administration of local anesthesia prior to invasive procedures
- Administration of vaccine eg. Bacille Calmette-Guerin and rabies vaccines.

4.3 Site of administration

The most common sites used are the inner surface of the forearm and the upper back, under the scapula (upper chest) (Fig.23.2). Choose an injection site that is free from lesions, rashes, moles, or scars, which may alter the visual inspection of the test results.

4.5 Size of Needle & Syringe

Equipment used for ID injections is a tuberculin syringe calibrated in tenths and hundredths of a millilitre, and a 1/4 to 1/2 inch, 26 or 27 G needle. The dosage of an ID injection is usually under 0.5 ml.

4.6 Complication in administration of ID injection

It may cause itching, pain, redness, blistering, crusting, scabbing or swelling at the injection site

5. Requirements:

Mannequin or simulated skin pad, tuberculin Syringes, Sterile alcohol swabs, Cotton balls or gauze pads, Vial of simulated medication or saline solution, Waste bin for disposal of used materials

6. Requirements used:

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7. Precautions to be taken:

- Do not aspirate. It is not necessary to aspirate because the dermis is relatively without vessels.
- Do not massage area after injection.

8. Demonstration Procedure:

The subject teacher must introduce the purpose of the experiment, show various sites of intradermal injections to the students and demonstrate the procedure of ID injection using a mannequin. YouTube videos can also be used for support.

Procedure to administer subcutaneous injection

1. Wash your hands thoroughly with soap and water.
2. Collect all of the necessary supplies.
3. Locate the proper injection site on the mannequin.
4. Cleanse the injection site on the mannequin with a sterile alcohol swab and allow it to dry. Do not touch this area until the injection has been administered.
5. Remove needle from cap by pulling it off in a straight motionAnd Draw up the required amount of simulated medication or saline solution into the tuberculin syringe. Remove any air bubbles from the syringe by gently tapping it and expelling the air.
6. Hold the syringe in the dominant hand between the thumb and forefinger, with the bevel of the needle up.
7. Using non-dominant hand, gently pull the skin tight at the injection site, with the forefinger and thumb.
8. Hold syringe at a 50 to 150 angle from the site. Place the needle almost flat against the patient's skin, bevel side up, and insert needle into the skin. Insert the needle only about 1/4 in., with the entire bevel under the skin. (Fig.23.1)
9. Once syringe is inserted, slowly inject the solution while watching for a small weal or bleb to appear. The presence of the weal or bleb indicates that the medication is in the dermis.
10. Withdraw the needle at the same angle as inserted. Do not massage area after injection.
11. Dispose of the remaining supplies, remove gloves, and perform hand hygiene

9. Activity (Role Play):

Give ID injection at a specific site as directed by your teacher. Follow the steps as demonstrated by your teacher. Students are suggested to read theoretical background of experiment before performing activity.

10. Result:

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11. Conclusion:

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12. References:

i. https://wtcs.pressbooks.pub/nursingskills/chapter/18-4-administering-intradermal-medication/
ii. https://opentextbc.ca/clinicalskills/chapter/6-7-intradermal-subcutaneous-and-intramuscular-injections/
iii. Bull World Health Organ. 2011 Mar 1; 89(3): 221–226. Published online 2011 Jan 5. doi: 10.2471/BLT.10.079426

13. Practical related questions :

a. Give the injection administration site for intradermal injection.
b. What is intradermal injection?
c. What are the uses of intradermal injection?
d. What is the specific type of needle used for administering intradermal injections, and what are their corresponding needle sizes?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 24
Vaccination and Injection Technique

1. Aim:

To study the administration technique of injectable vaccine in the mannequin.

2. Practical Significance:

Vaccination is a simple, safe, and effective way of protecting body against harmful diseases, before body come into contact with them. Vaccines are usually administered through needle injections, but some can be administered by mouth or sprayed into the nose. It prevents life-threatening diseases, helping people of all ages live longer, healthier lives and also reduces spreading of preventable diseases to other people in community. In this experiment, students will learn the technique of administration of injectable vaccines in the mannequin.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Discuss need of injectable vaccines	CO4	BTL2
2	Explain the technique of administration of injectable vaccine.	CO4	BTL5
3	Administer the injectable vaccine to mannequin.	CO4	BTL3
4	Follow ethics and cleanliness in performing practical.	CO4	BTL6
5	Collaborate and communicate with colleague students.	CO4	BTL6

4. Relevant Theoretical Background:

4.1 Injectable vaccines

Vaccine is the preparation that used to simulates the body's immune response against diseases. It uses body's natural defenses to build resistance to specific infections and makes your immune system stronger. It helps to protect the body from different bacterial or viral infection and reduces the risk of spreading disease in the community. Vaccines are usually administered through parenteral route, such vaccines are called injectable vaccine but some can be administered by mouth or sprayed into the nose.

4.2 Route of administration & Site of administration

Vaccines are usually administered through needle injection by intramuscular, subcutaneous or intradermal (Fig. 24.1). The majority of vaccines administered intramuscular or subcutaneous route. There are only two routinely recommended IM sites for administration of vaccines, the vastus lateralis muscle (anterolateral thigh- for infants younger than 12 months of age) (Fig. 24.2) and the deltoid muscle (upper arm-for persons 12 months of age and older) (Fig. 24.3).

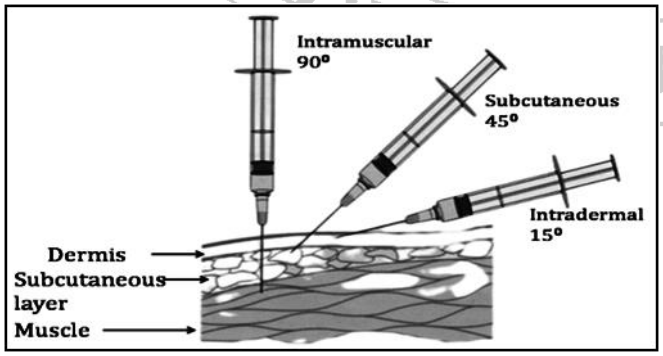

Fig.24.1 Route of administration Injectable vaccines

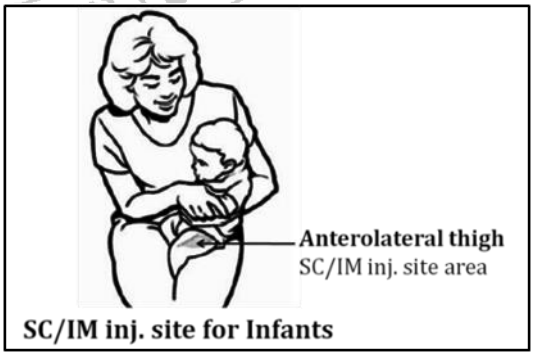

Fig. 24.2 SC/IM Inj. Site for infants

The recommended subcutaneous sites for vaccine administration are the thigh (for infants younger than 12 months of age) and the upper outer triceps of the arm (for persons 12 months of age and older) (Fig. 24.4). The recommended intradermal site for vaccine administration is the deltoid

region of the upper arm (Fig. 24.3). The recommended SC/IM site for vaccine administration is the vastus lateralis muscle (anterolateral thigh).

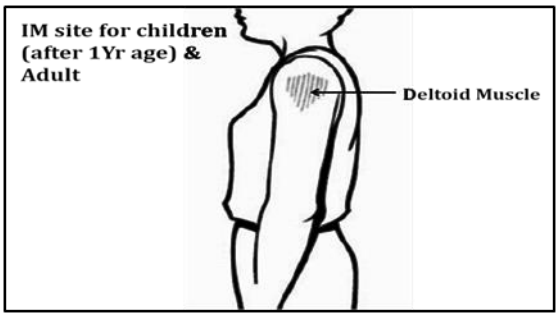

Fig. 24.3 IM/ID site for children & adult

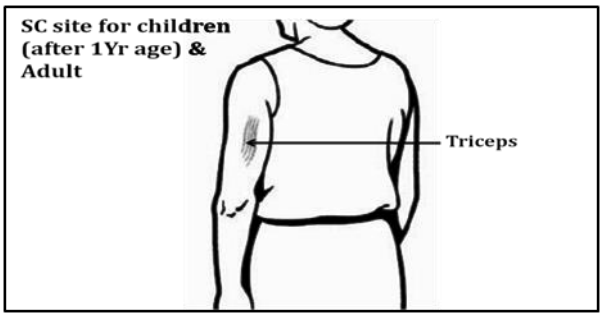

Fig. 24.4 SC Inj. Site for children & adult

4.3 Size of Needle

When injecting vaccine, select the appropriate needle size based on the route, age, patient size, and injection technique in order to ensure that those vaccines receive the immunological advantage without experiencing local adverse effects. The following table outlines injectable vaccines recommended route of administration, injection site, needle gauges and lengths.

Route	Age	Needle gauge and length	Injection site
Subcutaneous injection Measles, Mumps, Rubella (MMR); Varicella (Var); Zoster (Zos); MMRV (Pro Quad)	**All ages**	23–25G 5/8 inch	**Thigh** for infants younger than 12 months of age; upper outer **triceps** area for persons 12 months of age and older
Intramuscular injection Diphtheria, Tetanus, Pertussis (DTaP, DT, Tdap, Td); Haemophilus influenzae type b (Hib); Haemophilus influenzae type b (Hib); Hepatitis A (HepA), Hepatitis B (HepB); Human papillomavirus (HPV); Influenza, inactivated (IIV); Meningococcal serogroups A, C, W, Y (MenACWY); Meningococcal serogroup B (MenB); Pneumococcal conjugate (PCV);	**Neonate, 28 days and younger**	22–25G 5/8 inch	Vastus lateralis muscle of anterolateral thigh
	Infants, 1–12 months	22–25G 1 inch	Vastus lateralis muscle of anterolateral thigh
	Toddlers, 1–2 years	22–25G 1–1.25 inches	Vastus lateralis muscle of anterolateral thigh
		22–25G 5/8–1 inch	Deltoid muscle of arm
	Children, 3–10 years	22–25G 5/8–1 inch	Deltoid muscle of arm
		22–25G 1–1.25 inches	Vastus lateralis muscle of anterolateral thigh
	Children, 11–18 years	22–25G 5/8–1 inch	Deltoid muscle of arm
	Adults, 19 years and older • 130 lbs (60 kg) or less • 130–152 lbs (60–70 kg)	22–25G 1 inch 1 inch	Deltoid muscle of arm

Pneumococcal polysaccharide (PPSV); Polio, Inactivated Polio Vaccine (IPV); Zoster (Zos)	• Men, 152–260 lbs (70–118 kg) • Women, 152–200 lbs(70–90 kg) • Men, 260 lbs (118 kg) or more • Women, 200 lbs (90 kg) or more	1–1.5 inches 1–1.5 inches 1.5 inches 1.5 inches	
Intradermal Bacillus Calmette Guerin (BCG); IPV	**Infant**	26 or 27 G 1/4 to 1/2 inch	Deltoid muscle of arm

5. Requirements:

Mannequin, required number of needle and Syringes, Sterile alcohol swabs, Cotton balls or gauze pads, Vial of simulated medication or saline solution, Waste bin for disposal of used materials

6. Requirements used:

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7. Precautions to be taken:

- Perform hand hygiene before and after administering the vaccine to prevent the spread of infection.
- Store and handle the vaccine as per manufacturer guidelines to maintain potency.
- Follow correct procedures for preparing and reconstituting the vaccine using sterile equipment and checking expiration dates.
- Choose the appropriate injection site based on the vaccine type and age of the patient.
- Observe the patient for a short period after vaccination to monitor for any immediate adverse reactions
- Assess the patient's medical history, allergies, and contraindications to vaccination before administering the vaccine.

8. Demonstration Procedure:

The subject teacher must introduce the need and availability of injectable vaccines, show various sites of injectable vaccines to the students and demonstrate the procedure administering an injectable vaccine using a mannequin. YouTube videos can also be used for support.

Procedure for administering vaccine by injection (IM or SC or ID)

1. Wash hands thoroughly with soap and water.
2. Collect all of the necessary supplies.
3. Locate the proper injection site on the mannequin.
4. Cleanse the injection site on the mannequin with a sterile alcohol swab.
5. Stabilize tissue in the injection site to ensure that the vaccine is given correctly.
6. Hold the syringe with the dominant hand. Use the non-dominant hand to stabilize the injection site. Quickly insert the needle into the skin at a 90° angle (IM) or 45° angle (SC) or 15^0 angle (ID).
7. Inject the whole contents of the syringe by pressing down on the plunger. Do not inhale.
8. Remove the needle and press a dry cotton ball or gauze against the injection site. Hold the position for a few seconds.
9. If the injection site is bleeding, cover it with a bandage.
10. Dispose of the used syringe in the sharp container.
11. If you are giving multiple immunizations to the same extremities, make sure the injection sites are at least one inch apart.

9. Activity (Role Play):

Administer the injectable vaccine via the intramuscular route/ subcutaneous route/ intradermal route to the mannequin as instructed by your teacher.

Follow the steps as demonstrated by your teacher. Students are suggested to read theoretical background of experiment before performing activity.

10. Result:

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11. Conclusion:

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12. References:

i. https://www.cdc.gov/vaccines/hcp/admin/administer-vaccines.html.
ii. Advisory Committee on Immunization Practices General Best Practice Guidelines for Immunization. www.cdc.gov/vaccines/hcp/acip-recs/general-recs/administration.html.
iii. https://nhm.gov.in/index1
iv. www.immunize.org
v. https://ecampusontario.pressbooks.pub/immunizations/chapter/site-and-route/

13. Practical related questions :

a. What do you mean by an injectable vaccine? Enlist the various inieactable vaccines.
b. What are different sites of administration of injectable vaccines?
c. Give the needle size for intramuscular and subcutaneous injection.
d. What precautions need to be taken while administering injectable vaccines?

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Experiment No. 25
Hospital Pharmacy Software

1. Aim:

To study the use of Hospital Pharmacy Software and various digital health tools.

2. Practical Significance:

Hospital Pharmacy become more and more automated with record keeping and information sharing among patients, doctors, providers, and insurance companies, the role of Information Technology (IT) in healthcare has become critical to effective patient care. Technology helps to reduce medication errors, prevent adverse drug reactions and drug interactions, monitor patient compliance, maintains stock and billing, protect patient privacy, and improve overall care.In this practical, the students will be introduced to the components of hospital pharmacy software through demonstration.

3. Practical Outcomes (PrOs):

After completion of this practical, the students will be able to:

PrO	Practical Outcomes	Mapped CO	BTL
1	Describe various components of Hospital pharmacy software.	CO4	BTL2
2	Explain the features of hospital pharmacy software.	CO4	BTL2
3	Discuss the features of Arogya setu application.	CO4	BTL3
4	Practice and follow ethics while using software.	CO4	BTL6
5	Collaborate and communicate with fellow colleagues	CO4	BTL6

4. Relevant Theoretical Background:

Hospital Pharmacy:

The hospital pharmacy is one of the essential division in hospitals that handles the purchase, storage, compounding, dispensing, manufacturing, testing, packaging, and distribution of medicines under the supervision of a registered pharmacist. Hospital pharmacy software is a unified system that manages the products, medications and automates multiple operations related to the hospital pharmacy including stock control, drug dispensing, claims management, billing, and reporting.

Hospital Pharmacy software (HPS):

Nowadays HPS are used within hospitals for drug information, education, evaluation, analysis, medication history, and maintenance of patient records or financial records. Key features of hospital pharmacy software are as follows:

a) **Maintenance of individual patient records:** With the help of HPS pharmacist can store data i.e. records. The hospital pharmacy can keep up-to-date patient records like patient information (name, address, phone number, email address, weight, age), medication history, allergies, Laboratory records, current treatment, and financial records. It also stores all information in the files like the physician's name, direction, drug interaction etc.

b) **Purchasing and Inventory control:**
- To detect the items those have reached the minimum order level.
- To prepare a list of drugs to be ordered and their quantities.
- To prepare purchase orders and avoid duplicate orders.
- To detect infrequently purchased items for possible return or elimination from pharmacy drug supply.
- To produce periodic summary and inventory control statistics.

c) **Drug Database:** A complete database on the use, dosage, formulations, pharmacokinetic interactions, pharmacodynamic interactions, side effects, generic alternatives, pricing, etc. of

various drugs can be maintained. Hospital pharmacists can easily add, remove, or change database items and update inventory information.

d) **Processing and Billing:** Hospital pharmacists can manage prescriptions and process orders using this element of hospital pharmacy software. For billing purposes, it automatically creates invoices

e) **Reporting:** Using this tool, hospital pharmacists can create personalized reports on their daily sales, purchases, in-hand inventory, stock reports, lists of suppliers and clients, top-selling medications, earnings, pending bills, and other information.

f) **Processes:** For a controlled pharmaceutical environment, hospital pharmacy software enables users to define and set their daily workflows. To set up organized workflows, hospital pharmacists can fix categories for the type of inventory (chemicals, drugs, surgical etc.), critical levels for stock, and other factors.

g) **Suppliers:** Users can add suppliers to the platform and create or send orders directly from the software.

h) **Automation:** Hospital pharmacists can design the rules for billing, refills, orders, redundant workflows, taxation, and other repetitive tasks. The medicine procurement, prescription verification, dispensing, and other processes can be automated.

i) **Medication Management with HMS:** Seamlessly integrated with Hospital Management Software (HMS), helps to track medications in real-time, ensuring accurate prescribing by keeping you informed about expiration dates and restocking needs.

j) **Streamlined Prescriptions, No Paper Needed:** Bid farewell to handwritten prescriptions. It enables electronic prescription creation, warns about medication interactions, and provides dosage advice, simplifying tasks.

k) **Communication:** HMS facilitates communication within the floor pharmacies or other hospital departments.

Various Hospital Pharmacy software are available in the market and developers develop HPS as per the need of the hospital and hospital pharmacy. Herewith open-source free software used for demonstration.

Open Hospital software:

Open Hospital is an open-source, free software developed to aid hospitals and clinics in the administration of electronic medical records (EHR). It can be used to manage the processes of hospital pharmacy. Open Hospital has been developed by Information Senza Frontiere, Italy, a non-profit organization that helps those who are living in poverty using different tools or software. For basic understanding of the application of hospital pharmacy software, Open Hospital software can be used as a suitable alternative to other hospital pharmacy management software.

Features of Open Hospital software:

a. Pharmacy management
b. Laboratory management
c. OPD management
d. Patient admission and discharge management
e. Pregnancy management
f. Malnutrition control management
g. Vaccines database
h. Patient billing support
i. Therapy management
k. Appointment scheduling
j. Internal communication
l. Statistics and printing

5. Resources Required:

Computer with internet, Open Hospital Software, or any other if any, Smartphone, etc.

6. Resources used:

_____

_____

7. Precautions to be taken:

- Feed proper information in software.
- Before installation of software, check minimum hardware and software requirements

8. Demonstration of Open Hospital (OH) Software:

The subject teacher must show and explain the operation of the installed Open Hospital software to the students. (Note: In this experiment, the operation of Open Hospital software has been explained. Teachers can use any other software as per their convenience for demonstration.)

9. Procedure:

Step 1: Download and Installation of OH software

a. Go to https://www.open-hospital.org/ and download the appropriate zip file for your device.
b. For Windows, download "OpenHospital-v1.14.2-windows_x86_64-portable.zip".
c. Extract the zip file to a folder named "OHS" or "Open Hospital".
d. Open the extracted folder and double-click "oh.bat".
e. In the command prompt, type "P" and press Enter, or just press Enter.
f. After auto checks, a Login dialog box will appear.
g. Enter User ID and Password as "admin" and click "Submit".

Step 2: Setting of hospital name: Edit the name of the Hospital by clicking on “Settings” button from main menu (press “Alt + S” shortcut key to assess settings from main menu).Click on the Hospital tab then press the “Update” button followed by the “Close” button. (Fig. 25.1)

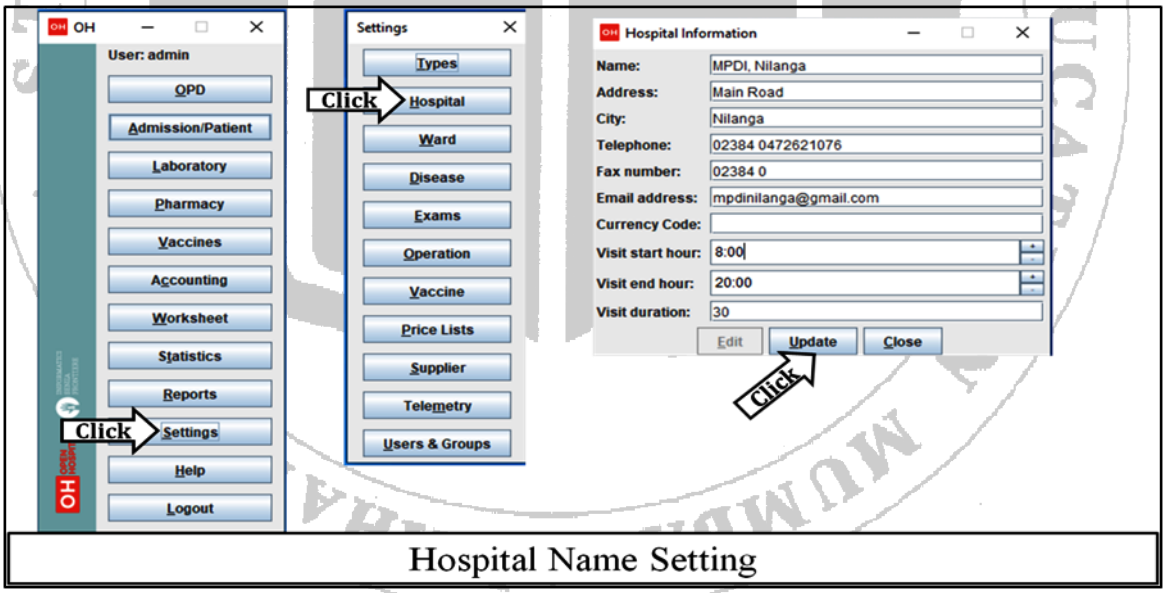


Fig. 25.1 Procedure for hospital name setting

Step 3: Admission of patient:

a. Click "Admission/Patient" to open "Patient Browser."
b. Click "New" and fill in the dummy patient's details.
c. Click "OK" to see the patient's details in "Patient Browser." (Fig. 25.2)
d. Select the patient's row and click "Admission." In "Edit Admission Record," choose a ward (e.g., Internal Medicine) and fill in the fields. Select “Diagnosis-IN” section, click on the down arrow and select any disease / ailment then click “Save”. (Fig. 25.3)
e. Close the "Patient Browser" window. The software is now ready for demonstration.

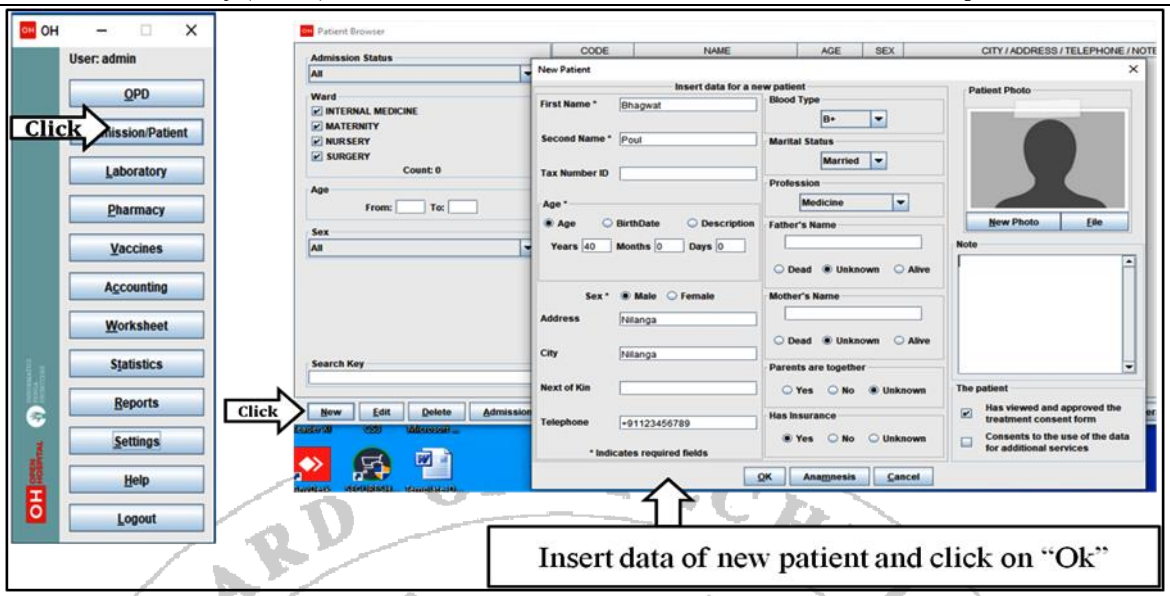


Fig. 25.2 Procedure for addition of new patient information

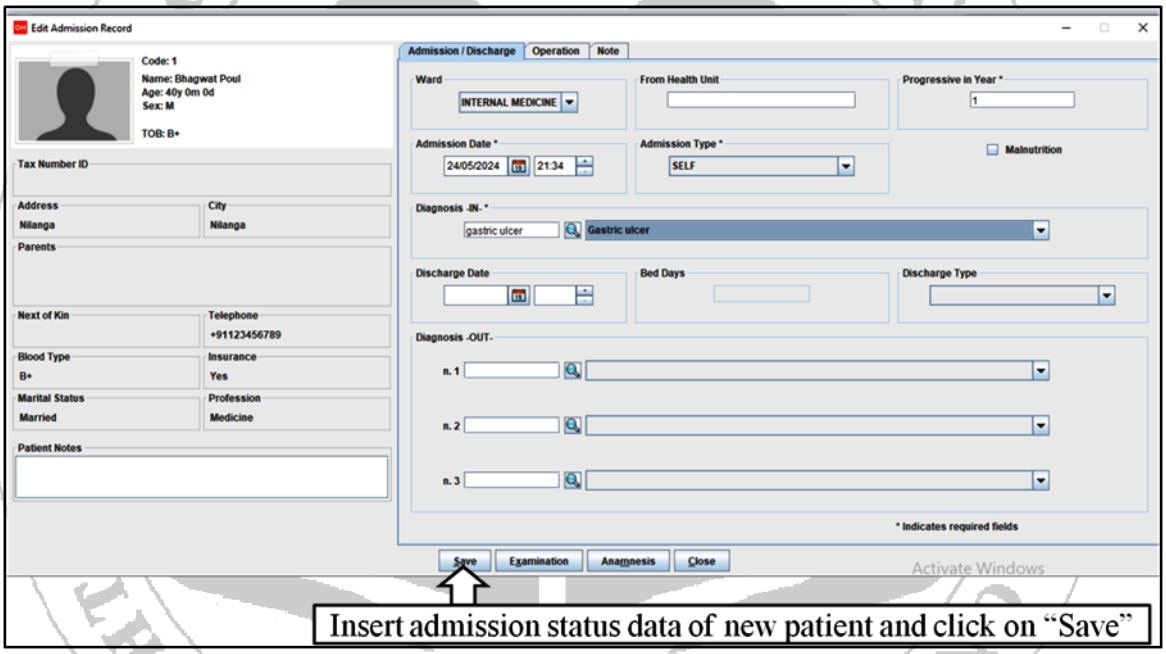


Fig. 25.3 Procedure to check the admission status of new patient

Step 4: Addition of Supplier:

Click on the "Settings" button of main menu followed by "Supplier" button of sub-menu. Click on the "New" button of the "Supplier Browser" and fill the details of a dummy supplier. (Fig. 25.4)

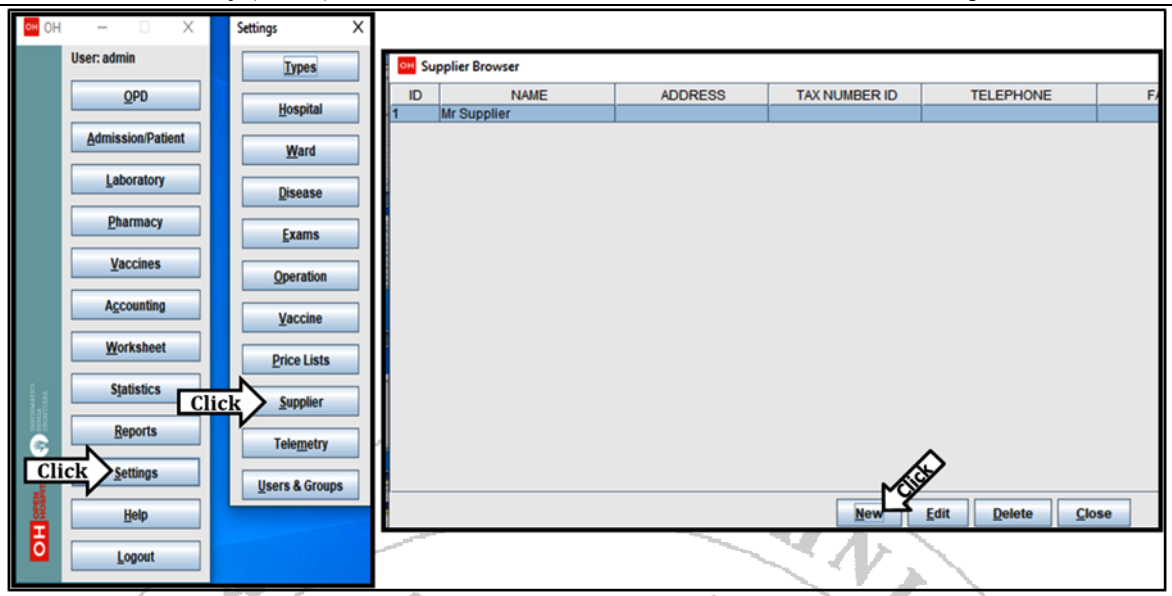


Fig. 25.4 Procedure for addition of supplier

Step 5: Addition of Drug to the Main Store:

a. Click on the "Pharmacy" button in the main menu, then select "Pharmaceuticals" in the sub-menu.

b. In the "Pharmaceutical Browser" window, check if the required drug is listed. If not, click "New", fill in the drug details, and click "OK". Close the window. (Fig. 25.5)

c. Click "Pharmacy" in the main menu, then "Pharmaceutical Stock" in the sub-menu. In the "Stock Movement Browser" window, click "**Charge**". In the "Stock Movement" window, select "Charge" in charge type drop-down menu and "Supplier" in the supplier drop-down menu, add a reference number, enter the drug name, select it, and click "Yes". Fill in quantity, lot number, and unit price details. (Fig.25.6)

d. Click "Save" and close the "Stock Movement Browser" window. (Fig. 25.7)

e. Return to the "Pharmaceutical Browser" window to check if the stock details are updated. Use the search box to find your drug.

f. Click "Stock" for stock quantity reports on a specific date.

g. Click "Stock Card" to view the history of a drug's movement. Select the drug first. (Fig. 25.8)

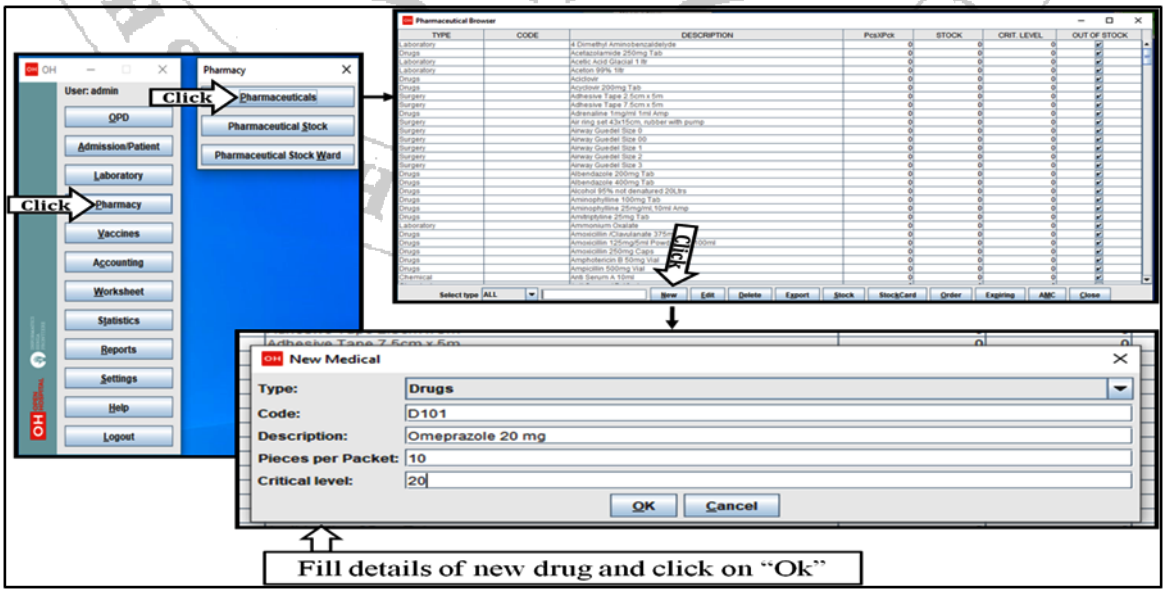


Fig. 25.5 Procedure to fill details of new drug

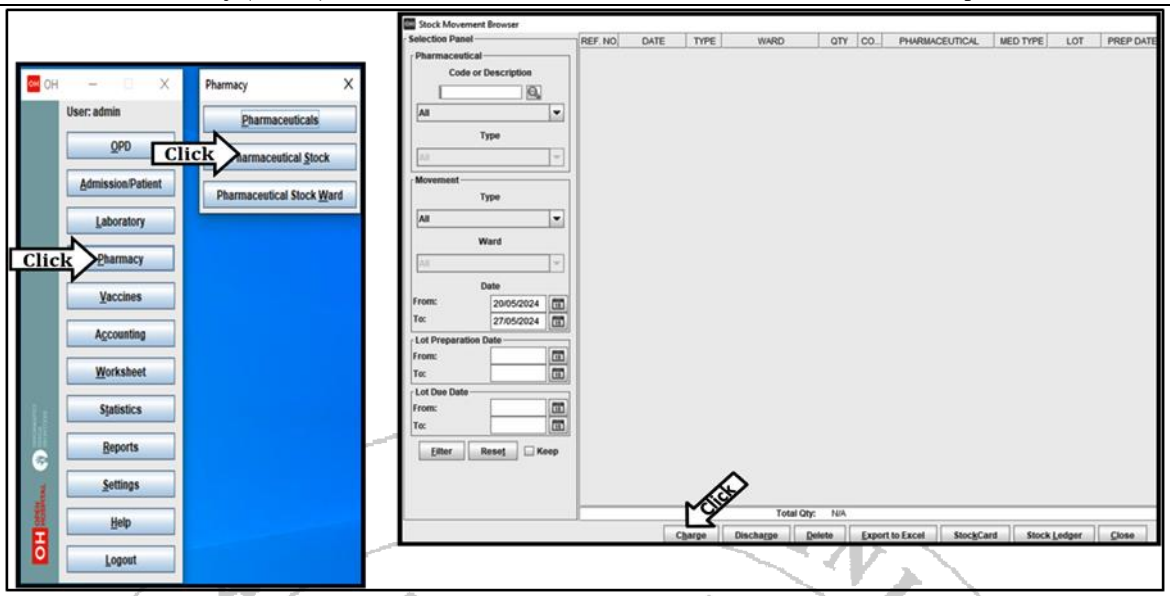


Fig. 25.6 Procedure for addition of stock in main store

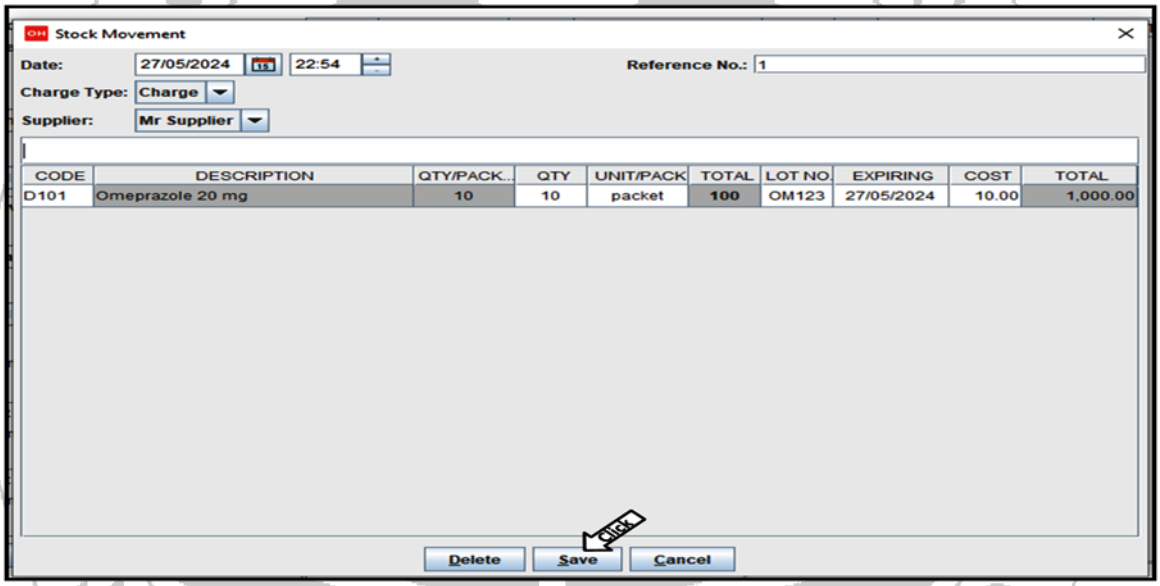
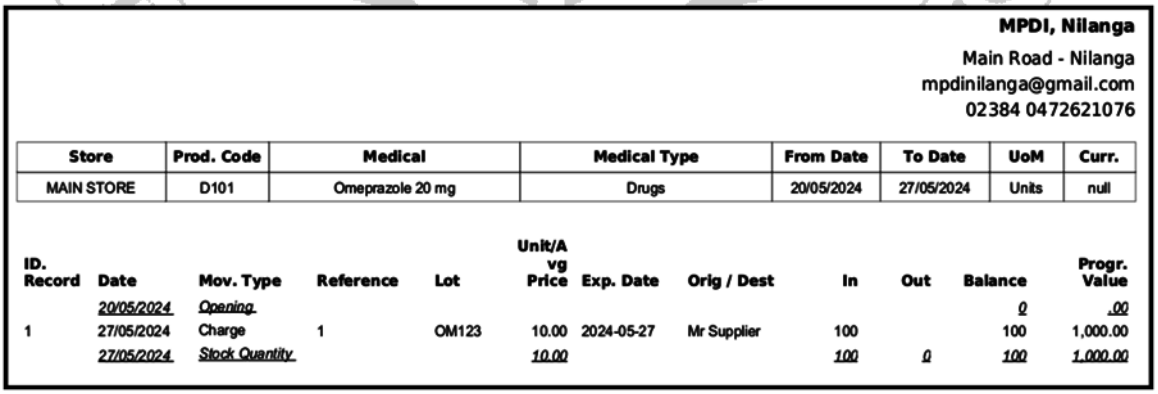


Fig. 25.7 Stock movement browser



MPDI, Nilanga
Main Road - Nilanga
mpdinilanga@gmail.com
02384 0472621076

Store	Prod. Code	Medical	Medical Type	From Date	To Date	UoM	Curr.
MAIN STORE	D101	Omeprazole 20 mg	Drugs	20/05/2024	27/05/2024	Units	null

ID. Record	Date	Mov. Type	Reference	Lot	Unit/Avg Price	Exp. Date	Orig / Dest	In	Out	Balance	Progr. Value
	20/05/2024	Opening								0	.00
1	27/05/2024	Charge	1	OM123	10.00	2024-05-27	Mr Supplier	100		100	1,000.00
	27/05/2024	Stock Quantity			10.00			100	0	100	1,000.00

Fig. 25.8 Drugs movement history of main store (Stock card)

Step 6: Distribution of Drug from Main Store to Ward Pharmacy:

a. Click on the "Pharmacy" button in the main menu, then select "Pharmaceutical Stock" in the sub-menu.

b. In the "Stock Movement Browser" window, click on the "**Discharge**" button. (Fig. 25.9)

c. In the "Stock Movement" window, add a reference number and select the appropriate ward from the Destination drop-down menu (e.g. Internal Medicine for patient with gastric ulcer). Ensure the ward matches where the dummy patient was admitted.

d. Enter the name of the added/prefilled drug, press enter, select the drug from the next window, and click "Yes". Fill in the transfer quantity and select the lot from which the drug is to be transferred. Click "OK".

e. Click "Save" and close the "Stock Movement Browser" window. (Fig. 25.10)

f. Open the "Pharmaceutical Browser" window (refer to steps a and b) and verify if the drug's stock details transferred to the ward pharmacy are updated. Use the search box to find your drug.

g. Click "Stock Card" to view the drug's movement history after transfer. Save this report as a PDF.

h. To confirm the drug's addition to the ward pharmacy stock, click "Pharmacy" in the main menu, then "Pharmaceutical Stock Ward" in the sub-menu.

i. In the "Ward Pharmacy" window, select the appropriate ward from the drop-down menu (e.g. Internal Medicine).

j. Check the "Drugs" tab to see if the drug has been added to the ward pharmacy stock.

k. Click "Stock Card" to view the drug's movement history from the main store. Save this report as a PDF.

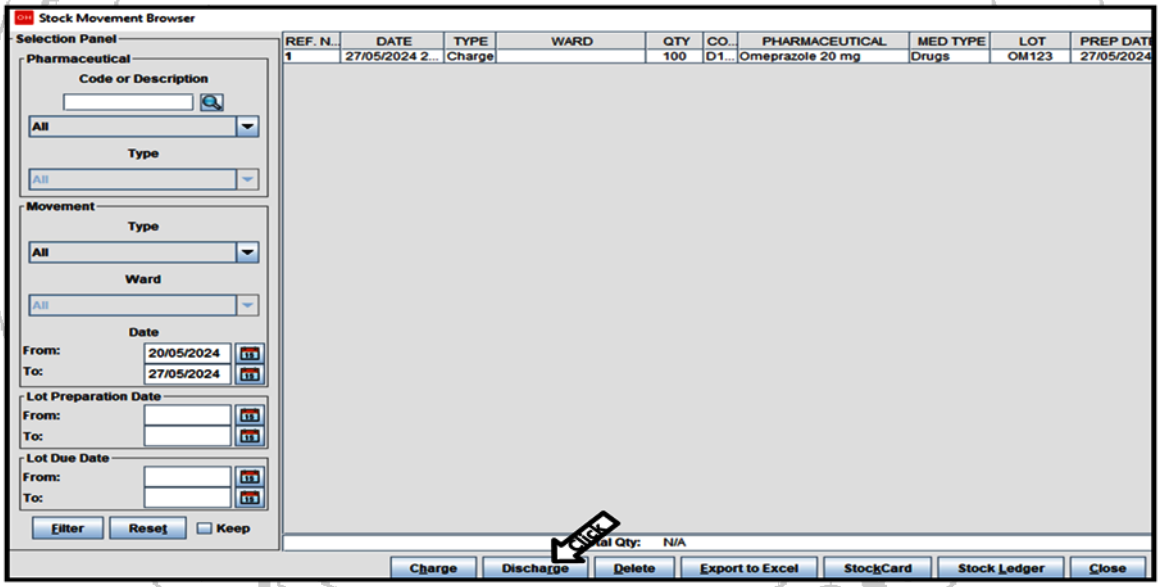


Fig. 25.9 Stock movement browser for distribution (Discharge) of drug to the ward (Step-1)

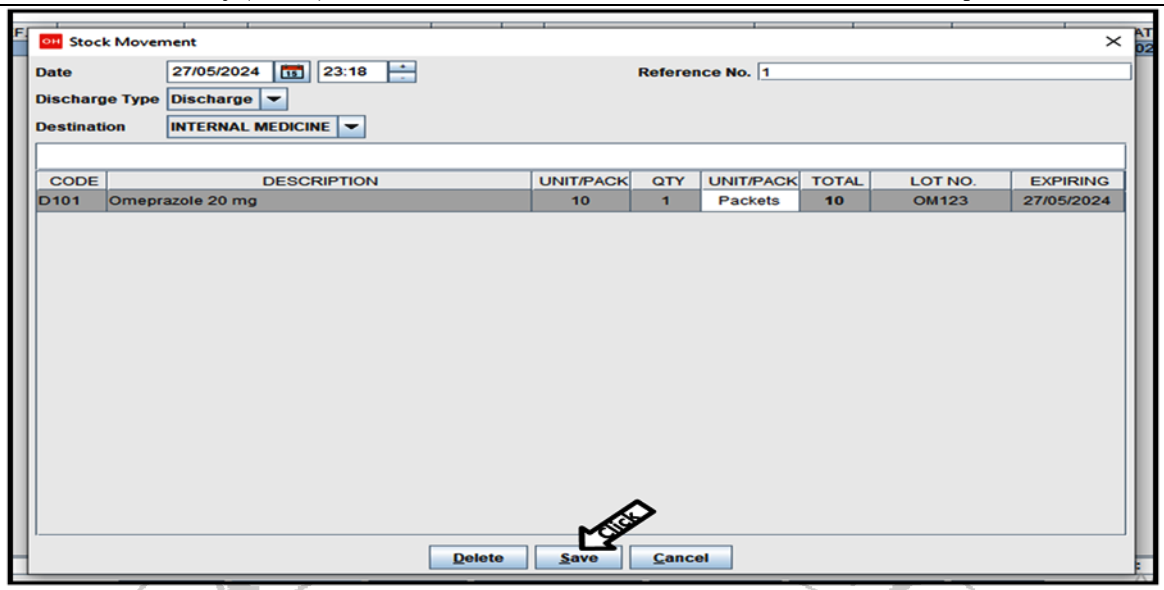


Fig. 25.10 Stock movement browser for distribution (Discharge) of drug to the ward (Step-2)

Step 7: Dispensing Drug from Ward Pharmacy to the Patient:

a. Click "Pharmacy" in the main menu, then "Pharmaceutical Stock Ward" in the sub-menu.
b. In the "Ward Pharmacy" window, select the ward where the dummy patient was admitted and the drug was transferred (e.g., Internal Medicine).
c. Click "New" in the "Ward Pharmacy" window, then "Select Patient" in the "New/Edit" window. Choose the patient in the "Patient Selection" window and click "Select".
d. In the "New/Edit" window, select the transferred drug from the drop-down menu. Click "+Medical" and add the quantity to be dispensed. Click "OK".
e. Click "OK" in the "New/Edit" window. (Fig. 25.11)
f. Click "Stock Card" to view the drug's movement history from the ward pharmacy and save the report as a PDF. (Fig.25.12)

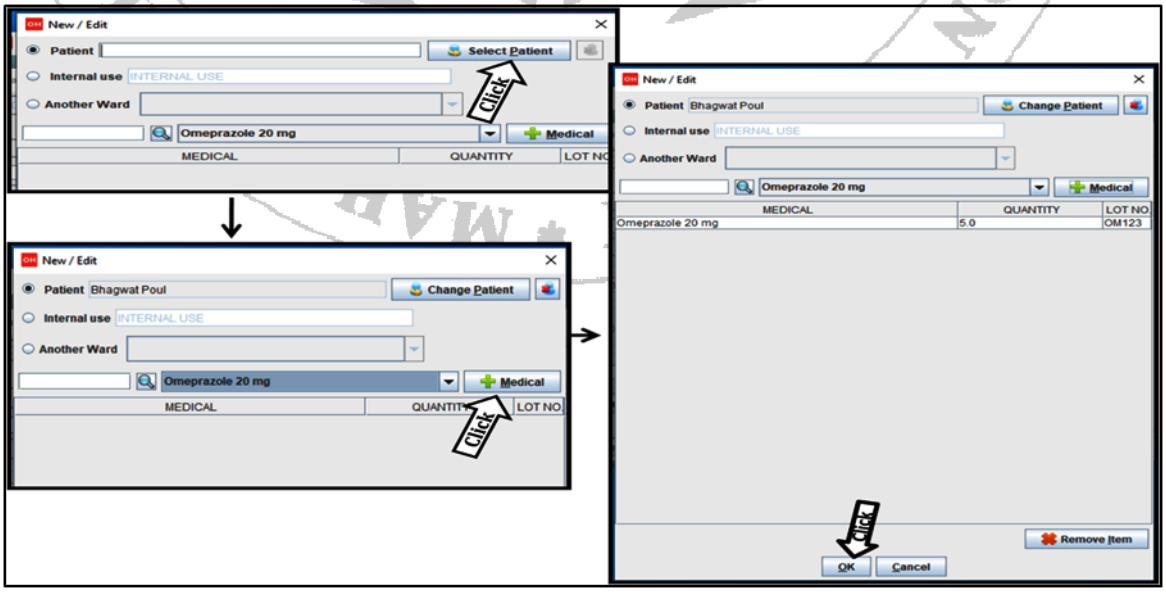


Fig. 25.11 Procedure for dispensing drug from ward pharmacy to patient

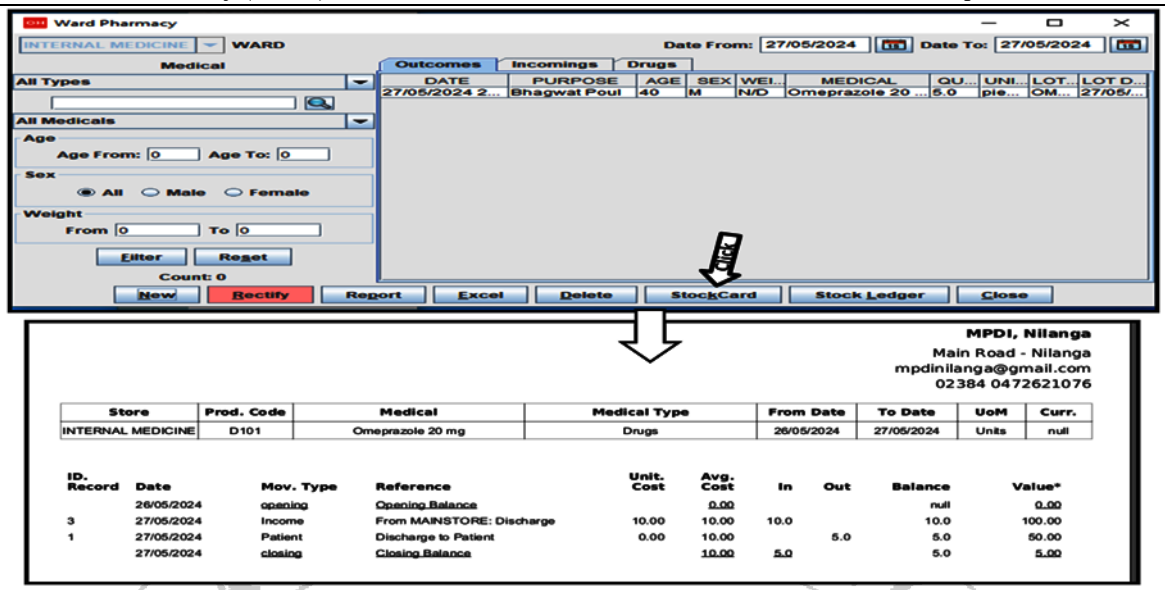


Fig. 25.12 Drug movement history of ward pharmacy (Stockcard)

Step 8: Preparation of Bill for the Patient:

a. Click on "Settings" in the main menu, then "Price Lists" in the sub-menu.
b. In the "Price Browser" window, select the dispensed drug from the list (preferably at the end of the Medicals list).
c. Double-click the cell under the Price List column for your dispensed drug and edit its price to match the unit price from the main store.
d. Click "Save" and close the "Price Browser" window (do not click "Cancel"). (Fig. 25.13)
e. Click on "Accounting" in the main menu, then "Bill Manager" in the sub-menu to open the "Patient Bill Management" window. (Fig. 25.14)
f. Click "New Bill" to open the "New Patient Bill" window, then click "Find Patient" and select the dummy patient from the "Patient Selection" window.
g. Click "+Medical" in the "New Patient Bill" window, select the dispensed drug from the "Medical" window, and click "OK."
h. Add the dispensed quantity and click "OK."
i. Click "Payment," enter the bill amount, and click "OK."
j. Click "Paid," then select "Yes" and "OK" in the following windows. Select "No" if asked to print the receipt. (Fig. 25.15)
k. Click "Receipt" in the "Patient Bill Management" window, select "Yes" if asked to print the receipt, and save it as a PDF. (Fig. 25.16)

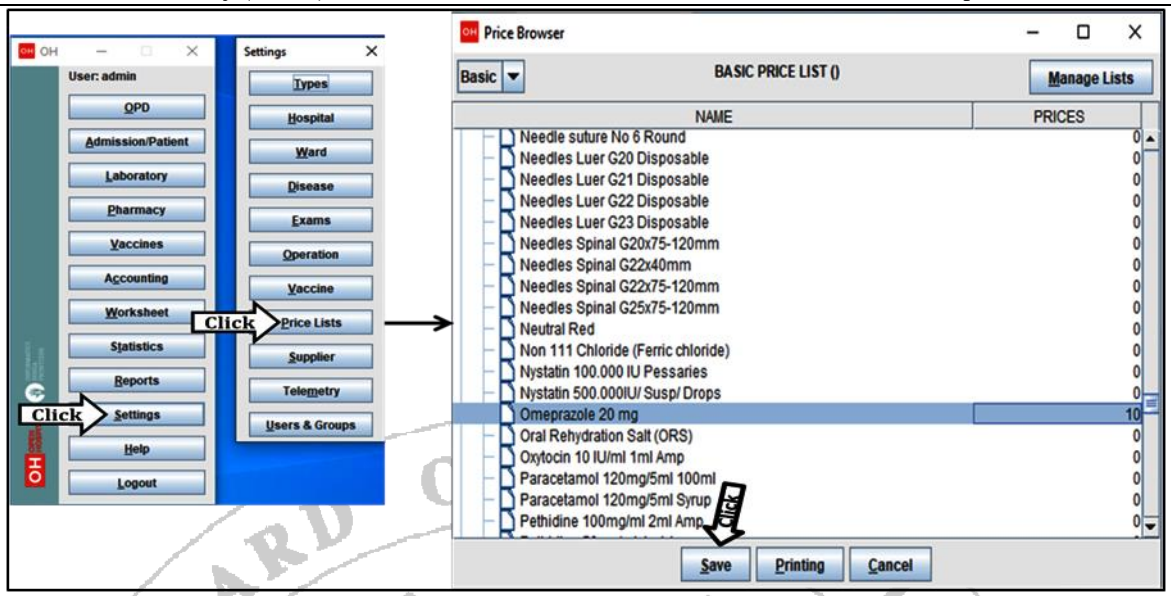


Fig. 25.13 Procedure to save the price of dispensed drug from "Price browser"

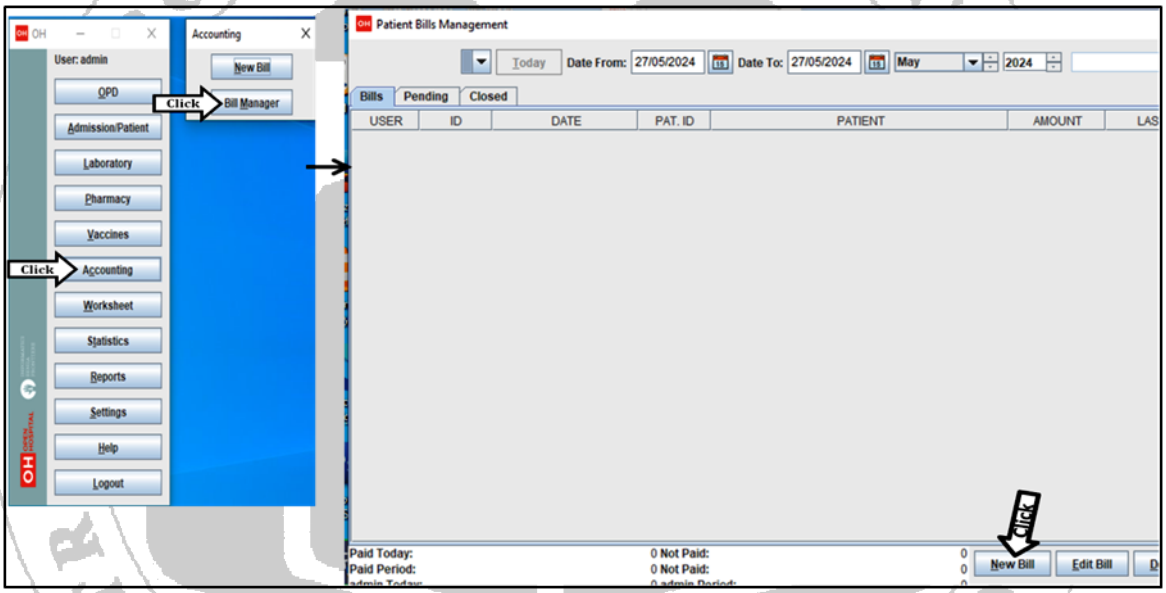


Fig. 25.14 Patient bill management

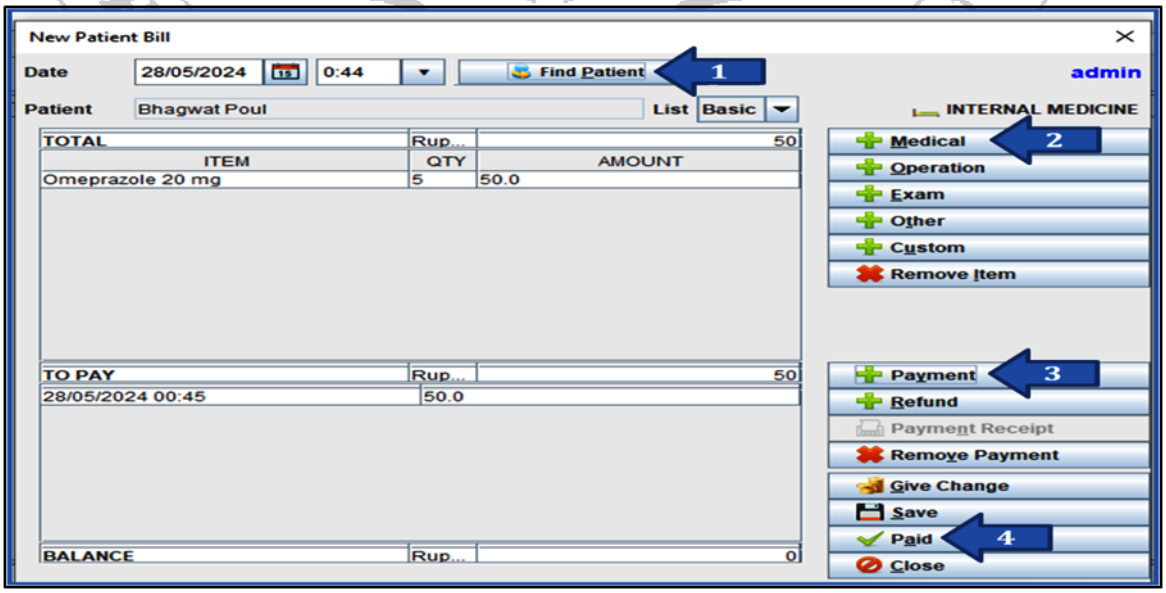
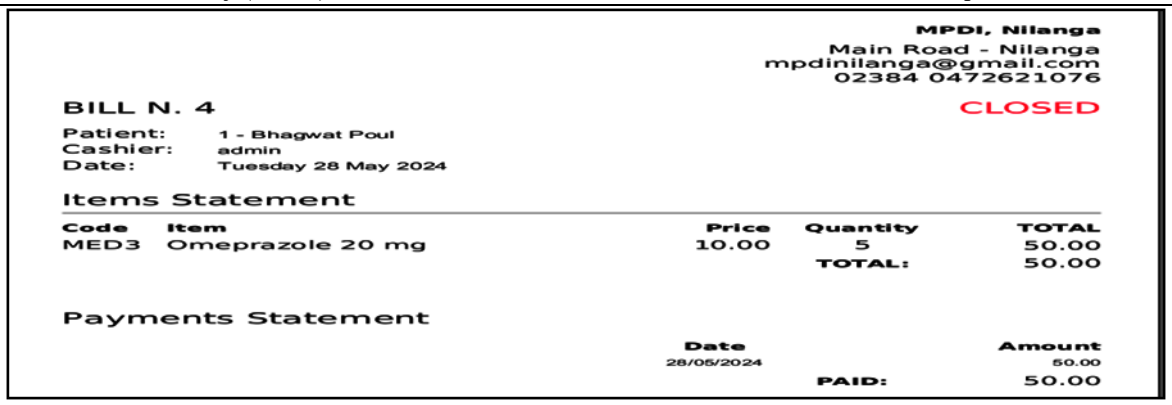


Fig. 25.15 Procedure to generate bill for new patient



MPDI, Nilanga
Main Road - Nilanga
mpdinilanga@gmail.com
02384 0472621076

BILL N. 4 CLOSED

Patient: 1 - Bhagwat Poul
Cashier: admin
Date: Tuesday 28 May 2024

Items Statement

Code	Item	Price	Quantity	TOTAL
MED3	Omeprazole 20 mg	10.00	5	50.00
			TOTAL:	50.00

Payments Statement

Date	Amount
28/05/2024	50.00
PAID:	50.00

Fig. 25.16 Generated bill for new patient

10. Activity:

Activity I: Add a supplier and a drug to the main store based on the disease of the dummy patient. Download the stock card report of the added drug, print it, and submit the report to the teacher.

- Disease of Dummy Patient:_____
- Drug added to main store:_____

Activity II: Transfer specific quantity of drug from the main store to the ward pharmacy. Download the stock card report of the transferred drug, print it and submit the report to the teacher.

Activity III: Dispense 10 units of drug from the ward pharmacy to the dummy patient. Download the stock card report of the dispensed drug, print it. Also prepare a bill for the dispensed drug, print it and attach the bill herewith and/or submit the report to the teacher. (Follow the instructions given by the Teacher).

11. Conclusion:

_____

_____

12. References:

i. https://www.open-hospital.org/

13. Practical related questions :

a. What is hospital pharmacy software?
b. Give the applications of computers in Hospital pharmacy practices.
c. Give a short note on Electronic Health Records.
d. Give the name of hospital pharmacy software used in your nearby Pharmacy or Hospital.

(Space for Answers)

14. Assessment Scheme:

Particular	Understanding the basic concept (Intellectual skill)	Performance of the experiment (Intellectual and motor skill)	Cleanliness & Handling (Affective domain)	Viva-voce / Answers Written	Total	Signature of teacher
Marks Obtained						
Max Marks	**02**	**05**	**01**	**02**	**10**	

Guidelines for Conduction of Sessional Practical Examination

Course Name: Hospital & Clinical Pharmacy (HCP) **Course code**: PH2J
Subject Code: 20060 **Class: Second Year**
Max Marks: 80 **Time: 3 Hrs**

Q. No.	Type of Question	Suggested Guidelines		Marks
1.	**Synopsis**	**(Answer any 5 from 6 questions)** Questions based on experiments conducted and practical related theory can be asked.		**10**
2.	**Experiment**			**50**
	a. Spotting	**(Give 5 spots)** **Following are the spots may be covered in spotting.** knee cap, lumbo sacral and abdominal belt, walking aids, different types bandages, needles, syringes, IV set, ryle's tube, oxygen mask, urinary catheters, urine pot, urine bag, colostomy bag etc., can be asked.	**10**	
	b. Minor experiment	**Following experiments may be covered-** Demonstration of any one from experiment no. 3 to 11 OR Demonstration of administration of IV/IM/SC/ID injection to the mannequin	**15**	
	c. Major experiment	**Following experiments may be covered-** Systematic approach in handling drug information query (Provide case that asks for drug information)* OR Interpretation of laboratory reports to optimization of drug therapy (Provide case with laboratory reports to optimize drug therapy)* OR Adverse Drug Reaction reporting form filling and casualty assessment (Provide case with ADR that asks for filling of adverse drug reaction reporting form and evaluate casualty assessment)* OR Identify drug-drug interaction (Provide therapy plan of the patient with or without interaction)*	**25**	
3	**Viva voce**	Viva should be conducted on practical and theory-based questions		**10**
4	**Practical record maintenance**	Average marks obtained for the experiment conducted.		**10**

***Note: Teacher can use another suitable case study for experiment in examination.**

Guidelines for conduction of Annual Practical Examination

Subject: **Hospital And Clinical Pharmacy** (HCP) **Max. Marks**: 80
Subject Code: 20060 **Max Time**: 3 hrs.
Class: Second year **Course code**: PH2J

Q. No.	Type of Question	Suggested Guidelines		Marks
1.	**Synopsis**	**(Answer any 5 from 6 questions)** Questions based on experiments conducted and practical related theory can be asked. (Ask students to solve any 5 questions out of given 6)		**10**
2.	**Experiment**			**60**
	a. Spotting	**(Give 5 spots)** **Following are the spots may be covered in spotting.** knee cap, lumbo sacral and abdominal belt, walking aids, different types bandages, needles, syringes, IV set, ryle's tube, oxygen mask, urinary catheters, urine pot, urine bag, colostomy bag etc., can be asked.	**10**	
	b. Minor experiment	**Following experiments may be covered-** Demonstration of any one from experiment no. 3 to 11 OR Demonstration of administration of IV/IM/SC/ID injection to the mannequin	**20**	
	c. Major experiment	**Following experiments may be covered-** Systematic approach in handling drug information query (Provide case that asks for drug information)* OR Interpretation of laboratory reports to optimization of drug therapy (Provide case with laboratory reports to optimize drug therapy)* OR Adverse Drug Reaction reporting form filling and casualty assessment (Provide case with ADR that asks for filling of adverse drug reaction reporting form and evaluate casualty assessment)* OR Identify drug-drug interaction (Provide therapy plan of the patient with or without interaction)*	**30**	
3	**Viva voce**	Questions may be asked from laboratory manual, assignment field visit record pertaining to the practical aspects.		**10**

***Note: Teacher can use another suitable case study for experiment in examination.**

PHARMACIST'S OATH

- I swear by the code of Ethics of Pharmacy Council of India in relation to the community and shall act as an integral part of health care team.
- I shall uphold the laws and standards governing my profession.
- I shall strive to perfect and enlarge my knowledge to contribute to the advancement of pharmacy and the public health.
- I shall follow the system which I consider best for pharmaceutical care and counseling of patients.
- I shall Endeavour to discover and manufacture drugs of quality to alleviate sufferings of humanity.
- I shall hold in confidence the knowledge gained about the patients in connection with my professional practice and never divulge unless compelled to do so by the law.
- I shall associate with organizations having their objectives for betterment of the Profession of Pharmacy and make contribution to carry out the work of those organizations.
- While I continue to keep this oath unviolated, may it be granted to me to enjoy life and the practice of pharmacy respected by all, at all times!
- Should I trespass and violate this oath may the reverse be my lot!