JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

ADVANCE EXERCISE THERAPY-II

(23A403P)

LIST OF PRACTICAL

S.NO	PRACTICAL
1.	To demonstrate different aerobic exercise and its benefits.
2.	To study about different breathing exercise techniques.
3.	To demonstrate the techniques of prevention of dyspnea.
4.	To demonstrate various postural drainage positioning.
5.	To study and analyse posture in different plane.
6.	To demonstrate uses and measurements of different walking aids.
7.	To demonstrate gait pattern with walking aids.

Practical-1

Aim: To demonstrate different aerobic exercise and its benefits.

Aerobic exercises are physical activities that raise your heart rate and improve the health of your heart, lungs, and circulatory system. These exercises are typically performed at a moderate intensity, and they can be sustained for a prolonged period.

1. **Running or Jogging**

Equipment: Running shoes

Benefits: Running is one of the most effective forms of aerobic exercise. It can improve cardiovascular health, burn fat and calories, reduces risk of heart disease, boosts mood and increases energy levels.

Safety concerns: choose well lit populated running routes. Let someone know where you will be.

Duration and frequency: 20-30 minutes, 2-3 times per week.

If you are a beginner, run for 20-30 minutes twice a week. At starting you can alternate between 5 minutes of running and 1 minute of walking. To stay injury free always start with stretching before running.

Figure 1.1 Running or jogging

2. **Walking**

Equipment: Gym shoes (Sneakers)

Benefits: Walking daily can reduce risk of heart disease, obesity, diabetes, high blood pressure and depression.

Safety: walk in well-lit and populated area. Choose shoes that offer good ankle support to reduce risk of injury.

Duration and frequency: 150 minutes per week or 30 minutes 5 days a week.

If walking is main form of exercise, aim to practice 150 minutes per week. It can be broken into 30 minutes of walking sessions per day for 5 days in a week or brisk walking for 10 minutes at a time, 3 times a day for 5 days.

Figure 1.2 Walking

3. **Swimming**

Equipment: swimming pool, swimming suit, goggles (optional)

Benefits: swimming is a low impact exercise, so it's good for people prone to or recovering from an injury or living with limited mobility. It can help to tone muscles, build strength and endurance.

Safety: avoid swimming alone and if possible choose a pool with a lifeguard on duty. New swimmers should begin by enrolling in swim sessions.

Duration and frequency: 10-30 minutes, 2-5 times weekly. Add 5 minutes to your swim time each week to increase your duration.

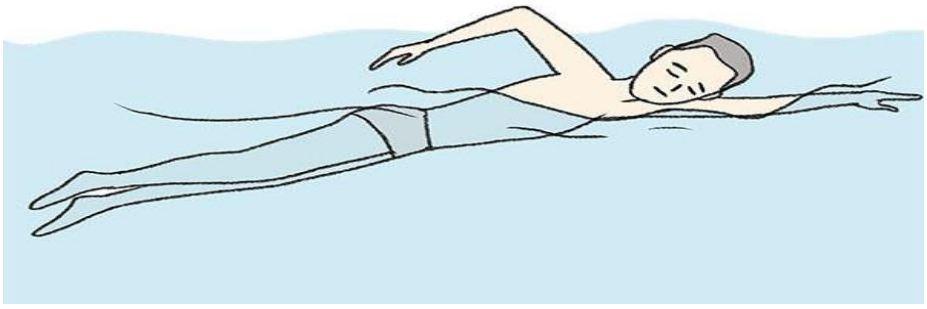

Figure 1.3 Swimming

4. **Cycling**

Equipment: Ergo cycle

Benefits: Improves cardiovascular health, increases endurance, strengthens legs and reduce stress.

Safety: correct seat height help to reduce risk of injury and fall.

General rule is to adjust bike seat height to maintain 5-10 degree bend in knee before reaching full extension to reduce knee joint compression.

Duration and frequency: 30-40 minutes, 3 times per week.

Figure 1.4 Cycling

5. **Jumping rope**

Equipment: Gym shoes (sneakers), rope

Benefits: Improves cardiovascular health, increases endurance, strengthens legs and boosts coordination.

Safety: jumping rope should be adjusted as per person height to avoid tripping on the rope. Stand with both feet on the middle of the rope and extend the handles to armpits. That should be the height of the rope. Cut it out, if it's too long.

Duration and frequency: 15-25 minutes, 3-5 times per week.

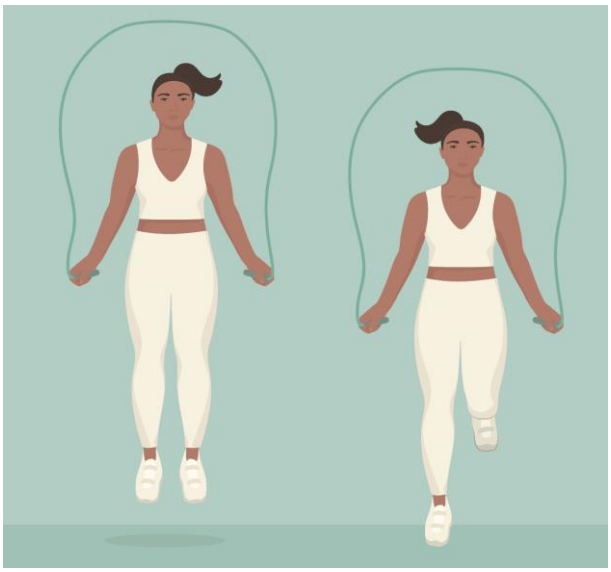

Figure 1.5 Jumping rope

Conclusion: The practical demonstration of different aerobic exercises has effectively showcased the various benefits of aerobic exercise for overall health and well-being. The knowledge and skills gained from this practical can be applied in various settings, including:

- Fitness and exercise programs.

- Rehabilitation and therapy.

- Health promotion and education.

Practical-2

Aim: To study about different breathing exercise techniques.

1. **Diaphragmatic breathing**

Aim: To improve the efficiency of ventilation, decrease the work of breathing, increase the excursion (descent or ascent) of the diaphragm, and improve gas exchange and oxygenation.

Patient position: Semi-fowler's position.

Therapist position: Beside the patient.

Procedure:

- Prepare the patient in a relaxed and comfortable position in which gravity assists the diaphragm, such as a semi- Fowler's position.
- Start instruction by teaching the patient how to relax accessory muscles (shoulder rolls or shoulder shrugs coupled with relaxation).
- Place your hand(s) on the rectus abdominis just below the anterior costal margin. Ask the patient to breathe in slowly and deeply through the nose.
- Have the patient keep the shoulders relaxed and upper chest quiet, allowing the abdomen to rise slightly. Then tell the patient to relax and exhale slowly through the mouth.
- Have the patient practice this three or four times and then rest. Do not allow the patient to hyperventilate.
- If the patient is having difficulty using the diaphragm during inspiration, have the patient inhale several times in succession through the nose by using a sniffing action. This action usually facilitates the diaphragm.
- To learn how to self-monitor this sequence, have the patient place his or her own hand below the anterior costal margin and feel the movement. The patient's hand should rise slightly during inspiration and fall during expiration.
- After the patient understands and is able to control breathing using a diaphragmatic pattern, keeping the shoulders relaxed, practice diaphragmatic breathing in a variety of positions (sitting, standing) and during activity (walking, climbing stairs).

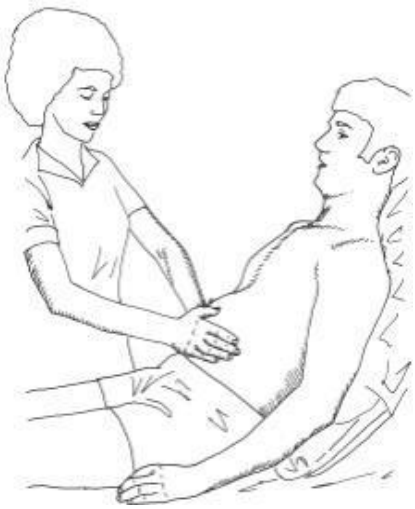

Figure 2.1 Diaphragmatic breathing

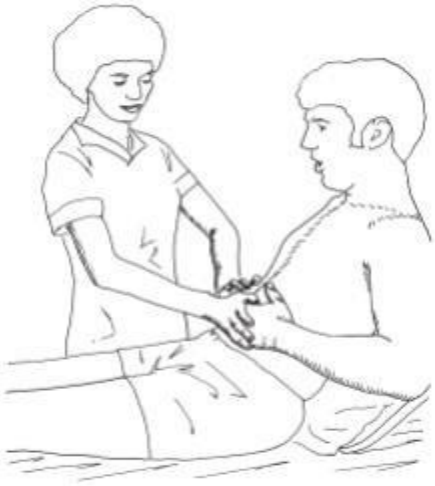

Figure 2.2 Diaphragmatic breathing (patient training)

2. Glossopharyngeal Breathing

Aim: To increase inspiratory capacity of patients who are ventilator-dependent because of absent or incomplete innervation of the diaphragm.

Patient position: Sitting

Therapist position: In front of patient.

Procedure:

- Glossopharyngeal breathing involves taking several “gulps” of air, usually 6 to 10 gulps in series, to pull air into the lungs when action of the inspiratory muscles is inadequate.
- After the patient takes several gulps of air, the mouth is closed, and the tongue pushes the air back and traps it in the pharynx.
- The air is then forced into the lungs when the glottis is opened. This increases the depth of the inspiration and the patient’s inspiratory and vital capacities.

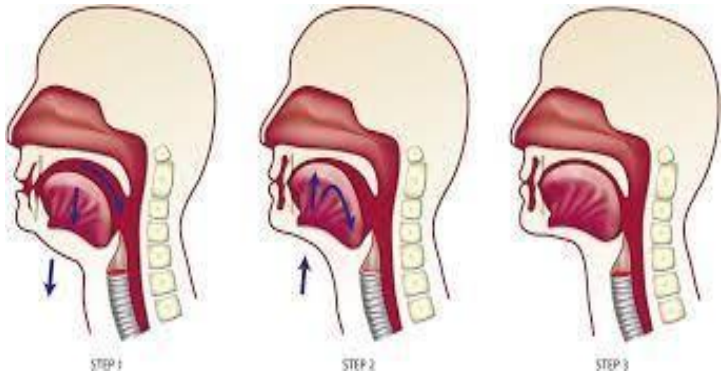

Figure 2.3 Glossopharyngeal breathing

3. Segmental breathing

Aim: To expand localized segment of lungs to overcome hypoventilation in patients with chest wall fibrosis, pain, and muscle guarding after surgery, atelectasis, and pneumonia.

I. Upper lobe / Apical expansion

Patient position: Sitting or semi-reclining position.

Therapist position: In front of patient.

Procedure:

- Position the patient comfortably. Place your hand just below the clavicle of the patient.
- Ask the patient to breathe in deeply and slowly through the nose under your hand. Hold breathe for a second.
- Ask to exhale through the mouth, apply force downward and inward during exhalation.

Figure 2.4 Segmental breathing (Apical expansion)

II. Middle lobe / Lingula expansion

Patient position: Sitting

Therapist position: Behind the patient

Procedure:

- Position the patient comfortably. Place your hand just below the axilla.
- Ask the patient to breathe in deeply and slowly through the nose under your hand. Hold breathe for a second.

- Ask to exhale through the mouth, therapist apply downward and inward force during exhalation.

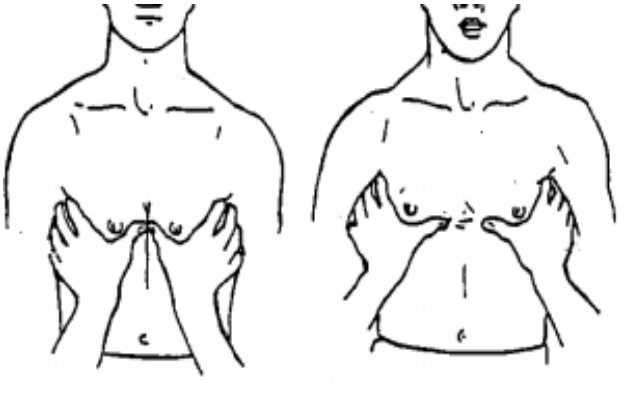

Figure 2.4 Segmental breathing (Lingula expansion)

III. Lower lobe/ Lateral Costal Expansion

Patient position: Sitting

Therapist position: Behind the patient

Procedure:

- Have the patient begin in a hook-lying position; later progress to a sitting position.
- Place your hands along the lateral aspect of the lower ribs to direct the patient's attention to the areas where movement is to occur.
- Ask the patient to breathe out, and feel the rib cage move downward and inward. As the patient breathes out, place pressure into the ribs with the palms of your hands.

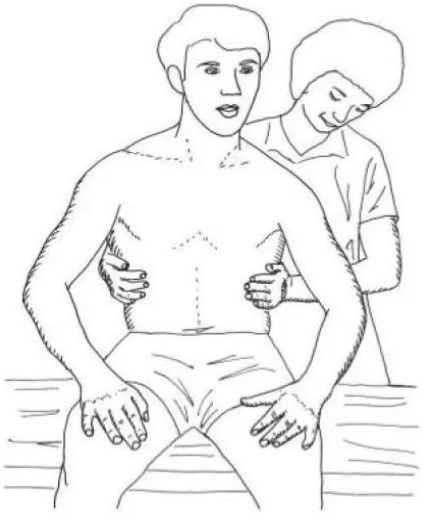

Figure 2.5 Segmental breathing (Lateral costal expansion)

Conclusion: Through this practical, participants have gained hands-on experience with different techniques, understanding their effects on physical and mental well-being. The knowledge and skills gained from this practical can be applied in various settings, including:

- Stress management and relaxation techniques.

- Yoga and meditation practices.

- Respiratory therapy and rehabilitation.

- Mindfulness and wellness programs.

Practical-3

Aim: To demonstrate the techniques of prevention of dyspnea.

Theory:

- Many patients with COPD (e.g., emphysema and asthma) may suffer from periodic episodes of dyspnea, particularly with physical exertion or when in contact with allergens.
- Episodes of dyspnea can be prevented by controlled breathing techniques, pacing activities, and becoming aware of what activity or situation precipitates a shortness of breath attack.
- Pacing is the performance of functional activities, such as walking, stair climbing, or work-related tasks, within the limits of a patient's ventilatory capacity.
- If the patient becomes slightly short of breath, he or she must learn to stop an activity and use controlled, pursed-lip breathing until the dyspnea subsides.

Procedure:

- Have the patient assume a relaxed, forward-bent posture. A forward- bent position stimulates diaphragmatic breathing (the viscera drop forward and the diaphragm descends more easily).
- Use bronchodilators as prescribed. Have the patient gain control of his or her breathing and reduce the respiratory rate by using pursed-lip breathing during expiration.
- Have the patient focus on the expiratory phase of breathing while being sure to avoid forceful expiration.
- After each pursed-lip expiration, teach the patient to use diaphragmatic breathing and minimize use of accessory muscles during each inspiration.

- Have the patient remain in a forward-bent posture and continue to breathe in a slow, controlled manner until the episode of dyspnea subsides.

Figure 3.2 Dyspnea relaxation position

Pursed-Lip Breathing

Procedure

- Have the patient assume a comfortable sitting position and relax as much as possible.
- Have the patient breathe in slowly and deeply through the nose and then breathe out gently through lightly pursed lips as if blowing on and bending the flame of a candle but not blowing it out.
- Explain to the patient that expiration must be relaxed and that contraction of the abdominals must be avoided. Place your hand over the patient's abdominal muscles to detect any contraction of the abdominals.

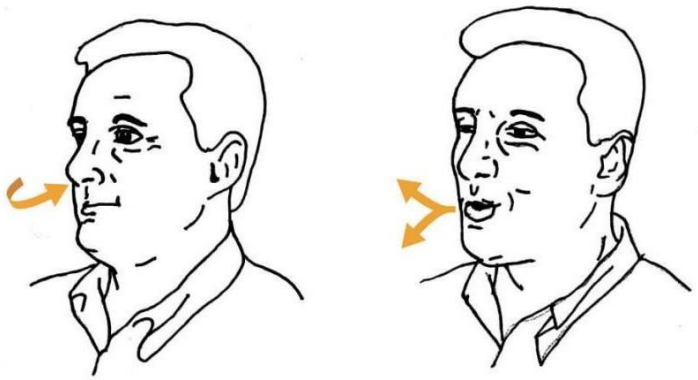

Figure 3.3 Pursed lip breathing

Conclusion: The practical on demonstrating dyspnea prevention techniques has effectively showcased the various methods and strategies for managing and preventing dyspnea. The knowledge and skills gained from this practical can be applied in various settings, including:

- Pulmonary rehabilitation programs.
- Respiratory therapy and care.
- Patient education and support.
- Community health initiatives.

Practical-4

Aim: To demonstrate various postural drainage positioning.

Theory:

- Postural drainage (bronchial drainage) is a technique of airway clearance means of mobilizing secretions in one or more lung segments to the central airways by placing the patient in various positions so gravity assists in the drainage process.
- When secretions are moved from the smaller to the larger airways, they are then cleared by coughing or endotracheal suctioning.

Procedure:

- Determine which segments of the lungs should be drained and position accordingly.
- Check the patient's vital signs and breathe sounds.
- Stand in front of the patient, whenever possible, to observe his or her color.
- Maintain each position for 5 to 10 minutes if the patient can tolerate it or as long as the position is productive.
- Have the patient breathe deeply during drainage but do not allow the patient to hyperventilate or become short of breath. Pursed-lip breathing during expiration is sometimes used.
- Apply percussion over the segment being drained while the patient is in the correct position. Encourage the patient to take a deep, sharp, double cough whenever necessary.
- If the patient does not cough spontaneously during positioning with percussion, ask to take several deep breaths or huff several times in succession as you apply vibration during expiration.
- The duration of any one treatment should not exceed 45 to 60 minutes, as the procedure is quite fatiguing for the patient.

Postural drainage positions:

1. **Upper lobe:**

I. Apical segment of both upper lobe: Patient position should be sitting upright or semi-fowler's position.

II. Anterior segment of both upper lobe: Patient position should be supine.

III. Posterior segment of right upper lobe: Patient position should be left side-lying, turned 45 degree toward prone.

IV. Posterior segment of left upper lobe: patient position should be right side-lying, turned 45 degree toward prone, head and shoulder are elevated 30-45 degree.

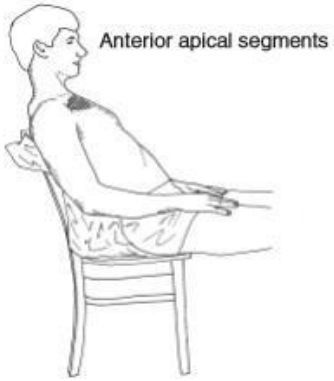

Figure 4.1 Postural drainage position for anterior apical segment of upper lobe

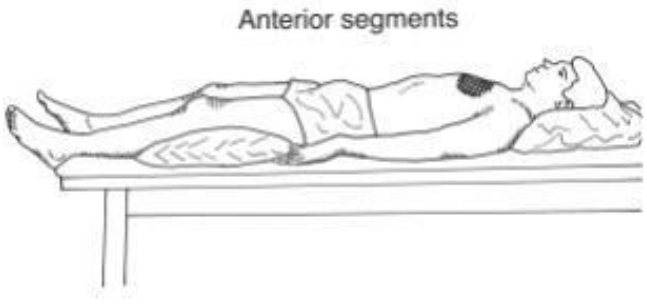

Figure 4.2 Postural drainage position for anterior segment of upper lobe

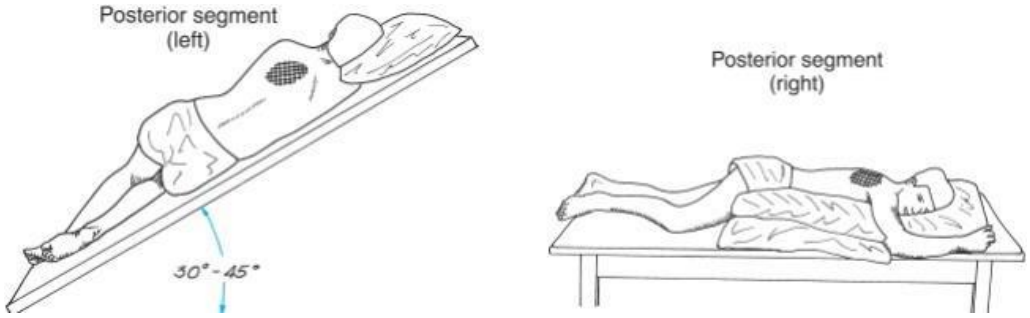

Figure 4.3 Postural drainage position for posterior segment of upper lobe

2. Middle lobe

I. Lingula: Patient lies one-quarter turn from supine on the right side, supported with pillows and in a 30 degree head-down position. Percussion is applied just under the left breast.

II. Right middle lobe: Patient lies one-quarter turn from supine on the left side, supported with pillows behind the back, and in a 30 degree head-down position. Percussion is applied under the right breast.

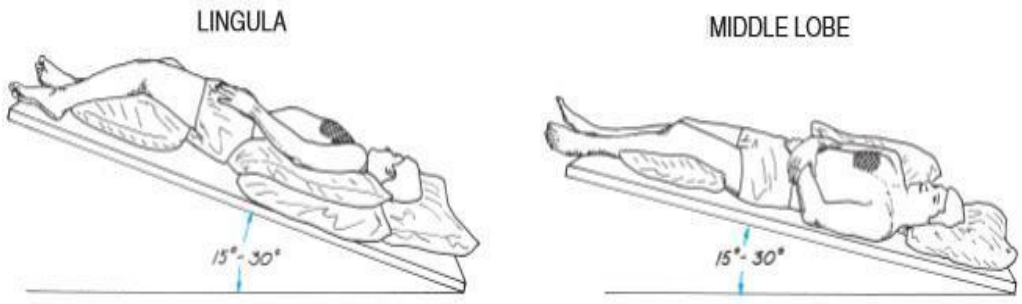

Figure 4.4 Postural drainage position for lingual and middle lobe

3. **Lower lobe**

I. Anterior segment: Patient lies supine, pillows under knees, in a 45 degree head-down position. Percussion is applied bilaterally over the lower portion of the ribs.

II. Posterior segment: Patient lies prone with a pillow under the abdomen in a 45 degree head-down position. Percussion is applied bilaterally over the lower portion of the ribs.

III. Left lateral segment: Patient lies on the right side in a 45 degree head-down position. Percussion is applied over the lower lateral aspect of the left rib cage.

IV. Right lateral segment: Patient lies on the left side in a 45 degree head-down position Percussion is applied over the lower lateral aspect of the right rib cage.

V. Superior segment: Patient lies prone with a pillow under the abdomen to flatten the back. Percussion is applied bilaterally, directly below the scapulae.

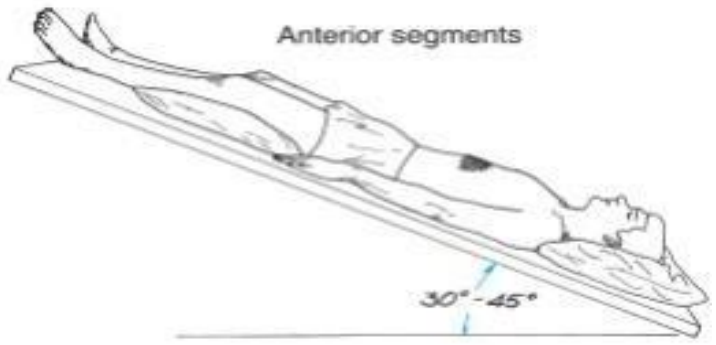

Figure 4.5 Postural drainage position for anterior segment of lower lobe

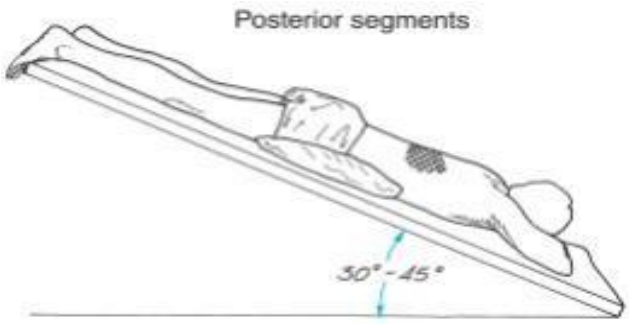

Figure 4.6 Postural drainage position for posterior segment of lower lobe

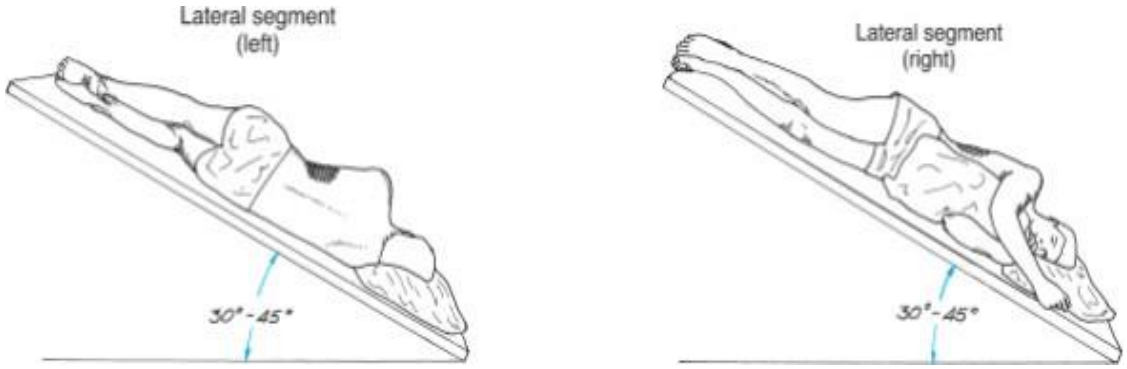

Figure 4.7 Postural drainage position for lateral segment of lower lobe

Conclusion: The practical on demonstrating various postural drainage positioning has effectively showcased the different techniques and positions used to facilitate mucus clearance and improve respiratory function. The knowledge and skills gained from this practical can be applied in various settings, including:

- Respiratory therapy and care.

- Pulmonary rehabilitation programs.

- Patient education and support.

- Home care and self-managemen

Practical-5

Aim: To study and analyse posture in different plane.

Theory: Posture is the attitude assumed by the body either with support during muscular inactivity, or by means of the coordinated action of many muscles working to maintain stability or to form an essential basis which is being adapted constantly to the movement which is superimposed upon it.

Analysis of standing posture

- Observational analysis of posture involves locating body segments in relation to the line of gravity, which is represented by a plumb line (a line with a weight on one end).
- The line is dropped from the ceiling and can be used to assess a person's posture from either the lateral aspect or from the anterior or posterior aspect.
- In an anterior/posterior analysis or frontal plane analysis, the line of gravity/plum line should bisect the body into two symmetrical halves.
- Evaluators of posture should be able to determine whether a body segment or joint deviates widely from the normal optimal postural alignment by using their observational skills.
- Simple photographs taken at the first evaluation may be used to review on-site analysis results and as a basis for comparison with subsequent photographs to determine either the effects of maturation or the results of treatment programs.

- **Alignment in the Coronal Plane in the Standing Posture: Anterior Aspect**

Body segments	Line of gravity	Observations
Head	Passes through middle of the forehead, nose and chin	Eyes and ears should be level and symmetrical.
Neck/shoulder	Passes through middle of the forehead, nose and chin	Right and left angles between shoulders and neck should be symmetrical. Clavicles also should be symmetrical.
Chest	Passes through the middle of the xyphoid process.	Ribs on each side should be symmetrical.
Abdomen/hip/pelvis	Passes through the umbilicus, line equidistant from the right and left anterior superior iliac spines. Passes through the symphysis pubis.	Right and left waist angles should be symmetrical. Anterior superior iliac spines should be level.
Knees	Passes between knees equidistant from medial femoral condyles.	Patella should be symmetrical and facing straight ahead.
Ankle/feet's	Passes between ankles equidistant from the medial malleoli.	Malleoli should be symmetrical, and feet should be parallel. Toes should not be curled, overlapping, or deviated to one side.

- **Alignment in the Coronal Plane in the Standing Posture: Posterior Aspect**

Body segments	Line of gravity	Observations
Head	Passes through middle of head.	Head should be straight with no lateral tilting. Angles between shoulders and neck should be equal.
Arms	Passes along vertebral column in a straight line, which should bisect the back into two symmetrical halves.	Arms should hang naturally so that the palms of the hands are facing the sides of the body.
Shoulder/spine	Passes along vertebral column in a straight line, which should bisect the back into two symmetrical halves.	Scapulae should lie flat against the rib cage, be equidistant from the LoG, and be separated by about 4 inches in the adult.
Hip/pelvis	Passes through gluteal cleft of buttocks and should be equidistant from posterior superior iliac spines.	The posterior superior iliac spines should be level. The gluteal folds should be level and symmetrical.
Knees	Passes between the knees equidistant from medial joint aspects.	Look to see that the knees are level.
Ankle/feet	Passes between ankles equidistant from the medial malleoli.	The heel cords should be vertical and the malleoli should be level and symmetrical.

Plumb line alignment in side view/ saggital plane:

Plumb line should pass through the following anatomical landmarks

- Slightly posterior to the apex of coronal suture
- Through the external auditory meatus.
- Through the odontoid process of axis.
- Through the bodies of lumbar vertebrae.
- Through the sacral promontory.
- Slightly posterior to the centre of hip joint.
- Through the calcaneocuboid joint.

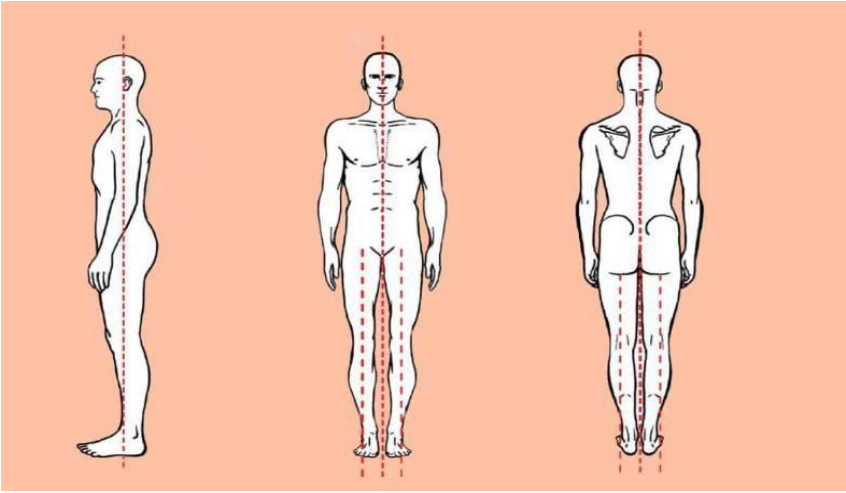

Figure 5.1 Postural analysis in different plane

Conclusion: Through this practical, participants have gained hands-on experience in analyzing posture in different planes, understanding the importance of proper alignment, and identifying potential postural deviations.

Practical-6

Aim: To demonstrate uses and measurements of different walking aids.

Walking aids is an external device used to transfer the body weight through the upper extremity.

Indications or uses of walking aids:

- Walking aids are advised to the person who cannot walk. Due to paralysis, pain, injury, surgery or any other diseases.
- Walking aids are advised to the person who should not walk following injury/surgery or in certain diseases, where lower limb need to be rest.
- Walking aids are also advised for the person who doesn't walk due to hysteresis.

Types of walking aids:

1. **Crutches:** Types of crutches
   - **A. Axillary crutch**
   - **B. Elbow crutch**
   - **C. Forearm/gutter crutch**
2. **Stick:** Types of stick
   - **A. Simple stick**
   - **B. Quadruped/tripod**
3. **Frame:** Types of frame
   - **A. Walking frame**
   - **B. Rollator**
   - **C. Reciprocal walker**

1. **Crutches**
   - There are three basic types of crutches and they are used to reduce weight-bearing on one or both legs, or to give additional support where balance is impaired and strength is inadequate.

A. Axillary crutches-

- They are made of wood with an axillary pad, a hand piece and a rubber ferrule. The position of the hand piece and the total length are usually adjustable.
- The axillary pad should rest against the chest wall approximately 5 cm below the apex of the axilla and the hand grip should be adjusted to allow the elbow to be slightly flexed when weight is not being taken.
- Weight is transmitted down the arm to the hand piece. The elbow is extended. On no account should weight be taken through the axillary pad as this could lead to a neuropraxia of the Radial Nerve or Brachial Plexus.

Measurement of length. There is a variety of ways of measuring the patient for crutches. It is usually carried out with the patient in lying.

a. With shoes off measure from the apex of the axilla to the lower margin of the medial malleolus. This is an easy measurement and is reasonably reliable.

b. With shoes on 5 cm vertically down from-the apex of the axilla to a point 20 cm lateral to the heel of the shoe.

- The measurement from the auxiliary pad to the hand grip should be taken with the elbow slightly flexed (approximately 15°) from a point 5 cm below the apex of the axilla to the ulnar styloid.

B. Elbow Crutches-

- They are made of metal and have a metal or plastic forearm band. They are usually adjustable in length by means of a press clip or metal button and have a rubber ferrule.
- These crutches are particularly suitable for patients with good balance and strong arms. Weight is transmitted in exactly the same way as for axillary crutches.

Measurement of length. The measurement is usually taken with the patient in the lying position with the shoes on. The elbow is slightly flexed (approximately I5°) and the measurement is taken from the ulnar styloid to a point 20 cm lateral to the heel of the shoe.

C. Gutter Crutches (Adjustable arthritic crutches; forearm support)

- They are made of metal with a padded forearm support and strap, an adjustable hand piece and rubber ferrule.
- These are used for patients with Rheumatoid Disease, who require some form of support but cannot take weight through hands, wrists and elbows because of deformity or pain.
- The crutch is adjustable in length in the same way as the elbow crutch. It should also be adjustable in the length of forearm support and in the angle of the hand piece to allow for deformities.

Measurement of length

(a) If the patient is able to stand, it is better to assess the required length in this position from elbow to the floor.

(b) Measurement can be carried out with the patient lying with shoes on, and is taken from the point of the flexed elbow to 20 cm lateral to the heel.

Figure 6.1 Different types of crutches

2. Sticks

- Sticks may be either of wood or metal with curved or straight hand pieces. The metal ones are adjustable and therefore suitable for assessment purposes. The wooden ones are cut to the required length.

Measurement. The measurement can usually be taken with the patient in the standing position. The elbow is slightly flexed and the measurement is taken from the ulnar styloid to the floor approximately 15 cm from the heel.

Use of sticks. Sticks allow more weight to be taken through the leg than do crutches. One stick may be used on the unaffected side so that the stick and the affected leg are placed forward together, taking some of the weight through the stick. Metal sticks with three- or four-pronged bases give a more stable support than a stick.

Figure 6.2 Different types of walking stick

4. Frames-

- The commonest type is the lightweight frame with four feet which may be adjustable in height.
- Ataxic patients who are too unsteady to lift a frame forward may be able to use a rollator frame which can be pushed or a reciprocal frame where each side moves independently.

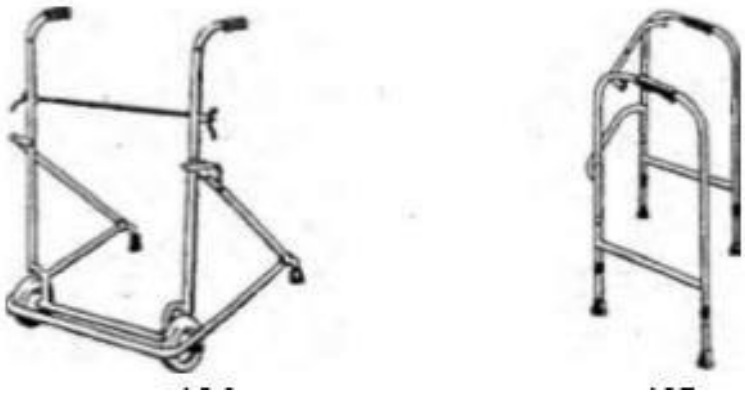

Figure 6.3 Different types of frames

Conclusion: The practical on studying different types of walking aids has provided valuable insights into the various assistive devices available to support mobility and independence.

Practical-7

Aim: To demonstrate gait pattern with walking aids.

Preparation for Crutch Walking:

a. Arms:

- The power of the extensors and adductors of the shoulder and the extensors of the elbow must be assessed and if necessary strengthened before the patient starts walking.
- The hand grip must also be tested to see that the patient has sufficient power and mobility to grasp the hand piece. The results of this assessment will determine the type of crutch chosen.

b. Legs

(i) Non-weight-bearing: The mobility and strength of the unaffected leg should be assessed, paying particular attention to the hip abductors and extensors, the knee extensors and the plantar flexors of the ankle.

(ii) Partial weight-bearing: The mobility and strength of both legs should be assessed and muscles strengthened where necessary.

c. Balance

- Sitting and standing balance, must be tested and trained if necessary.

Demonstration: The physiotherapist should demonstrate the appropriate crutch walking to the patient, emphasising the important points.

Crutch Walking

- **Non-weight-bearing (3 point gait):** The patient should always stand with a triangular base, i.e. crutches either in front or behind the weight-bearing leg.
- To walk, the patient first moves the crutches a little further forward, takes weight down through the crutches and lifts the foot forward to a position just behind the line of the

crutches. Once this is mastered the patient may progress to lifting the foot forward to a position just in front of the line of the crutches.

- It is important in certain cases for the patient to progress to 'shadow walking', where the affected leg is moved in sequence simulating walking- but taking no weight.

- **Partial weight-bearing.** There are two methods of partial weight- bearing.

  (i) 4 point gait: This is a progression from shadow walking, where no weight is taken through the affected leg, to permit a gradual increase of weight to be taken. The crutches and the affected leg are taken forward and put down together. Weight is then taken through the crutches and the affected leg while the unaffected leg is brought through.

  (ii) 2 point gait: This method simulates normal walking and more weight is taken through the affected leg. The right crutch is moved forward followed by the left leg, then the left crutch is moved forward followed by the right leg. This can be progressed to moving the right crutch with left leg and vice versa.
- **Swing to gait:** patient put their crutches forward simultaneously or alternately then jump up to the level of the crutches.
- **Swing through gait**: patient put their crutches forward simultaneously or alternately then jump beyond the crutches.

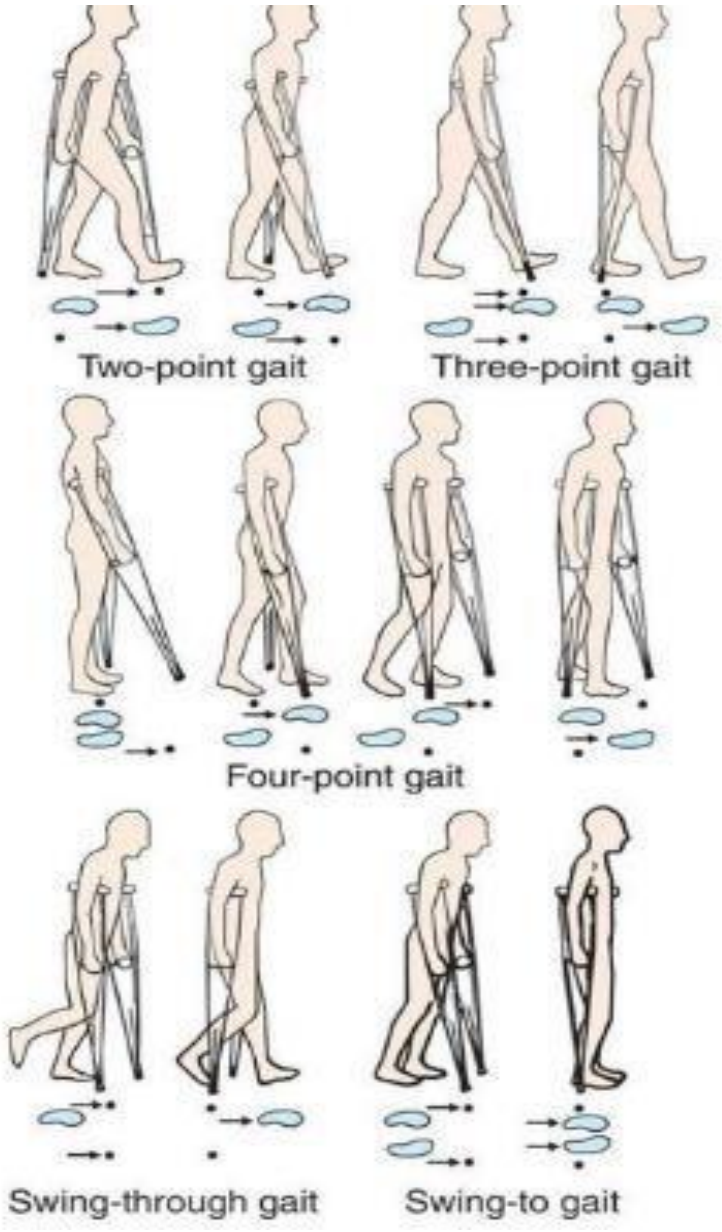

Figure 7.1 Crutch walking pattern

Conclusion: In conclusion, the practical on studying gait patterns with walking aids has provided valuable insights into the various techniques and strategies for safe and effective ambulation. Through this practical, participants have gained hands-on experience in analysing gait patterns with walking aids, understanding the benefits and challenges of different assistive devices**.**