JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

PHYSIOTHERAPY IN CARDIOPULMONARY CONDITION

BPT VI

LIST OF PRACTICAL	
PHYSIOTHERAPY IN CARDIOPULMONARY CONDITIONS,	
Practical 1	CARDIOPULMONARY ASSESSMENT -ADULT
Practical 2	CARDIOPULMONARY ASSESSMENT -PEDIATRIC
Practical 3	SKIN ASSESSMENT
Practical 4	PNF OF RESPIRATION
Practical 5	RESPIRATORY MUSCLE TRAINING
Practical 6	COUGHING FACILITATION
Practical 7	DEMONSTRATION OF ASSISTIVE DEVICES IN CARDIOPULMONARY
Practical 8	CARDIAC REHABILITATION
Practical 9	PULMONARY REHABILITATION
Practical 10	OBSTERICS ASSESSMENTS

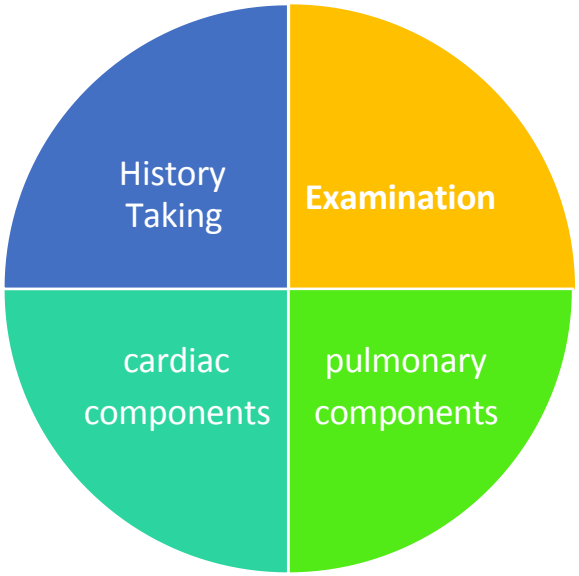
Practical -1

Aim of Experiment: To Know about Cardiopulmonary Assessment in Adults

Introduction

Patients with respiratory problems consult with healthcare practitioners because their family or friends have noted some departure from normal health. Patients may be suffering from mild symptoms or may be apprehensive and fearful of a severe illness that may lead to their incapacitation. Assessment is, without a doubt, the most important skill required to initially evaluate the patient with a respiratory disease and recognize the health problems facing the patient. The patient's perception of the respiratory care practitioner's (RCP) competence is of utmost importance. Therefore, it is imperative that any healthcare provider's affect be genuinely caring toward the patient; skill and a caring attitude must coexist to ensure professional and trustworthy relationship.

Components of assessments



Components of the medical History Taking

Demographic data	Patient name Address Age Gender Race/ethnicity Education Marital status Religion Languages spoken Admitting diagnosis (if available) Patient's physician Brief description of reason for medical care
Chief Complain	The particular reason for this visit made by patient or family member List of complaints in order of acuity
History of Present Illness	Specific details regarding the presenting illness in chronologic order
Past Medical History	Previous hospital admissions Past operations Major illnesses Accidents Injuries Pregnancies
Medication history	Current prescription medications Over- the-counter medications Allergies
Social history	Birthplace Marital status Living arrangements Smoking history Alcohol use Drug use Sexual activity
Family history	Relatives and causes of death Family diseases
Occupational/environmental history	Occupation Work environment and exposure Military service
Review of symptoms	General symptoms Skin and nails Head, eyes, ears, nose, and throat (HEENT) Endocrine Respiratory Cardiac/cardiovascular Hematologic Lymph Gastrointestinal (GI) Genitourinary Musculoskeletal Neurologic Mental status

Chief Complain:

The chief complaint is the problem or group of symptoms that brings the patient to the physician or hospital for health care.

History of Present Illness

The history of present illness describes the detailed information pertinent to the chief complaint. Once the patient has completed his or her answer to the initial chief complaint question, the practitioner moves on to clarify and focus using specific questions**.**

Components of History of Present Illness are as follows

Onset	Date, time, sudden, or gradual
Location	Where is the problem? Did it spread
Duration	Symptom duration
Character	Quantity and quality of symptoms
Associated manifestations	The setting in which the symptoms began
Relieving factors	Factors that diminish or aggravate symptoms
Treatment	Medications, remedies that relieve or exacerbate symptoms

Past Medical History:

The PMH gives an insight into the health status of the patient up to the point of the present illness. This section contains information about the patient's past illnesses and treatment, including previous hospital admissions, prior surgeries, major illnesses (such as diabetes, hypertension, or heart disease), and accidents. When taking a PMH, it is important to ascertain the diagnosis, dates, sequence, and management of each diagnosis. Other information documented here include childhood diseases and development, allergies, and immunizations**.**

Medication History

Medication information is crucial. Current medications serve as a reminder of other existing conditions that the patient may have forgotten to mention earlier in the interview. Medications taken may contribute to the current problem or influence the choice of medications for the current problem. It is important to ask about over-the-counter medications as well as herbal remedies because all these can have adverse reactions or drug interactions. Numerous drugs affect gastric pH, enzyme quality, normal renal excretion, intestinal bacteria, and blood chemistries. Drugs may also confuse the significance of certain signs and symptoms

Family History

Some disorders are considered familial or hereditary. Obtaining a patient's family history can reveal the presence of a genetic predisposition to certain diseases. For example, the presence of cerebrovascular disease or dementia in a close blood-related relative might help guide the management of the patient.

Review of Symptoms or Review of Systems

The review of symptoms (ROS), also known as a review of systems, provides an opportunity for the RCP to collect data verbally. The focus of the ROS is on the system or systems that are affected by the present iSocial History

A patient's health and well-being are affected by social, personal, and occupational factors. Knowledge of the patient's background is useful, not only for diagnosis but also for disease management**.**

Occupational and Environmental History

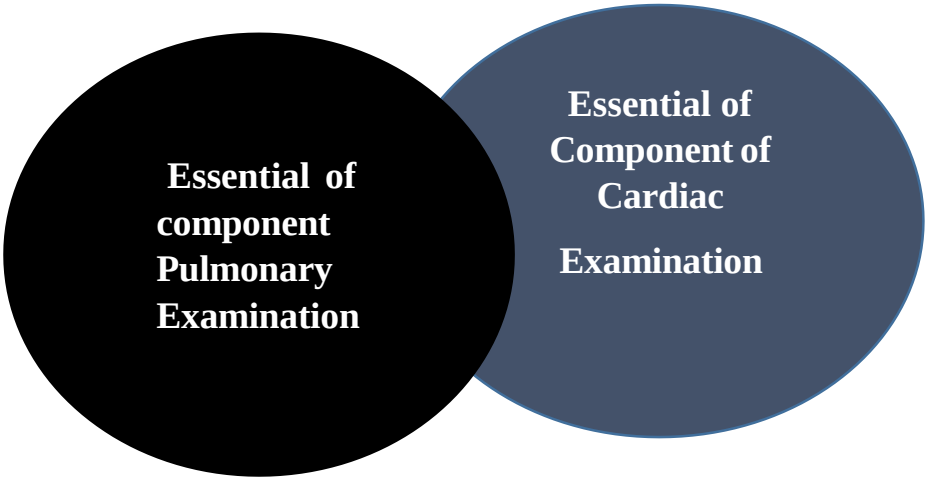
Taking a patient's history needs to include information about previous and current employment. This is important because aspects of employment other than the job itself can influence social well-being if illness precludes a return to work. Patient management and prognosis

General symptoms	Weight loss, weight gain, fatigue, difficulty sleeping, fevers, chills, sweats, chronic pain
Skin and nails	Color, temperature, appearance, skin eruptions/rashes, itching, clubbing
HEENT	**Head**—dizziness, loss of consciousness, fainting, head injury, concussion **Eye**s—Blurred vision, double vision, eye discharge, red eye, pupillary reaction **Ears**—Pain, hearing loss, tinnitus, vertigo **Nose**—Nasal discharge, sneezing, nasal flaring, sinus pain, postnasal drip, nosebleeds **Throat**—Vocal cord pathology, voice change, sore throat, tooth pain, bad breath, appearance of gums
Endocrine	Diabetes, thyroid enlargement, thyroid tenderness, polyuria, weight gain, weight loss
Respiratory	Chronic or past pulmonary disorders, SOB with or without exertion, chest pain, cough, hemoptysis, wheezing, snoring, chest deformity, chest trauma
Cardiovascular	Chronic cardiovascular disorders, chest pain or pressure, SOB at rest or with exertion, orthopnea, paroxysmal nocturnal dyspnea, peripheral edema, syncope, palpitations, leg pain or cramps with ambulation, foot ulcers that are difficult to heal

are affected significantly by the knowledge of this information. For example, patients with occupational asthma or hypersensitivity pneumonitis often cannot be managed adequately without cessation of exposure to the offending agentllness and relate to the patient's complain

Vital Signs

Vital signs are the four signs of life: temperature, pulse, respiratory rate (RR), and blood pressure (BP).



Essential Elements of a Pulmonary Examination On Observation

Observation of the patient begins when the respiratory therapist walks through the door to the patient's room. It includes a quick review of the Accessory Muscle Use

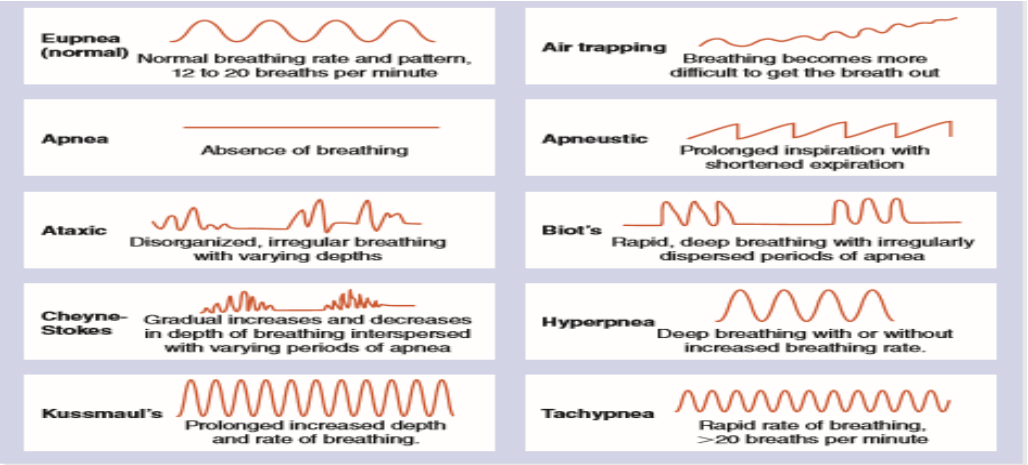
When the diaphragm is severely depressed by the increase in residual volume and functional residual capacity, or air trapping, the accessory muscles of inspiration are activated. The use of accessory muscles, at rest, is an indication of respiratory distress, increased work of breathing, and oxygen consumption

Sternal retractions are the inward movement of intercostal spaces and are caused by conditions that impede inspiration.

Nasal flaring occurs when the external nares flare outward during inhalation. This occurs most often in infants with respiratory distress, indicating an increased work of breathing.

Cyanosis occurs when the concentration of Desaturated hemoglobin is 5 g or more.patient and the patient's environment**.**

Breathing Pattern



Inspection

Jugular vein distension (JVD)

The most common cause of jugular vein distension (JVD) is right-sided heart failure (cor pulmonale) secondary to increased pulmonary vascular resistance as a result of chronic hypoxemia. Right-sided heart failure may be secondary to chronic left-sided heart failure. JVD may be present because of hypervolemia or increased impedance to venous return to the right atrium**.**

Tracheal Position

Inspection of the neck is a valuable tool in evaluation of the tracheal position. The trachea is located anteriorly, in the midline of the neck. Check the centrality of the trachea by inserting the tip of the index finger into the suprasternal notch

Paradoxical Breathing

Paradoxical breathing occurs when chest movement is the opposite of the normal chest motion. One common cause of paradoxical breathing is flail chest**.**

Finger Clubbing

Chronic hypoxia can lead to digital clubbing, where the fingers appear like a small club

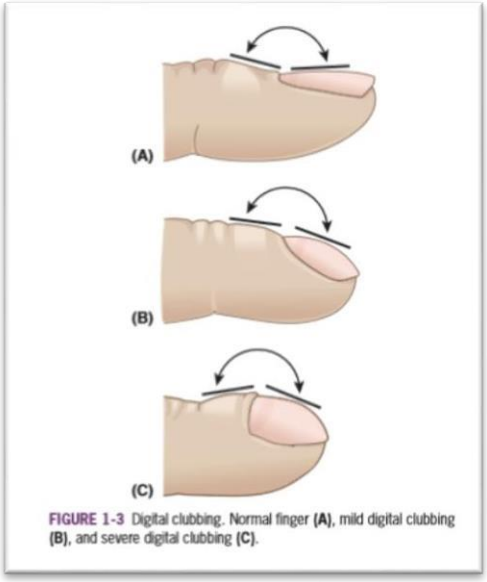
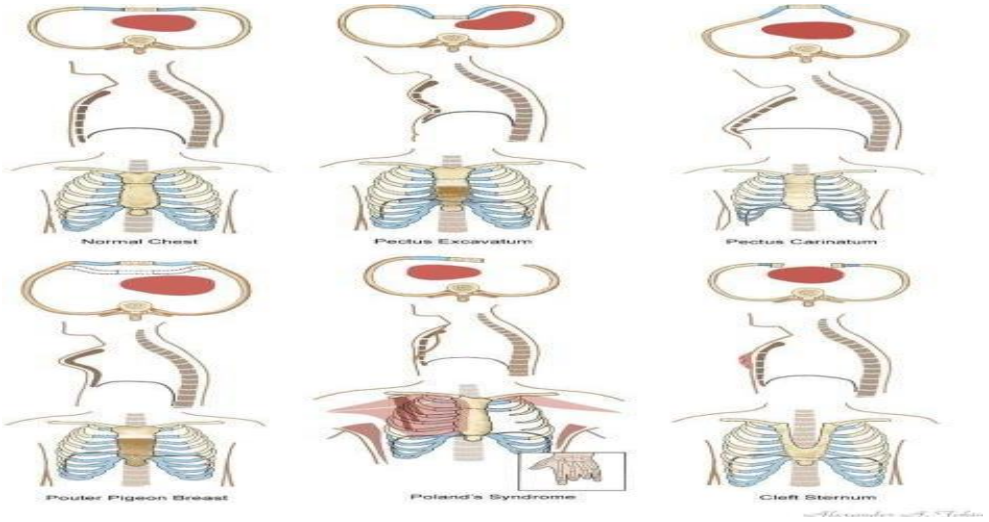


FIGURE 1-3 Digital clubbing. Normal finger **(A)**, mild digital clubbing **(B)**, and severe digital clubbing **(C)**.

Chest Configuration

Inspection of chest configuration is important to identifying abnormalities of the chest that impact on pulmonary mechanics and reveal information about the progression of lung disease.



Pedal Edema

Edema is an excessive accumulation of fluid in the interstitial space. Chronic lung disease can cause pedal edema because of right heart failure or cor pulmonale.

Palpation

Palpation is the art of touching and feeling the surface of the body to assess the underlying tissue. For chest assessment, this involves touching the chest wall of a patient to find areas of tenderness or subcutaneous emphysema due to trauma, determine chest expansion, and assess for tactile fremitus. Palpation uses the fingertips, palms, or the ulnar part of the hand with light pressure**.**

Peripheral Skin Temperature

Palpation of the patient's feet and hands provides information about perfusion; cool extremities may indicate inadequate perfusion. When cardiac output and blood flow are not sufficient, compensatory vasoconstriction of the extremities shunts the blood to the vital organs.

Capillary Refill Time

Capillary refill time (CRT) is the amount of time required for the return of color after the application of blanching pressure to a distal capillary bed, and is used to assess the adequacy of blood flow to the extremities

Tactile Fremitus

Normal lungs transmit palpable vibrations to the chest wall. This is fremitus and requires the examiner's hands to be placed on the chest wall to feel the vibrations that occur while a patient is speaking. The patient is asked to repeat the word "ninety-nine" or "one-one-one," while the examiner places the ulnar aspect of both hands firmly against either side of the posterior chest wall between the scapula and the spine. The hands are moved downward and laterally to assess the lower lobes.

Subcutaneous Emphysema

Subcutaneous emphysema is the presence of air under the skin. The air may be present in subcutaneous tissues of the neck, chest, and face. This condition may be painful, and the tissues may swell. Subcutaneous emphysema may be detected by placing the stethoscope over the tissue and listening for crackling or popping sounds or by palpating bubbles as the examiner's fingers move along the surface of the affected area.

Chest Wall Expansion

The chest wall is palpated to determine if the lungs are expanding symmetrically. Lung disorders such as atelectasis, pneumothorax, pneumonia, lung resection, and right main stem intubation can cause asymmetrical chest expansion. Under normal conditions, each thumb moves equally (symmetrically) a distance of approximately 3–5 cm.

Percussion

Percussion or tapping with a finger is used to evaluate the underlying lung tissue by the transmitted sounds. During percussion of the chest, the clinician firmly places the middle finger of the non- dominant hand over the area to be evaluated. With the flip of the non- dominant wrist, the tip of the dominant hand middle finger is used to strike the finger on the chest. Symmetrical and orderly chest percussion is essential to compare the sounds generated over the percussed areas of the chest.

Dull Percussion Note	Hyperresonant Percussion Note
A dull percussion note heard over the areas of high density or areas with little or no air is due to pleural effusion, atelectasis, and pleural thickening. It is also heard over the liver and a tumor. A dull	A hyperresonant note is loud, has a high pitch, and is of long duration. This note is heard over the areas of low tissue density or areas with increased air. These areas occur in
percussion note has a flat or soft, high frequency (high pitch) and short duration. When there is an increase in tissue density, the sound vibrations generated by percussion do not freely transmit through the lungs.	patients who have emphysema, pneumothorax

Auscultation of Breath Sounds

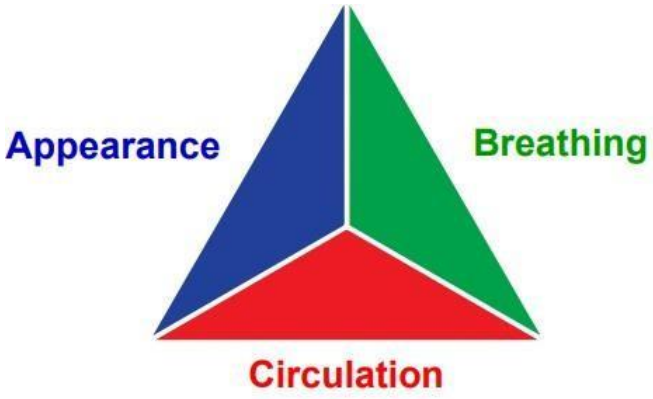
Breath sounds are generated in the large airways because of high air flow in the trachea and large bronchi. The bulk flow of air and its velocity produce turbulence in the large airways, creating audible sounds.

Practical - 2

Aim of the study: To study about the cardiopulmonary assessment of a Pediatric Principle

The aim of assessment is to define the patient's problems accurately. It is based on both a subjective and an objective assessment of the patient. Without an accurate assessment it is impossible to develop an appropriate plan of treatment.

The Pediatric Assessment Triangle (PAT) is a rapid evaluation tool that establishes a child's clinical status and his or her category of illness in order to direct initial management priorities. The PAT seems to be a valid tool for identifying the most severe patients as a first step in the triage process.



A

CARDI-RESPIRATORY ASSESSMENT OF THE INFANT AND CHILD

Careful assessment is essential to identify a problem requiring physiotherapy intervention. Many aspects of assessment will be the same as in adults, but specific differences are listed below.

When assessing a neonate, the following points are relevant: Medical notes:

1. History of pregnancy, labor, and delivery.

2. The Apgar score, which relates to heart rate, respiratory effort, muscle tone, reflex irritability, and color, and gives an indication of the degree of asphyxiation suffered by the infant at birth.

3. Gestational age and weight.

Observation charts

Pyrexia may indicate a possible respiratory infection. In preterm infants, a temperature of less than 36.5°C indicates that non-essential h
Tachycardia may be due to sepsis or shock. It may also be caused by inadequate levels of sedation or analgesia.
Apneic spells in the infant may indicate respiratory distress, sepsis, or presence of secretions in the upper or lower respiratory tract.

Examination

Apgar score

	Score 2	Score 1	Score 0
Appearance	 Pink	 Extremities blue	 Pale or blue
Pulse	> 100 bpm	< 100 bpm	No pulse
Grimace	Cries and pulls away	Grimaces or weak cry	No response to stimulation
Activity	 Active movement	 Arms, legs flexed	 No movement
Respiration	Strong cry	Slow, irregular	No breathing

Recession occurs because of the high negative pressure generated on inspiration pulling on the soft, compliant chest wall and may be sternal, subcostal, or intercostal.

Nasal flaring is a dilatation of the nostrils by the dilators naris muscles and is a sign of respiratory distress in the infant it may be a primitive response attempting to decrease airway resistance.

Tachypnoea (respiratory rate greater than 60 breaths /min) may indicate respiratory distress in infants.

Grunting occurs when an infant expires against a partially closed glottis

Stridor is heard when there is partial obstruction of the upper trachea and/or larynx. Obstruction may be due to collapse of the floppy tracheal wall, inflammation, or an inhaled foreign body.

Cyanosis is an unreliable sign of respiratory distress in infants and young children as it depends on the relative amount and type of hemoglobin in the blood and the adequacy of the peripheral circulation.

Auscultation of the infant and young child may be difficult owing to the easy transmission of sounds.

Cardiac manifestations of respiratory distress include an initial tachycardia and possible increase in systemic blood pressure. **Neck extension** in an infant with respiratory distress may represent an attempt to reduce airway resistance.

Head bobbing occurs when infants attempt to use the sternocleidomastoid and the scalene muscles as accessory muscles of respiration.

Pallor is commonly seen in infants with respiratory distress and may be a sign of hypoxemia or other problems including anemia.

Reluctance to feed is often associated with respiratory distress, and infants may need to take frequent pauses from sucking when tachypnea.

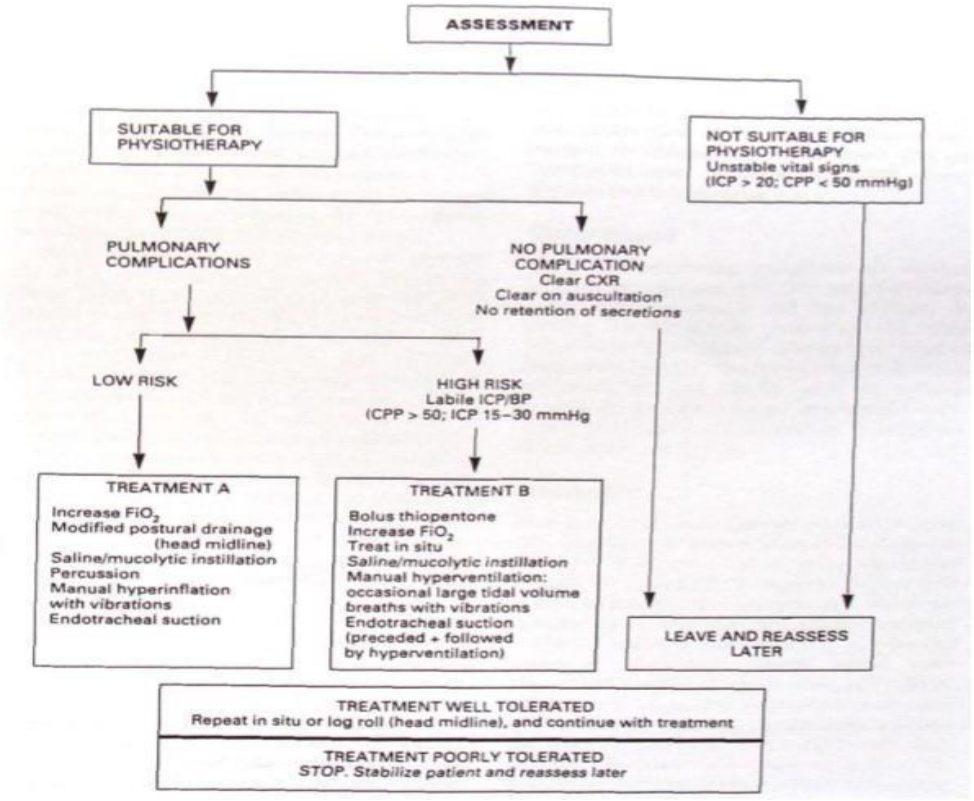
Alterations in conscious level should be noted. A reduction in activity may be due to neurological deficit or following the use of opiate analgesia but can also be due to hypoxia and may
andling should be delayed until the infant's temperature has risen.

Vital Signs:

Age group *	Heart rate (beats/min)	Respiratory rate (breaths/min)	Blood pressure (mmHg)
Preterm infants	120-140	40-60	70/40
FulHann infants	100-140	30-40	80/40
1-4 years	80-120	25-30	100/65
Adolescents	60-80	15-20	115/60

Components of Assessment for Cardiopulmonary Physiotherapy
Diagram outlines an assessment and treatment algorithm for patients, likely in an intensive care or post-operative setting, focusing on their suitability for physiotherapy based on pulmonary and neurological status. It starts with an initial assessment, branching into two paths: suitable for physiotherapy and not suitable for physiotherapy. The suitability is determined by factors such as vital signs, intracranial pressure (ICP), cerebral perfusion pressure (CPP), presence of pulmonary complications, and the state of the patient's lungs.

The algorithm serves as a guide for clinicians to make informed decisions regarding physiotherapy interventions, balancing the potential benefits against the risks associated with the patient's condition. It emphasizes a systematic approach to patient management, ensuring that interventions are tailored to the individual's specific needs and physiological status.



Results of investigations and observations:

Provisional Diagnosis: Plan of Care

Practical -3

Aim of Study: To Study about Integumentary Assessment

Introduction:

The integumentary system has a functional relationship to many other body systems. The health of this system is dependent on the normal functions of the arterial, venous, and lymphatic capillaries (dermal circulation). A thorough review of the functions of the skin illustrates the importance of even a small area of damage to this organ. It might be tempting to skip a systems review before using other tests and measurements in the examination process to save time. This Examination however, is of utmost importance as physical therapists move toward greater autonomy. Results may alert the physical therapist to problems that may require referral to another practitioner. A systems review is particularly important here because the disorders discussed in this chapter are the result of dysfunction in other systems of the body.

Integumentary Integrity

Collection of data about skin and subcutaneous tissues is interrelated with the tests and measurements for circulation and cutaneous sensation.

Observation and Palpation

Characteristics of the skin are noted almost entirely by observation and palpation. A comparison between involved and normal integument is made with careful attention to color, moisture, texture, firmness, temperature, elasticity, symmetry, and shape. In the presence of a wound, the wound tissue, the peri-wound area, and the wound exudate should all be observed and data recorded regarding the observations. he location of a wound, presence of edema, and presence of lymphedema can be documented using a body diagram.

Trophic Changes

Fibrosis: The best way to detect fibrotic changes of the skin is through palpation of the affected tissue. The superficial skin and underlying tissue will feel thickened, firm, and unyielding or immobile. Testing for the presence or absence of the Stemmer's signs an objective measurement that can be added to the examination for lymphedema.

Coloration

Skin color will vary based on the underlying disease. Observation is the best way to note comparisons between normal tissues and those under examination. he most abnormal color changes include red, purple, and brown. Color changes may indicate a chronic condition such as hemosiderin staining or an acute situation such as redness associated with DVT. If color changes are intermittent they may signal a disease such as Raynaud's.

Temperature:

The temperature of the skin is most often examined by palpation but data can be objectively collected and quantified using a radiometer or a thermistor. Maintenance of normal skin temperatures is essential for good wound healing. Abnormal skin temperatures can signal problems related to the dermis or other structures. A decrease in superficial skin temperature may indicate poor arterial perfusion. An increase may indicate infection or active disease processes.

Wounds

For wound inspection assessment are done in the following Categories:

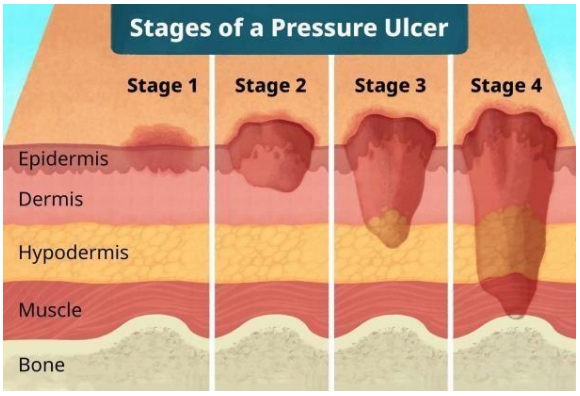
Size and Depth: Wounds not classified with staging or grading can be described based on the depth of tissue damage. The descriptions used for depth of burn injury, superficial, partial, and full thickness, can

Drainage: Drainage is measured by observation and is often described in terms of color and thickness. Examination of wound drainage may be very important because it may indicate a normal response to trauma

Table 14.2 Descriptions of Drainage by Color and Thickness

Drainage Type	Color	Thickness
Transudate	Clear	Thin, watery
Serosanguineous	Clear or tinge of red/brown	Thin, watery
Exudate	Creamy, yellowish	Moderate to very thick, expected with autolytic debridement
Pus	Yellow, brown	Moderate to very thick
Infected pus	Hues of yellow, blue, green	Thick, usually indicates infection (but may be normal as white blood cells macrophage necrotic cells and turn them into slough); drainage can be foul and yet the wound may not be infected

Staging: Pressure ulcers are typically classified using a staging or grading system that gives information about the severity of the wound based on depth of tissue destruction.



<u>Tests and Measurements:</u>

Owing to the close relationship among disorders of the vascular, lymphatic, and integumentary systems, the importance of differential diagnosis, and the likelihood of a patient or client presenting with more than one disorder, a physical therapist will make use of a wide variety of available tests and measurements during the examination.

An annotated version of selected tests and measurements has been included to assist the Physical therapist in greater understanding of the tests and the conditions under examination are mentioned below.

Aerobic Capacity/Endurance:

Aerobic capacity during functional activities is important to measure since activity will be encouraged as part of long-term management of the disorders. This might include the use of angina, claudication and dyspnea scales, pulmonary function tests, and electrocardiogram (ECG). A determination of heart rhythm sounds, as well as breath and voice sounds, may also be required. As discussed in Exercise Tolerance Test.

Anthropometric Characteristics:

Height and Weight:

Data on height and weight are necessary to address and track normal weight values, especially for the patient with a disorder that results in abnormal fluid retention such as diabetes, edema, lymphedema, venous disease, or underlying cardiopulmonary disease.

Imperial System:

$$BMI = 703 \times \frac{\text{Weight (in pounds)}}{\text{Height}^2 \text{ (in inches)}}$$

Metric System:

$$BMI = \frac{\text{Weight (in kilograms)}}{\text{Height}^2 \text{ (in meters)}}$$

Volumetric Measurement:

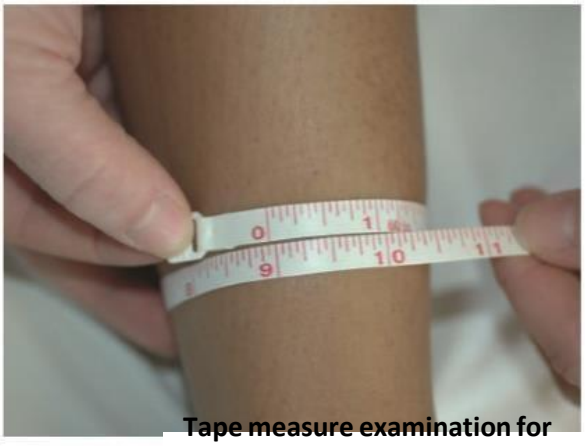
Volumetric are performed utilizing special containers that hold water, and a graduated cylinder for water collection. his method is accurate for measuring changes in body dimensions with the most common measurements taken for the hand, full arm, foot, or full lower leg; however, it is time consuming, awkward to administer, and may be inappropriate when open wounds are present owing to cross-contamination risks.

Volumetric Measurement

Girth Measurement:

Girth is recorded using a tape measure to determine circumferential body dimensions ideally, a tape measure specially designed to measure girth should be used. Although bony landmarks are sometimes used as reference points in taking girth measurements, the standard among experts who treat edema is to use consistent centimeter intervals instead

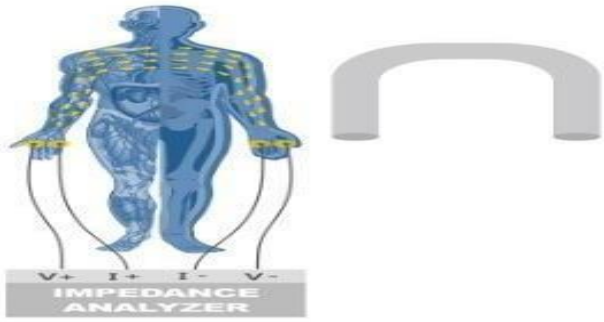
Procedure: In measuring the LE, circumferential measurements are taken every centimeter, starting from the floor or weight-bearing surface to the groin. Clinicians choose intervals of 4, 6, or 10 cm. he smaller the interval, the better the representation of body dimensions. Special measuring boards can be obtained for measuring the LE, or a well-placed clipboard can be used to establish the beginning measurement.



Tape measure examination for girth measurement.

Tonometry or Bioelectrical Impedance:

Bioelectrical impedance analysis provides accurate measurements to help predict the onset of lymphedema, often many months before a clinical diagnosis is possible**.**



Bioelectric Impedance Analyzer

Palpation/Pitting Scale

Palpation of soft tissues must be a regular part of vascular, lymphatic, and integumentary examinations. Here is no universal pitting scale currently used by healthcare professionals.

The following scale, most commonly used by physical therapists and physicians, gives a numerical grade to the pitting based on how long it remains after fingertip pressure is applied:

1+: Indentation is barely detectable.

2+: Slight indentation visible when skin is depressed, returns to normal in 15 seconds. 3+: Deeper indentation occurs when pressed and returns to normal within 30 seconds. 4+: Indentation lasts for more than 30 seconds.

Arterial Perfusion:

The therapist collects data to determine whether adequate blood flow is reaching distal tissues. If blood flow is adequate, the oxygen supply will be adequate. Some noninvasive tests and measurements are designed to determine blood flow and skin perfusion.

The following scale, commonly used by physical therapists and physicians, gives a numerical grade to the pulse quality:

0 = No pulse

1+ = Weak pulse, difficult to palpate

2+ = Palpable but not normal, diminished

3+ = Normal, easy to palpate

4+ = Bounding, very strong, may imply the possibility of an aneurysm or other pathological condition.

Assistive and Adaptive Devices

It is very likely that patients with vascular, lymphatic, or integumentary disorders will need assistive devices during the intervention and self-care phases of management. Observation, gait analysis, and manual muscle testing are often used to guide this determination.

Circulation: Collecting data about the movement of blood and lymph through the arterial, venous, and lymphatic systems is interrelated with the tests and measurements for integumentary integrity. Tests and measurements for skin changes that may occur with impairment of the circulation are discussed under the section on Integumentary Integrity.

Temperature:

To further examine circulation, skin temperature can be assessed by palpation. Objective data should also be collected and quantified by radiometer. A decrease in skin temperature can indicate poor arterial perfusion. An increase can indicate infection or active disease processes such as cellulitis or a Charcot joint.

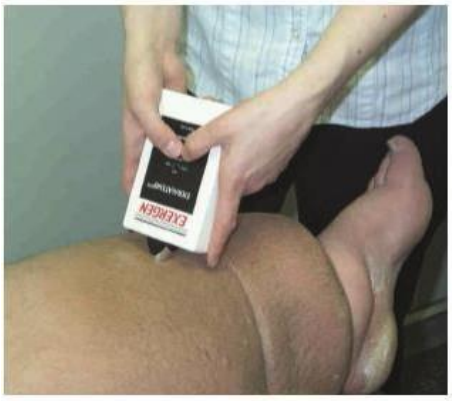


Figure 14.13 Skin temperature examination using a skin thermometer.

Trophic Changes:

Trophic changes occur in the skin of the LEs when circulation is impaired by poor arterial blood flow. Observation is the most accurate way to note changes. Trophic changes include dry, shiny skin (pale in Caucasians), decreased or absent leg hair, and thick toenails.

Pain:

When related to circulation, a thorough pain history may be all that is necessary to suggest the possibility of arterial disease. Reports of pain indicate the need for further tests and measurements of the vascular system. Pain as the result of intermittent claudication (IC) is described

earlier in this chapter. Rest pain that develops at night, awakens the patient, or requires analgesics for relief is considered more severe than IC. Pain can be measured for severity on a Visual Analog Scale (VAS).

Intermittent Claudication Rating Scale	
0	No claudication pain
1	Initial, minimal pain
2	Moderate, bothersome pain
3	Intense pain
4	Maximal pain, cannot continue

Investigation Provisional Diagnosis

Diagnosis

Plan of Care

Practical -4

Aim of the Study: To Know about Inspiratory Muscle Training.

Introduction:

The respiratory muscles are expected to function continuously throughout life to provide the appropriate level of ventilation for meeting the body's metabolic needs. Respiratory pump can fail, leading to a condition characterized by hypoventilation and hypercapnia that may ultimately progress to ventilator failure and death.

Causes of respiratory pump failure can be grouped into the following two major categories:

(I) those in which the respiratory drive is decreased or the sensitivity and function of the respiratory center is altered (i.e., those that affect the central nervous system control), and

(2) Those in which the ventilator response is decreased through impairment of the mechanics of respiration

Mechanism of Respiratory Muscle Fatigue

The major mechanisms thought to be responsible for inspiratory muscle fatigue include an imbalance between energy supply and demand and impaired excitation-activation.

Assessment of Fatigue

The clinician will most often have to rely on physical signs exhibited by the patient to recognize inspiratory muscle fatigue. The following signs are indicative of inspiratory muscle fatigue are

I. Tachypnea

2. Decreased tidal volume

3. Increased PC02 (which is a late sign)

4. Bradypnea and decreased minute ventilation

Treatment of Fatigue

The goals of treating inspiratory fatigue are as follows:

(I) restore the balance between energy supply and demand,

(2) Improve diaphragmatic contractility, and

(3) Increase the strength and endurance of the inspiratory muscles.

INSPIRATORY MUSCLE TRAINING:

Inspiratory muscle training (l M T) is currently used in pulmonary rehabilitation to increase the strength and endurance of the inspiratory muscles.

Two techniques have been used for inspiratory muscle training

1. Isocapnic hyperventilation
2. Inspiratory resistive or resistance breathing.

Isocapnic hyperventilation

Principle: Isocapnic hyperventilation is dynamic and is used to increase the endurance of the inspiratory muscles. Expiratory muscles will benefit as well with this technique.

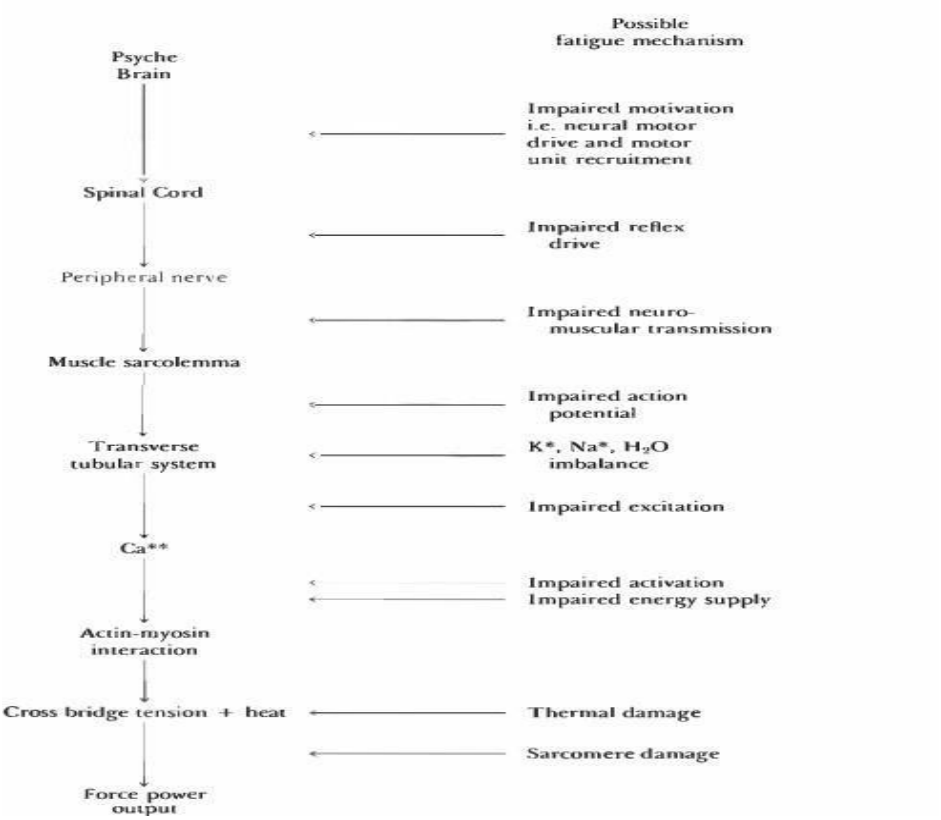
Procedure: Patients are asked to breathe at the highest rate they can manage for 15 to 30 minutes. A rebreathing circuit or the addition of CO2 to the inspired air must be used with this technique to prevent hypocapnea

Inspiratory resistive breathing:

Principle: Inspiratory resistive breathing allows both strength and endurance training, since it incorporates both isometric and isotonic exercises. There are two devices available for this purpose, a nonlinear device and a threshold JMT device. The nonlinear device has been noted to produce unreliable training loads if the rate of inspiratory flow is not controlled.

Procedure:

Patients inspire through a narrow tube that offers a nonlinear airway resistance for one to three daily periods of 15 to 30 minutes. The size of the orifice through which the patient inspires is adjusted to provide a level of resistance that the patient can tolerate without becoming immediately exhausted. In addition, this device is not well suited for stronger patients, since they have difficulty achieving a satisfactory tidal volume with the extremely small orifice at higher loads. With the tllreshold device, a reliable inspiratory pressure load is provided regardless of airflow rate. The load is adjusted by a nurse therapist, or patient according to a desired percentage of the patient's maximal inspiratory pressure (PI-max). Usually, the patient begins training at a low load, equal to about one third of the PI-max and progresses slowly in small increments adjusting a screw to alter the tension until the training load reaches 60% of the current PI max. The threshold device delivers a reliable tension because the poppet valve at the end of the device will not open and allow inspiration unless the patient generates the designated negative pressure. Both types of devices are hand held



and potable and are easily used and maintained by patients.

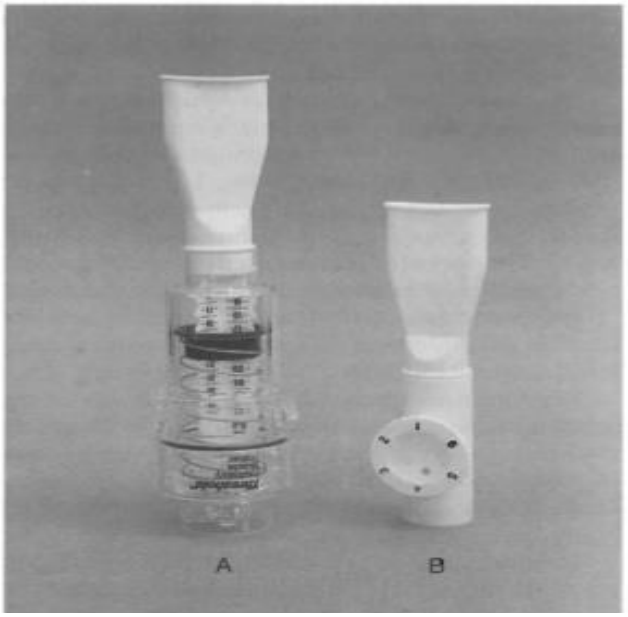


FIGURE: handheld resistive breathing training

References:

Intensive Care Management in Secondary Cardiopulmonary Dysfunction
Principle and Practice of Cardiopulmonary Rehabilitation, Downe Frownfelter, 3rd Edition

Practical 5

Aim of the Study: To Know about Neurophysiological Facilitation of Respiration

Principle: Neurophysiological facilitation of respiration is the terminology used to describe externally applied proprioceptive and tactile stimuli that produce reflex respiratory movement responses and that appear to alter the rate and depth of breathing.

The observed responses to these facilitators Stimuli have been remarkably consistent in un- I conscious patients, normal subjects and laboratory animals observed under fluoroscopy. I Application of these procedures results in: visible deeper respirations - larger expansion of the ribs and increased epigastric excursion; increased

The stimuli used in treatment have been designated as follows:

- Perioral pressure
- Intercostal stretch
- Vertebral pressure to the upper thoracic Spine
- Vertebral pressure to the lower thoracic spine
- Anterior stretch-lifting of the posterior basal area
- Maintained manual pressure.

Indication:

- unconscious persons
- Semicomatous

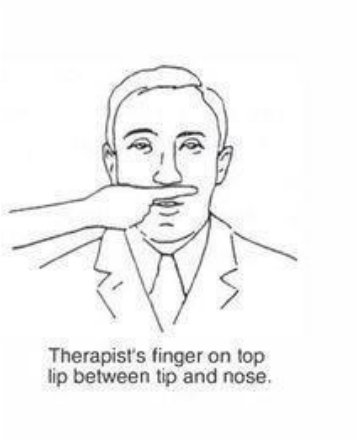
Perioral pressure Stimuli

Perioral stimulation is provided by applying firm maintained pressure to the patient's upper Up. Pressure is maintained for the length of time that the therapist wishes the patient to breathe in the activated pattern**.**

Response

The response to this stimulus is a brief (approximately 5 seconds) period of apnea followed by increased epigastric excursions

(As a precautionary measure the use of surgical gloves is advised to avoid picking up a contaminant and/or carrying contaminants from one patient to another.)



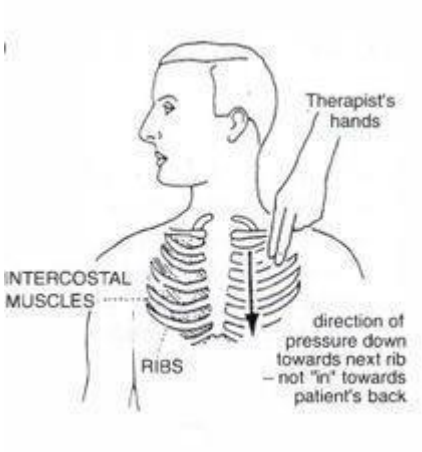
Intercostal stretch Stimuli

Intercostal stretch is provided by applying pressure to the upper border of a rib in order to stretch the intercostal muscle in a downward (not inward) direction. The stretch position is then maintained while the patient continues to breathe in his/her usual manner. This procedure can be performed unilaterally or bilaterally on any rib with the exception of the floating ribs.

Response

The response to this stimulus is a gradual increase in respiratory movements in the area under and around the stretch.

(Care must be taken to avoid sensitive mammary tissue in female patients.)



Vertebral pressure Stimuli

Very firm manual pressure applied with the open hand directly over the uppermost thoracic vertebrae

Response

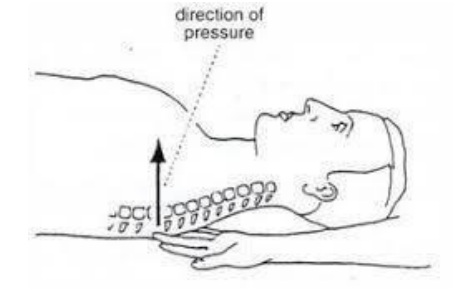
Results in increased epigastric excursions via the presence of a mainly relaxed abdominal wall.

Stimuli

Pressure applied in the same manner directly over the lower thoracic vertebrae

Response

Results in increased respiratory movements of the apical thorax.



VERTEBRAL PRESSURE

Anterior-stretch basal lift Stimuli

This procedure is performed by placing the hands under the posterior ribs of the supine patient and lifting gently upwards. The lift is maintained and provides a maintained stretch and pressure posteriorly and stretch anteriorly as well.

Response

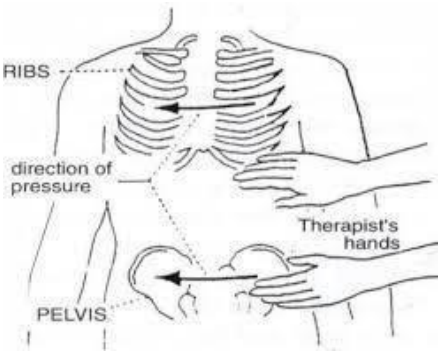
As the lift stretch is maintained, increasing movements of the ribs in lateral and posterior directions can be seen and felt increased epigastric movements also often become obvious.

Co-contraction of the abdomen Stimuli

Co-contraction of the abdomen is a procedure that Margaret Rood (1973) taught to facilitate respiration. It increased the tone in the abdominal muscles**.** This procedure is performed by the therapist placing one hand on the patient's lower ribs and one on the pelvis on the same side and pushing with moderate pressure so that force is applied at right angles to the patient.

Response

This is an effective procedure. Increasing tone in the abdomen can both be seen (by increased muscle definition) and palpated. Increased epigastric excursions occur.


RIBS
direction of pressure
Therapist's hands
PELVIS

Practical -6

Aim of the Study: To Know about Cough Facilitator Technique.

Introduction:

A cough is a reflex that clears your throat and lungs of irritants like dust, mucus, and germs. It's a normal, healthy response that helps protect your body. The cough assist helps to clear secretions by applying a positive pressure to fill the lungs, then quickly switching to a negative pressure to produce a high expiratory flow rate and simulate a cough. It is known as 'manual insufflation-insufflation' and can be applied via a mask, mouthpiece, endotracheal or tracheostomy tube.

Poor technique may be camouflaged by making loud but ineffectual noises in the throat. Tips to overcome problems are described below:

- Pain following surgery inhibits coughing
- Thick secretions reduce the effectiveness of coughing
- Weakness due to neuromuscular or terminal disease

Phases of Coughing

There are four stages involved in producing an effective cough

First stage: inspiring enough air to provide the volume necessary

Second stage: closing of the glottis (vocal folds) to prepare for the abdominal and intercostal muscles to produce positive intrathoracic pressure distal to the glottis.

Third stage: active contraction of these muscles.

Fourth stage: opening of the glottis and forcefully expelling the air.

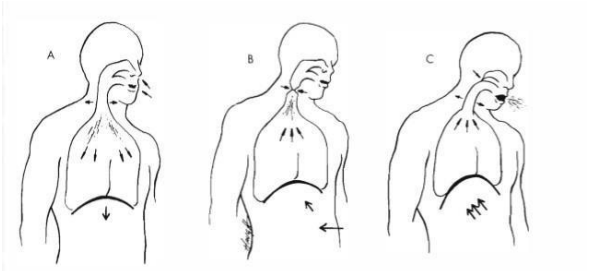


FIGURE 21-1
Cough mechanics. **A,** Stage 1: adequate inspiration. **B,** Stage 2: glottal closure; Stage 3: building up of intrathoracic and intraabdominal pressure. **C,** Stage 4: glottal opening and expulsion.

COUGH EVALUATION

Guidelines for objective evaluation with pulmonary function tests have been indicted.

The patient should be able to cough three to six times per expiratory effort. A minimal threshold of a FEV_1) (forced expiratory volume in 1

second) of at least 60% of the patient's actual vital capacity is a good indicator of adequate muscle strength necessary for effective expulsion

Facilitator Techniques

If after instruction and modification in the patient's cough as described previously, the patient still cannot produce an effective cough, then one of the following assistive cough techniques are indicated

These Techniques are subdivided into two parts:

1. Manually Assisted Techniques
    - Cost phrenic assist
    - Heimlich-type assist or abdominal thrust assist
    - Anterior chest compression assist
    - Counter rotation assist
    -
2. Self-Assisted
    - Prone on elbows head flexion self-assisted cough
    - Long-sitting self-assisted cough
    - Short-sitting self-assisted cough
    - Hands-knees rocking self-assisted cough
    - Standing self-assisted cough

PATIENT INSTRUCTION

- Patients with asthma tend to go into an expiratory wheeze when they force and prolong exhalation. This can lead to bronchospasm and respiratory distress. The patient can be taught a pump cough, a variation on a huff technique.
- Patients with emphysema have overdistel')ded lungs and difficulty with exhalation. Do not instruct the patient to take a deep breath and cough because this can cause more air trapping,

Manually Assisted

Techniques Costo-phrenic

assist

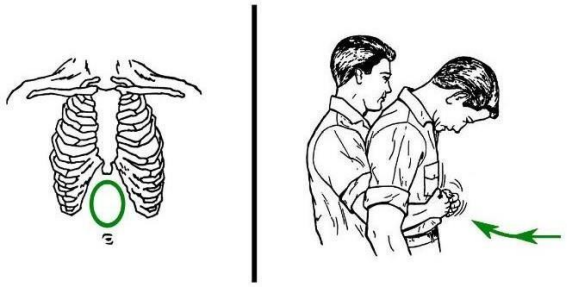
After assessing the most appropriate position for the patient (most often sitting or side-lying) and giving the patient instructions to maximize all four coughing stages, the therapist places his or her hands on the costo-phrenic angles of the rib cage. At the end of the patient's next exhalation, the therapist applies a quick manual stretch down and in toward the patient's navel to facilitate a stronger diaphragmatic and intercostal muscle contraction during the succeeding inhalation.

FIGURE 21-2
Assisted cough techniques in supine position; costophrenic assist.

Heimlich-type assist or abdominal thrust assist:

Heimlich-type assist or an abdominal thrust, requires the therapist to place the heel of his or her hand at about the level of the patient's navel, taking care to avoid direct placement on the lower ribs. After appropriate positioning, the patient is instructed to "take in a deep breath and hold it."

Unfortunately, manual facilitation of inhalation is not feasible with this technique. As the patient is instructed to cough, the therapist quickly pushes up and in, under the diaphgram with the heel of his or her hand, as in a Heimlich choking maneuver. The patient is instructed to assist with appropriate trunk movements to the best of his or her ability. TechnicalJy, this procedure is very effective at forcefully expelling the air (Braun, 1984), as in a cough, but it can be extremely uncomfortable for the patient because of (1) its concentrated area of contact, (2) the abrupt nature, which may elicit an undesired high neuromuscular tone response or worse when combined with the sensory input that the therapist's manual contacts supply, (3) the force, which may cause an abdominal herniation. Because of its limited usefulness, the Heimlich type of assist or abdominal thrust should only be used when the patient does not respond to other techniques and the need to produce an effective cough is imminent.



Anterior chest compression assist:

The third assistive cough is called the anterior chest compression assist, since it compresses both the upper and lower anterior chest during the coughing maneuver. This is the first single technique thus far to address the compression needs of the upper and lower chest in one maneuver. The therapist puts one arm across the patient's pectoralis region to compress the upper chest and the other arm is either placed parallel on the lower chest or abdomen The commands are the same as in the other techniques. Because of the direct manual contact on the chest, inspiration can be easily facilitated first, followed by a "hold." Thus the therapist can readily enhance the first two cough stages. The therapist then applies a quick force through both arms to simulate the force necessary during the expulsion phase.

The directions of the force are

(l) down and back on the upper chest, and

(2) up and back on the lower chest or abdominal arm.

Performed together the compression force from both arms makes the letter V.

FIGURE 21-4
Assistive cough techniques in supine position; variation of the anterior chest compression assist.

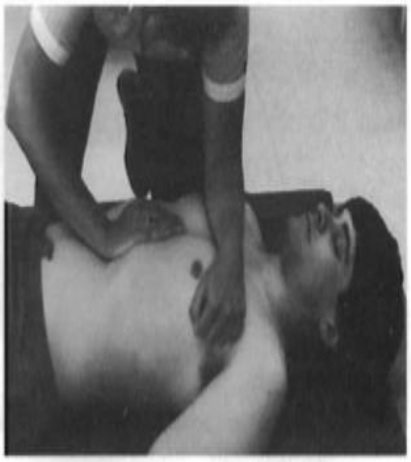


FIGURE 21-5
Assistive cough techniques in supine position; variation of the anterior chest compression assist.

Counter-rotation assist

The most effective assistive cough for the widest cross-section of neurological patients, in these authors' clinical experience, is the fourth and final method described in side-lying, the counter-rotation assist. The positioning and procedures required for the counter-rotation technique.

The therapist begins by following the patient's breathing cycle with his or her hands positioned over the patient's shoulder and pelvis the therapist then gently assists the patient in inhalation and exhalation to promote better overall ventilation. This sequence is generally repeated for three to five cycles or until the patient appears to have achieved good ventilation to all lung segments.

Other effects of counter-rotation make this procedure particularly beneficial to patients with low levels of cognitive functioning.

1. The rotation component is a natural inhibitor of high tone. Thus this is the least likely of all techniques discussed so far to elicit an increase in abnormal tone during the coughing phase. In fact the opposite usually prevails.
2. Counter-rotation is an excellent mobilizer for a tight chest, which in itself can facilitate spontaneous deeper breaths. Tidal volumes (TVs) can therefore be increased for many patients by mobilizing the chest walls.
3. Finally, rotation can be a vestibular stimulator and may assist in arousing the patient cognitively, allowing him or her to take a more active role in the procedure.

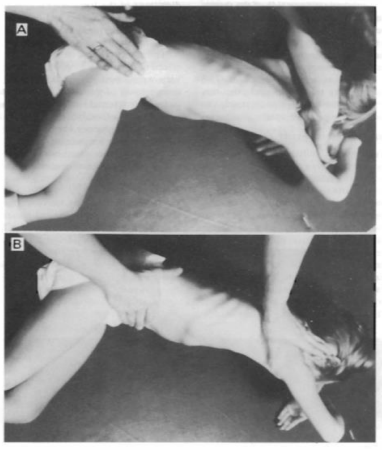


FIGURE 21-6
Counterrotation assist; **A,** Hand placement during expulsion phase; **B,** Hand placement during inspiration phase.

Self-assisted Techniques

Prone on elbows head flexion self-assisted cough

Prone is not frequently used as a posture for coughing because the position itself inhibits FULL use of the diaphragm by preventing lower anterior chest and abdominal excursion following a neurologic insult. This forces the patient to use an alternate breathing pattern that facilitates greater accessory muscle use. Because this change in breathing patterns often occurs spontaneously, prone on elbows can be an effective posture for promoting spontaneous use of the accessory muscles in a more difficult activity (coughing).

The head flexion assist requires good use of head and neck musculature, scen in patients sustaining a spinal level injury below C4 (e.g., spinal cord injuries (SCIs), spina bifida). It can be used either as a self-assisted or therapist-assisted procedure, using the principles of trunk extension to facilitate inspiration and trunk flexion to facilitate expiration.

FIGURE 21-7
Head flexion assistive cough in prone on elbows; extension and inspiratory phase.

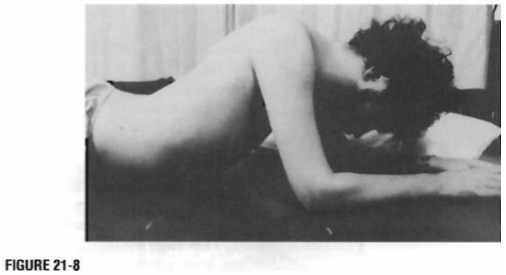


FIGURE 21-8
Head flexion assistive cough in prone on elbows; flexion and coughing phase.

Long-sitting self-assisted cough

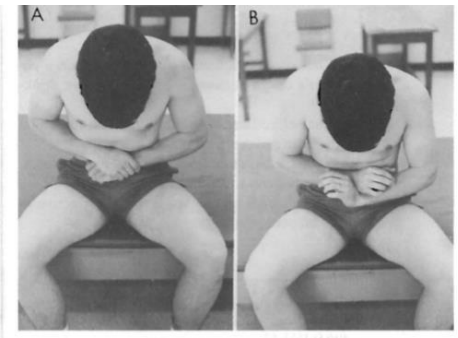
For the first procedure, tetraplegia-Iong-sitting self-assist, the patient is positioned on a mat in a long-sitting posture (legs straight out in front of the patient) and with upper extremity support. The therapist instructs

the patient to extend his or her body backward while inhaling maximally.

FIGURE 21-12
Paraplegic–self-assisted cough in long-sitting: expiration.

Short-sitting self-assisted cough

This Self-assist, is typically performed in a wheelchair or over the edge of a bed. The patient is instructed to place one hand over the other at the wrist and place them in his or her lap. As in the previous technique, the patient is then asked to extend his trunk backward while inhaling maximally, followed by a strong voluntary cough. During the cough, the patient pulls his or her hands up and under the diaphragm, resembling the motion of a Heimlich maneuver.



Assisted cough in short sitting. **A,** Hand position for patient with good hand function; **B,** Hand position for patients with only wrist function.

Hands-knees rocking self-assisted cough

The last assistive cough to be discussed is performed most frequently as a multipurpose activity to increase the patient's balance, strength, coordination, and functional use of breathing patterns (including quiet breathing and coughing) simultaneously. The patient

assumes an all-fours position (hands-knees). He or she is then instructed to rock forward, looking up and breathing in as he or she moves to a fully extended posture.

After this, the patient is told to cough out as he or she quickly rocks backward to the heels with a flexed head and neck.

FIGURE 21-14
Assisted cough in hands-knees position; extension or inspiratory phase.

Precautions

Coughing should be avoided immediately

1. After eye or cranial surgery
2. Presence of an aneurysm.
3. raised intracranial pressure
4. surgical emphysema,
5. recent pneumonectomy
6. Hemoptysis.
7. Coughing should be avoided after eating.

Reference: Facilitating Airway Clearance With Coughing Techniques, Principle and Practice of Cardiopulmonary Physical Therapy ,Donna Frownfelter 3rd Edi

PRACTICAL - 7

Aim of study: Demonstration Of Assistive Devices in Cardiopulmonary.

Introduction

Assistive devices play a crucial role in the management and rehabilitation of individuals with cardiopulmonary conditions. These devices are designed to support respiratory and cardiovascular function, enhance patient mobility, and improve overall quality of life. The demonstration of such devices is essential for understanding their purpose, correct usage, and benefits in clinical practice. This session focuses on showcasing various assistive devices commonly used in cardiopulmonary care, including oxygen delivery systems, incentive spirometers, nebulizers, and positive airway pressure devices etc. By gaining hands-on experience and knowledge about these tools, healthcare professionals can better assist patients in managing their conditions effectively and safely.

Incentive spirometer: Incentive spirometer is a respiratory therapy technique that uses a medical device (called an incentive spirometer) to encourage deep breathing and lung expansion. It helps prevent pulmonary complications such as atelectasis by promoting sustained maximal inspiration, improving ventilation, and enhancing oxygenation—particularly after surgery or during prolonged bed rest.

Procedure

1. A demonstration is given using a separate device.
2. Patients should be relaxed and positioned as for deep breathing, either side-lying or sitting upright, preferably in a chair.
3. With lips sealed around the mouthpiece, the patient inhales slowly and deeply. Throughout the procedure the patient watches the incentive spirometer while the physiotherapist monitors the patient's breathing pattern.
4. An end-inspiratory hold is sustained.
5. After exhalation, shoulder girdle relaxation is rechecked.

Conclusion

Individuals vary, and observation of expansion and breathing pattern shows whether the patient breathes more effectively with or without the device. Incentive spirometer is also suited to children and those with learning difficulties because it can be learnt by demonstration. It is not suitable for breathless patients.

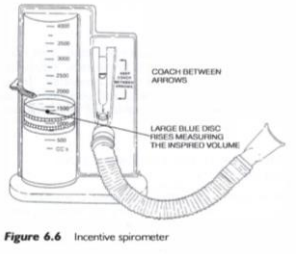


Figure 6.6 Incentive spirometer

Intermittent positive pressure breathing: Intermittent Positive Pressure Breathing (IPPB) is a respiratory therapy technique that uses a mechanical device to deliver short bursts of positive pressure air or aerosolized medication into the lungs during inhalation. This method assists patients in achieving deeper breaths than they can take on their own, helping to improve lung expansion, enhance gas exchange, and mobilize secretions. IPPB is simply pressure-supported inspiration using a non-invasive ventilator such as the Bird. Inspiration is triggered by the patient, sustained by positive pressure, and followed by passive expiration.

Indications

1. Patients with atelectasis who are drowsy, weak or fatigued
2. Sputum retention may be an indication for drowsy, weak or exhausted patients, e.g. those with neurological problems.

Procedure of Intermittent Positive Pressure Breathing (IPPB):

1. **Patient Assessment:**
    - Review patient history and indications for IPPB (e.g., atelectasis, reduced lung expansion).
    - Check vital signs, respiratory rate, oxygen saturation, and lung auscultation.
2. **Equipment Preparation:**
    - Set up the IPPB machine and ensure its functioning correctly.
    - Attach the appropriate interface (mouthpiece or mask) and medication nebulizer if needed.
    - Set initial parameters (pressure, flow rate, sensitivity, and inspiratory time) as per physician's order.
3. **Patient Positioning:**
    - Position the patient in a comfortable, upright sitting or semi-Fowler's position to facilitate optimal lung expansion.
4. **Instruction and Demonstration:**
    - Explain the procedure to the patient, emphasizing the importance of deep, slow inhalations and passive exhalation.
    - Demonstrate how to seal lips tightly around the mouthpiece or fit the mask properly.
5. **Initiation of Therapy:**
    - Begin the treatment at low pressures (10–15 cm H_2 O), adjusting based on patient comfort and response.
    - Encourage the patient to take slow, deep breaths and allow the machine to assist inhalation.
    - Observe for signs of effective ventilation and comfort.
6. **Monitoring During Treatment:**
    - Continuously monitor respiratory pattern, vital signs, and patient response.
    - Watch for complications such as hyperventilation, dizziness, or discomfort.
    - Ensure proper delivery of medication if a nebulizer is used.
7. **Completion and Documentation:**
    - Gradually wean the patient off the device after the prescribed session duration (usually 10–20 minutes).
    - Remove the interface and provide oral care if needed.
    - Document the procedure, settings used, patient response, and any adverse effects.

Effects and complications

Effects of IPPB:

1. **Improved Lung Expansion** – Helps in re-expanding collapsed alveoli and treating atelectasis.
2. **Enhanced Oxygenation** – Promotes better gas exchange by increasing tidal volume.

3. **Reduced Work of Breathing** – Assists in inhalation, especially beneficial for patients with neuromuscular weakness.
4. **Effective Aerosol Delivery** – Facilitates the deeper delivery of bronchodilators or mucolytic.
5. **Mobilization of Secretions** – Assists in loosening and mobilizing mucus in the airways.

Complications of IPPB:

1. **Barotrauma** – Risk of pneumothorax or lung injury due to excessive airway pressure.
2. **Hyperventilation** – Can lead to respiratory alkalosis, dizziness, or lightheadedness.
3. **Gastric Distension** – Air may enter the stomach if the patient swallows during inhalation.
4. **Hypoventilation** – If improperly set, the machine may under-deliver volume.
5. **Decreased Cardiac Output** – Positive pressure may reduce venous return and cardiac output, especially in hypotensive patients.
6. **Infection Risk** – If the device is not properly cleaned, it may harbor pathogens.
7. **Patient Discomfort or Anxiety** – Some patients may find the sensation of forced inhalation uncomfortable.

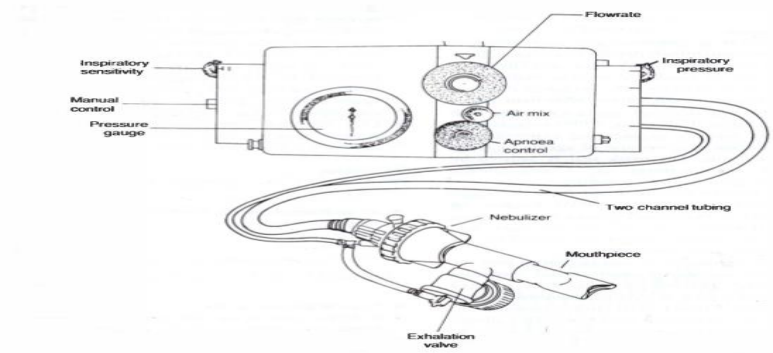


Figure 6.9 Bird ventilator. **Inspiratory sensitivity** regulates the ease with which the machine triggers into inspiration. **Manual control** can override the patient-trigger and machine-cycling mechanisms. The **pressure gauge** indicates the airway pressure. The **flow rate** controls the rate at which gas is delivered to the patient. The **inspiratory pressure** is the pressure that should be reached before cycling into expiration. The **air-mix knob** allows entrainment of room air. The **apnoea knob** controls automatic function and should be off throughout.

Positive expiratory pressure:
Positive expiratory pressure (PEP) is the application of positive pressure at the mouth during expiration. Breathing out against resistance is thought to open up airways, even the distribution of ventilation, force air through collateral channels and boost mucociliary clearance. PEP also helps counteract airway closure caused by floppy airways or coughing.

Indications

1. People with CF especially adolescents and those seeking freedom from PD
2. People with bronchiectasis, or those with COPD who have difficulty clearing secretions, also find it helpful (Christensen et al., 1990). It is suited to patients with moderate amounts of sputum
3. PEP can reduce the incidence of chest infection and improve lung function. There are claims that it is more effective than PD

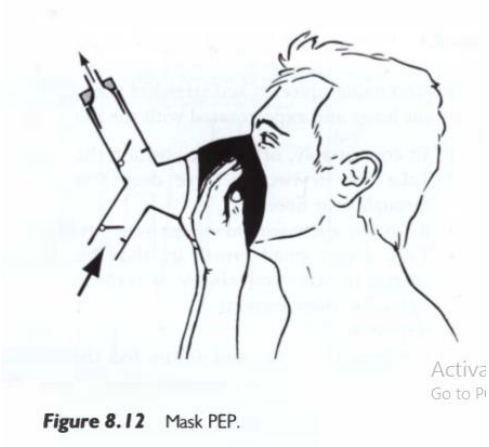


Figure 8.12 Mask PEP.

Flutter

Is a device resembling a short fat pipe and suited to anyone who can blow bubbles. By exhaling into the flutter, the patient creates a positive oscillatory pressure of 10-20 cmH20 in the airways.

The **Flutter** device is a handheld oscillatory positive expiratory pressure (OPEP) device used in respiratory therapy to aid mucus clearance from the airways.

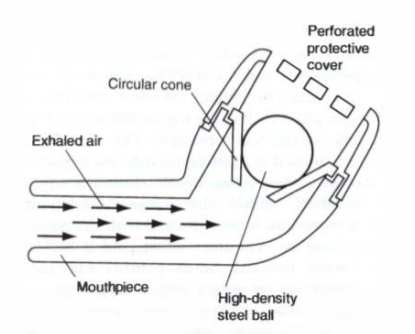


Figure 8.14 Flutter device (VarioRaw).

Procedure

1. Patients sit as if using the PEP mask, hold the mouthpiece in the lips
2. inhale through the nose, hold for 2-3 seconds, then
3. Exhale at twice normal speed through the mouth.
4. Patients must keep their cheeks taut and avoid blocking the holes on the device

Cornet

Positive pressure and oscillations can be created by actively breathing out through a curved plastic tube called a cornet. This contains a flexible hose, which acts as a valve. Feng et at.

Claim that this decreases sputum viscosity. The **Cornet** device is an oscillatory positive expiratory pressure (OPEP) device used to aid in airway clearance by producing vibrations and resistance during exhalation, which helps to mobilize and expel mucus.

Indications:

1. **Chronic Obstructive Pulmonary Disease (COPD)**
   – To aid in mucus clearance and improve lung function.
2. **Cystic Fibrosis**
   – To help loosen and remove thick secretions from the lungs.
3. **Bronchiectasis**
   – To assist in managing chronic mucus production and reduce infection risk.
4. **Asthma (with excessive mucus production)**
   – As an adjunct therapy for airway clearance.
5. **Chronic Bronchitis**
   – To reduce airway obstruction caused by mucus buildup.
6. **Post-surgical Pulmonary Care**
   – To prevent postoperative pulmonary complications like atelectasis and secretion retention.
7. **Neuromuscular Disorders (with sufficient expiratory effort)**
   – To support airway clearance in patients with weak cough but preserved expiratory ability.

Preparation:

- Wash your hands thoroughly.
- Ensure the device is clean and properly assembled.
- Choose the appropriate mouthpiece or mask (usually a mouthpiece is used).

 Patient Positioning:

- Sit upright in a comfortable chair or position to allow optimal lung expansion.
- Relax your shoulders and take a few normal breaths before starting.

 Device Setup:

- Hold the RC Cornet horizontally or in the angle recommended by the manufacturer.
- Adjust the resistance control if your device has one, starting with a low to moderate setting.

 Breathing Technique:

- Seal your lips tightly around the mouthpiece.
- Inhale slowly through your nose (or mouth if needed), slightly deeper than normal.
- Exhale through the mouthpiece actively but not forcefully (about 3–4 seconds).

- You should feel vibrations in your chest/throat during exhalation — this is the oscillatory pressure loosening mucus.

 Repetition:

- Repeat the inhale-exhale cycle 10–15 times per set.
- After each set, perform a "huff cough" or deep cough to clear loosened mucus:
    - Take a deep breath and then exhale forcefully with your mouth open as if trying to fog a mirror.

 Session Duration:

- Perform 1–2 sessions per day or as prescribed by your healthcare provider.
- Each session typically lasts 10–15 minutes.

Figure 8.15 Comet (RC comet, with permission).

Non-invasive ventilation (NIV) provides inspiratory muscle rest for people who are burdened with ventilator failure due to excessive WOB. This can be due to obstructive or restrictive disorder in either the acute or chronic state.

NIV delivers a predetermined volume or pressure either automatically or, more usually, in response to patient effort. Positive pressure is delivered via mask or mouthpiece, or less commonly via the natural airway using negative pressure. Compared to invasive mechanical ventilation, NIV carries less risk of infection, is more comfortable, easier for speech and swallowing, safer and more convenient .

Common Indications:

1. Acute Respiratory Failure:

- **Chronic Obstructive Pulmonary Disease (COPD) exacerbation** with hyper-capnia (elevated CO_2 levels)
- **Acute cardiogenic pulmonary edema**
- **Asthma exacerbation** (in select cases)

- **Pneumonia** with mild to moderate respiratory failure
- **Post-extubation respiratory distress**
- **Post-operative respiratory failure** (especially abdominal or thoracic surgery)

2. Chronic Respiratory Failure:

- **Obstructive sleep apnea (OSA)**
- **Obesity hypoventilation syndrome (OHS)**
- **Neuromuscular disorders** (e.g., ALS, muscular dystrophy)
- **Chest wall deformities** (e.g., kypho-scoliosis)
- **Restrictive lung disease** with hypoventilation

3. Preventive Use:

- To **prevent re-intubation** in high-risk post-extubation patients
- To support **weaning** from invasive ventilation in certain cases

Procedure

1. a spontaneous option, which superimposes inspiratory and, usually, expiratory pressures on the patient's own breathing
2. a spontaneous/timed option, which adds mandatory breaths if the patient does not breathe after a set time interval
3. a timed option, usually used by the physician, which is fully controlled ventilation for patients who are unable to breathe at all.
4. For the spontaneous/timed option, RR is set at 2-5 less than the patient's spontaneous rate. Parameters are set according to ABGs and comfort. Alternatives to ABGs are capillary blood gases or transcutaneous monitoring
5. The machine should match the patient rather than the patient being obliged to conform to the machine. If inspiratory and expiratory times are used, they are set to synchronize with chest wall movement. For volume-controlled machines, CO_2 can be blown off by increasing VT or I: E ratio in order to raise minute volume.
6. The machine is turned on before applying the mask. Anxiety is minimized by allowing patients to feel the air blowing against their hand. When strapping the mask on, the top straps are tightened first, and straps need to be equally tight on both sides. If oxygen is· added, an oxygen analyzer and oximetry are used as for CPAP.

Continuous positive airway pressure: Continuous Positive Airway Pressure (CPAP) is a non-invasive respiratory support technique that delivers a constant, steady flow of pressurized air through a mask to keep the airways open during both inhalation and exhalation. It is commonly used in the treatment of obstructive sleep apnea, as well as in certain cases of respiratory distress, by improving oxygenation, reducing the work of breathing, and preventing airway collapse.

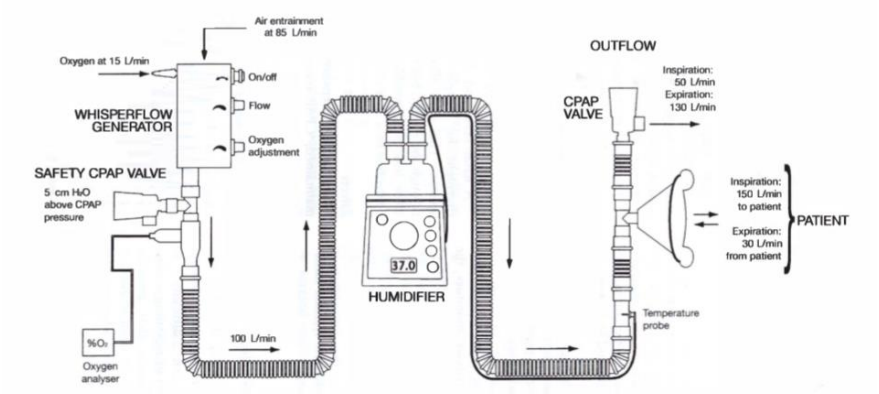
Procedure:

1. Patients using a full face mask should be in a high dependency area or kept under constant observation because of difficulty in expectoration and danger of aspirating vomit.
2. A CPAP valve is chosen that provides pressure low enough to be comfortable but high enough to maintain adequate gas exchange, usually 5-10 cmH20.

3. The patient is introduced to the mask.
4. Oxygen is adjusted to the required F,0_2'
5. The flow is turned on.
6. The patient assists with putting on the mask if possible in order to reduce anxiety. It is best that the mask is not strapped on until the patient has felt the flow and is ready. Flow should be at a level sufficient to maintain an open CPAP valve, even during a deep breath. Fine tuning trims it to just above the patient's peak inspiratory flow so that there is outflow from the valve throughout the cycle, while the mask has a firm but comfortable seal.
7. The outflow should be rechecked after the patient has settled. The oximeter should be rechecked after changing the flow, and FI02 adjusted if appropriate.
8. Regular checks are required on the comfort and seal of the mask, the fluid level and temperature of the humidifier, and the oximeter.
9. After use, the mask should be removed before turning off the flow.

Conclusion

1. When the above steps are followed and comfort is maintained, CPAP increases FRC
2. improves gas exchange and may avoid the need for intubation and mechanical ventilation
3. CPAP can also be used for patients with pneumonia (p. 104) or increased WOB due to obstructed airways (p. 84). It can assist gas exchange for people with pulmonary oedema as an interim measure until medication takes effect



Complications

Discomfort is common, and uncomfortable patients restrict their depth of breathing. Individual adjustment of the mask, or a change of mask, may be needed to prevent chafed skin, sore ears or dry eyes.

The bridge of the nose should be protected before rather than after a pressure sore develops, using a dressing such as Granule especially in patients who are hypotensive, hypovolemic or with thin skin because of ageing or long-term steroids.

WOB may be increased and Pa02 decreased because of difficulty in exhalation against positive pressure. If there is loss of lung or chest wall elasticity, patients might be forced to use even more active exhalation.

At high pressures, gas can be forced into the stomach, causing discomfort and restricted breathing. The risk is reduced by using a nasogastric tube, which is advisable at pressures over 10 cmH20.

Aspiration is a risk for patients unable to remove the mask rapidly by themselves. The mask must be removed for eating and drinking.

Coughing without removing the mask can create high pressures, which may damage the ears

and, with emphysema or late-stage Cystic Fibrosis.
The system is noisy, which may be detrimental to the patient and neighbours.
The haemo-dynamic effects of CPAP vary. Positive pressure may compress alveolar vessels, redistribute blood from chest to abdomen and, at pressures above 10 cmH20, increase right ventricular afterload.

Precautions

CPAP should not normally be used in the presence of:

- An undrained pneumothorax
- Surgical emphysema
- Bullae
- Facial trauma
- Excessive secretions.

It should be used with caution in the presence of:

- Broncho pleural fistula
- a large tumor in the proximal airways, because inspired gas under pressure may be able to enter but not exit past the obstruction.

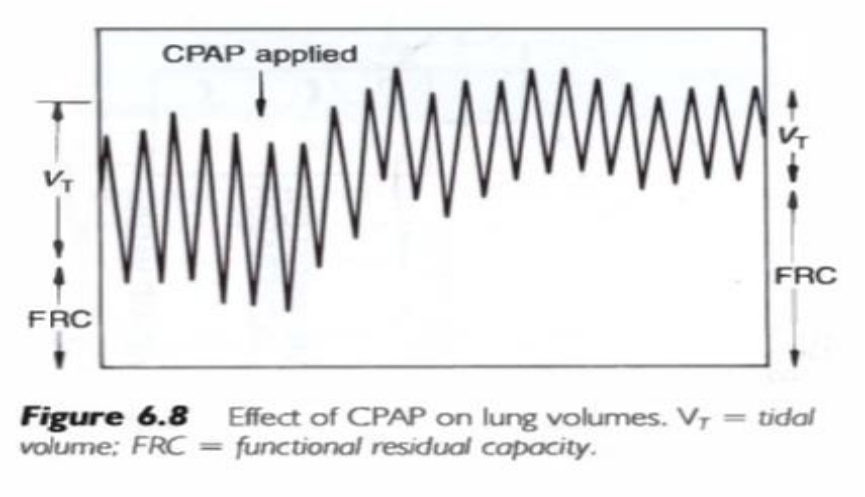


Figure 6.8 Effect of CPAP on lung volumes. V_T = *tidal volume; FRC = functional residual capacity.*

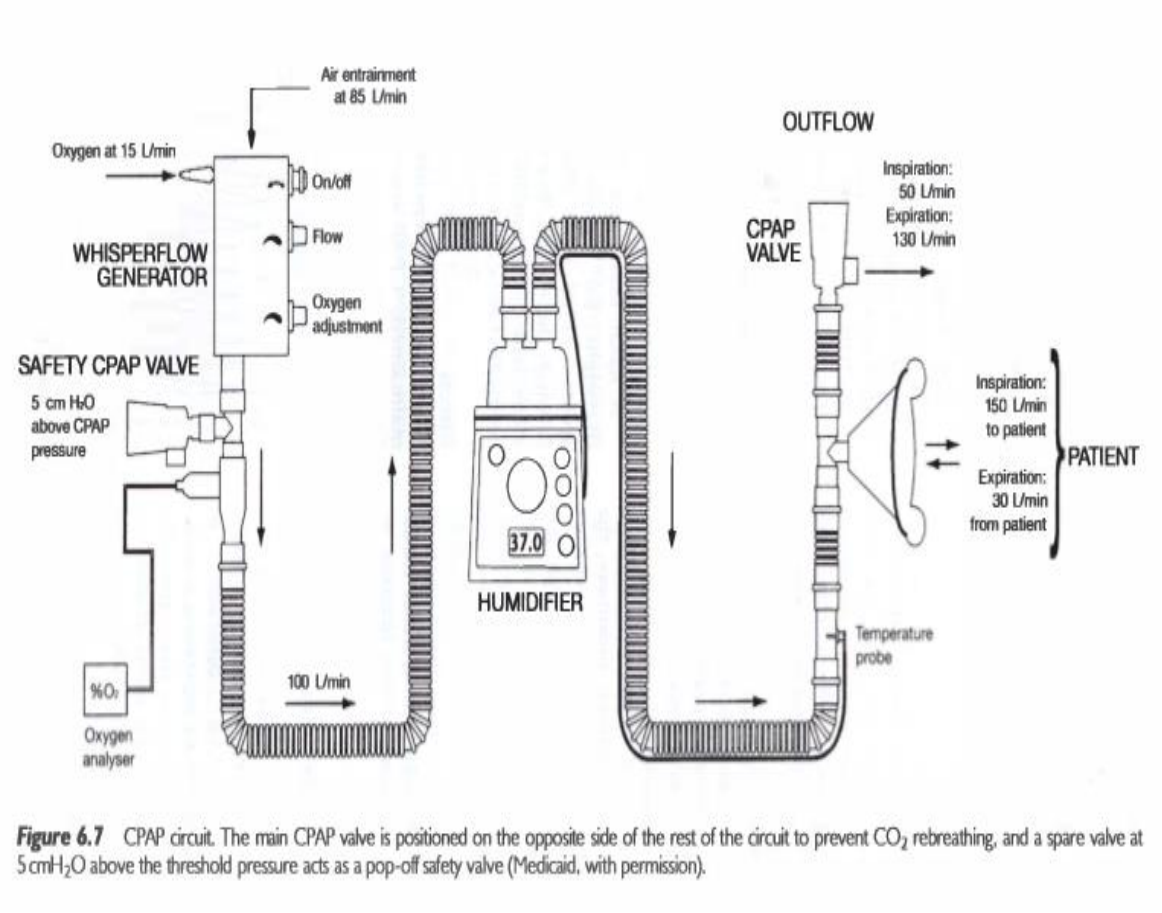


Figure 6.7 CPAP circuit. The main CPAP valve is positioned on the opposite side of the rest of the circuit to prevent CO_2 rebreathing, and a spare valve at 5 cmH_2O above the threshold pressure acts as a pop-off safety valve (Medicaid, with permission).

Bi-level positive airways pressure (Bi-PAP)

Bi-PAP through the ventilator is equivalent to the support provided by non-invasive ventilation for the spontaneously breathing patient.

BiPAP (Bilevel Positive Airway Pressure): An Overview

BiPAP, or **Bilevel Positive Airway Pressure**, is a **non-invasive ventilatory support** device that delivers two levels of pressure to the airway:

- **Inspiratory Positive Airway Pressure (IPAP)** – assists inhalation
- **Expiratory Positive Airway Pressure (EPAP)** – maintains airway patency during exhalation

Key Features:

- Used in patients with **moderate to severe respiratory distress**, especially when oxygen therapy alone is insufficient.
- Common in **COPD exacerbations**, **obstructive sleep apnea (OSA)**, **neuromuscular diseases**, and **acute respiratory failure**.
- Delivered via a **tight-fitting nasal or full-face mask** connected to a BiPAP machine.

How BiPAP Works:

- During **inhalation**, IPAP helps push air into the lungs, reducing the effort needed to breathe.
- During **exhalation**, EPAP keeps the airways open to prevent collapse and aids gas exchang
- **Clinical Indications:**

- Chronic Obstructive Pulmonary Disease (COPD) exacerbation with CO_2 retention
- Obstructive Sleep Apnea (for patients not tolerating CPAP)
- Neuromuscular disorders (e.g., ALS, muscular dystrophy)
- Obesity hypoventilation syndrome
- Acute respiratory failure (in select cases)

Contraindications:

- Respiratory arrest
- Inability to protect airway
- Uncooperative or unconscious patients (without secure airway)
- Facial trauma or deformities preventing mask seal

PRACTICAL 8

PULMONARY REHABILITATION

- Rehabilitation for people disabled by breathlessness is a neglected area of health care but one of the most rewarding aspects of physiotherapy
- Pulmonary rehabilitation should be integral to the management of people with chronic respiratory disability
- Rehabilitation does not reverse lung damage but it modifies the disability that derives from it and normally shows greater benefit than medication
- Advantage!
    - Decrease Breathlessness by 65% (Votto, 1996)
    - increase exercise capacity and quality of life, according to 14 trials (Lacasse, 1996), even for severely impaired patients (Griffiths et al., 1996)
    - Decrease Health care costs (Figure 9.1), with at least, Quality of life shows the most sustained improvement, and chronic lung disease links physical and psychological factors by a potent blend of breathlessness and chronic disability, and the attitude and encouragement of the rehabilitation team play a major role.
- **The set up The options are:**

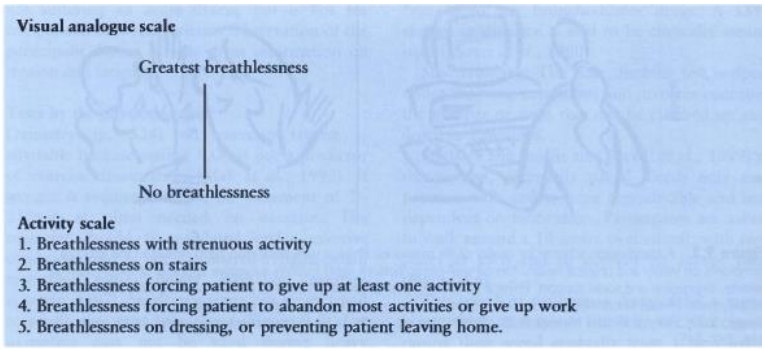
    • An outpatient programme
    • An inpatient programme in a dedicated rehabilitation ward
    • A discharge programme after exacerbation, either in a pre-discharge ward or at home
    • A home-based programme, useful for severely disabled people or as a cost-effective alternative to hospitalization for mild exacerbations
    • A community-based programme in a day center, physiotherapy practice (Cambach, 1997) or other facility that has single-story access and a more upbeat atmosphere than hospital.

- Sessions are arranged typically twice weekly for 6-12 weeks. Once a week tends to be less successful in maintaining motivation between sessions. The initial physiotherapy session, either on a one-to-one basis or with half the group at a time, includes assessment, identification of participant needs, goal setting, breathing re-education and a suggested home programme.
- Assessment should take account of:
    • Respiratory impairment: 1 lung function, e.g. FEV}
    • Respiratory disability: the effect of this impairment, e.g. anxiety or 1 exercise capacity
    • Respiratory handicap: social and other disadvantages.

Respiratory function tests

Breathlessness and quality of life: Health-related quality of life (QoL) scales characterize wellbeing and include the effect of deconditioning caused by a lifestyle restricted to minimize

breathlessness



Exercise testing Exercise testing can be measured objectively by walking or stair-climbing. This gives an accurate indication of progress so long as the patient is not suffering an acute illness, but is not for comparison between patients. Observation of the participant during activity gives information on tension and fatigue.(Six-minute distance:) Stair climbing: The stair climbing test is done under the same conditions and involves counting the number of steps that can be climbed up and down in 2 minutes

Shuttle: The shuttle test (Revill et al., 1999) is incremental, externally paced, needs only one practice walk and is more reproducible and less dependent on motivation. Participants are asked to walk around a 10-metre oval circuit, with two cones at each end to prevent an abrupt turn

Tests by the physiotherapist Oximetry (p. 324) on exercise testing is advisable because resting S.02 is not a predictor of exercise desaturation (Mak et al., 1993). If oxygen is required at rest, an increment of 12 L/min is often needed on exercise.

Tests in the laboratory Exercise testing based on **treadmill-walking or cycle ergometry** is unfamiliar to participants, unreliable in relation to everyday activity (Mak et aI., 1993) and less related to exercise capacity than breathlessness (Wijkstra, 1994). However, measurable workloads can be imposed in the laboratory while monitoring minute ventilation, CO2 output, HR, BP, Sa02, blood gases and oxygen consumption (V02). This helps to highlight the interaction between venous systems involved in oxygen delivery to the tissues. An ECG stress test detects myocardial ischemia by identifying ST segment changes. Exercise testing can help determine the cause of exercise limitation. Respiratory disease is likely if breathlessness is the limiting factor. If a person reaches the anaerobic threshold early, i.e. at less than 40% predicted V02max, or if maximum predicted HR is reached early, limitation is probably due to cardiovascular disease. A checklist can be made up from any of the suggestions in Box 9.2 and selected parts used for initial assessment, interim assessment and final outcome

EDUCATION

Motivation

Understanding reactions to the disease

Smoking withdrawal

REDUCTION IN BREATHLESSNESS:

Thoracic mobility

EXERCISE TRAINING (overload, i.e. intensity must be greater than the muscle's normal load • reversibility, i.e. cessation of training loses the benefit gained • specificity, i.e. only the specific activities practiced will show improvement)

Exercise prescription four components make up the exercise prescription: mode, intensity, duration and frequency. The mode of exercise relates to the participants' lifestyles. Many choose walking, stair-climbing or occupation-based exercise. Some prefer the stationary bike or treadmill because they feel in control, can

use oxygen easily and have support for their shoulder girdle. About 85% of body weight is supported by a bike, and large muscle groups

PRACTICAL 9

CARDIAC REHABILITATION

Aim of Study: To Know About Cardiac Rehabilitation

Introduction

Cardiac rehabilitation is a multidisciplinary program of education exercise, and behavior changed established to assist individuals with heart disease in achieving optimal physical, psychological, and functional status within the limits of their disease.

This Program includes

1. Education of the patient and family in the recognition, prevention, and treatment of cardiovascular disease
2. Amelioration or reduction of risk factors
3. Dealing' with the psychological factors that influence recovery from heart disease
4. Structured, progressive 'physical activity either in a rehabilitation or home program
5. Vocational Counselling

Goal of Rehabilitation:

1. To prevent harmful effects of prolonged bed rest
2. To develop cardiovascular fitness after acute illness.
3. To identify patients whose psychological response to cardiac disease
4. To initiate a program of secondary prevention of Cardio-vascular disease aimed at reducing risk of illness and death as well as improving function and quality of life.
5. To accomplish the preceding goals through .interdisciplinary efforts directed at discovering patient's optimal activity level, diet, and ability to improve unfavorable risk factors]

Components of Rehabilitation are:

This should include System assessing Goals achievements of assessing goal achievement for each component for each patient

1. Risk Factor
2. Assessment
3. Plan of care

Cardiac Rehabilitation Program Components

RISK FACTOR	ASSESSMENT	TREATMENT
Smoking	Current and past smoking habits	Referral to smoking cessation
Exercise	Exercise habits, weekly calorie expenditure, maximal functional capacity	Exercise prescription for supervised or individual exercise training
Nutrition/lipids	Weight, body fat (body mass index), cholesterol, LDL, and HDL	Nutritional counseling, medical management for elevated cholesterol, weight management
Psychosocial	Stress, hostility, depression	Referral for counseling, group support
Hypertension	Blood pressure, vascular status (pulses, bruits)	Diet, exercise, counseling, and medication, if necessary
Diabetes	Blood glucose fasting blood sugars, urine testing	Diet, exercise, medication (insulin) and diabetic education re: multisystem dysfunction
Menopausal females	Estrogen status, possibly bone density	Dietary evaluation and counseling, estrogen replacement, calcium and other bone-building supplements

Phases of Cardiac Rehabilitation

Cardiac rehabilit.uion is typically organized in progressive phases of programming to meet the specific needs of individuals and their families in their stages of recovery, there are four phases

Phase I: The acute or in-hospital phase.

Phase II: the outpatient or intensive monitoring.

Phase III: is the training and maintenance

Phase IV: presented for the high-risk patient in disease prevention program

Precaution for Cardiac Rehabilitation

1. Before initiating each activity session patients status should be reassessed
2. There must be reviewed patient chart
3. The ECG monitor should be checked for any new changes
4. Vitals Sign cardiac rhythm, Symptom and Heart and lung sound needed to be rechecked.
5. Activity Session Should be scheduled after one hour of meal
6. Avoid Isometric Exercise such as breath holding with exercise this may cause dramatic changes in Blood Pressure and Arrythmias.

Phases of Cardiac Rehabilitation

PHASE I: ACUTE PHASE OR MONITORING PHASE

Inpatient cardiac rehabilitation begins when the patient is determined to be medically stable following a myocardial infarction, coronary artery bypass surgery, angioplasty, valve repair, or congestive heart failure.

PHASE II: SUBACUTE PHASE OF REHABILITATION OR CONDITIONING PHASE

This initial outpatient phase begins as early as 24 hours after discharge, and lasts up to 6 weeks. Frequency of visits depend on the patient's clinical needs. Patients are monitored by ECG telemetry and are taught the basics of self-monitoring and proper exercise procedure. In addition, secondary prevention of disease by implementation of risk factor reduction is a key component of this phase.

PHASE III: TRAINING OR INTENSIVE REHABILITATION

Patients are usually seen once a week, and extends from the time the patient finishes phase II to indefinitely. Patients exercise in larger groups and continue to progress in their exercise program. Resistance training often begins in this phase.

PHASE IV: ONGOING CONDITIONING (MAINTENANCE) PHASE OR PREVENTION PROGRAM

Candidates for this program are individuals who are at high risk for infarction due to their risk factor profile, as well as those who want to continue to be followed by supervision of trained personnel.

References: Essential of Cardiopulmonary Physical Therapy, Ellen A.Hillegass, Second Edition

Practical -10

Aim of the Study: To Know the Obstetric and Gynecological Assessment.

Definition

The obstetric exam is an essential way of establishing the obstetrical diagnosis and the assessment of pregnancy evolution until it is completed by birth. It involves professional knowledge, patience and tact, calmness, consistency, elegance in relation to the patient, good sense, respecting the woman's chastity, being easy and quick to adapt to the particular situation, sensing the patient's mental condition and creating the conditions of some relationships of mutual affectionateness and trust.

The obstetric examination includes:

- anamnesis
- general physical exam on apparatus and systems
- obstetric clinical examination

Anamnesis

The patient's personal data (age, marital status, occupation, urban / rural domicile) will be recorded.

Reasons for the consultation

Includes:

- *Major emergencies* (seizures, umbilical cord prolapse, haemorrhage, shock)
- *Abdominal pain* - the following will be analysed: date of occurrence, primary site, intermittent / continuous, colic or contractility, irradiation, accompanying symptoms, relation to a certain position, relationship with rest and / or pain relievers and antispastic medication
    - *Amniotic fluid loss*
    - *Bleeding* (appearance of bleeding, bleeding duration, amount)
- *Other symptoms* such as hyperthermia, digestive disorders (epigastric pain, nausea, vomiting, transit disorders, hemorrhoids), urinary disorders (polakiuria, dysuria), refractory intense headache, acute dyspnea, lower limb oedema.

The evaluation of ***Life and work conditions*** (dwelling, monthly income, occupational activity, nutrition, toxic consumption, family environment) as well as family medical history (refer to obtaining data on the existence of chronic diseases of parents, close relatives as diabetes, high blood pressure, hereditary diseases, genetic diseases, malformation syndromes, as well as data on the health of the spouse - age, blood group, Rh, communicable diseases, chronic diseases, malformations, genetic diseases).

From the ***personal physiological antecedents*** the following shall be recorded:

- Menstrual cycle history - the date of the first menstrual period, the succession of menstrual cycles: interval, regularity, duration, quality and quantity of menstrual bleeding, premenstrual syndrome - dysmenorrhea, mastodynia, age of onset of sexual life, marriage
- *Obstetric antecedents* - number of pregnancies, number of births - spontaneous / caesarean, evolution of childbed, healthy children and their weight, breastfeeding

Personal pathological antecedents are of particular importance:

- *Obstetrics* - spontaneous / provoked abortions, abortion complications, extopic pregnancies, premature birth, birth complications, obstetrical manoeuvres (forceps, vidextraction, manual extraction of placenta), caesarean surgery, postpartum complications, newborn complications

- *Gynecological* - inflammatory / tumoral pathology, genital surgery, sexually transmitted diseases, Babes-Papanicolaou (BPN) cytology
- *Medical* - pathology of various apparatus and systems, infectious-contagious diseases
- *Surgical* - extragenital surgery

Current pregnancy history should be evaluated, by assessing the first day of the last menstruation, the date of first foetal movement perception, the date of fecund sexual intercourse, weight gain, oedema, blood pressure oscillations, treatments administered during pregnancy, registration at a physician, the rhythm of prenatal examinations, pregnancy evolution - mentioning the existence of pregnancy-related conditions, and the reason of the consultation

Inspection

A general obstetric inspection will be carried out with the *facies inspection*, observing the chloasma, *breasts inspection* observing the pregnancy-induced changes, *inspection of abdomen* (size, uterine shape, umbilical modifications, stretch marks, scars, oedema), and the *inspection of vulvo-perineal region* indicating changes induced by pregnancy, ano-vulvar distance (perineum height), perineal scarring, or haemorrhoids.

Measures in the pregnant uterus

- The fundal height - pregnancy to term 32-34 cm
- Abdominal circumference - pregnancy to term 90-92 cm

Applying Johnson's formula, we can assess the foetus weight according to the fundal height (FH) and the foetal skull situation (n).

Palpation

Provides information on the following:

- The tonicity of the abdominal wall, being able to sense the uterine contraction
- The amount of amniotic fluid, being able to appreciate the abdomen's distensibility
- Foetal state: place, position, presentation, report of the presentation with the superior pelvic strait

The examination is performed with the patient in dorsal decubitus, with hips and knees in semiflexion, the examiner located on the right side of the patient

Palpation is performed following the ***technique described by Leopold*** (Leopold's maneuvers):

- 1 - palpation of the pregnant woman's abdomen with the examiner's hand, assessing the consistency of the uterine wall
- 2 - delineation of the uterus fundus and they way it reports to certain parts: pubic symphysis, umbilicus, xifoid appendix
- 3 - palpation of the lower pole of the uterus (lower segment) - establishing the presentation:
  - skull - round, regular, tough pseudotumoral formation, non depressible
  - pelvis - irregular pseudotumoral formation, uneven, depressible consistency
  - transverse position - the lower segment is empty
  - on this occasion the ratio that exists between the presentation and the superior pelvic strait is appreciated (mobile, applied, fixed, engaged, lowered)
- 4 - the area of uterine fundus is palpated, determining the

foetal pole to be distinguished at this level

- 5 - Palpation of the uterine flank, defining:
  - foetal back - regular plan, hard convex surface, non depressible
  - small foetal parts - irregular, depressible region

Auscultation

It is performed with the obstetrical stethoscope, concomitant with the palpation of the maternal pulse, to distinguish the maternal sounds from the foetal ones. The location of the auscultation focal point varies according to the presentation:

- flexed skull presentation - halfway between the navel and the anterior superior iliac spine to the part of the foetal back
- pelvic presentation - paraumbilical left or right
- transversal presentation - supra or subumbilical
- facial presentation - halfway between the navel and anterior superior iliac spine on the opposite side of the foetal back

Foetal heart beats are perceived as rhythmic clock ticks with a frequency of 120-160 beats / minute, without being synchronous with the mother's pulse. It can also be noticed:

- umbilical cord souffle - has a fine tonality and overlaps with foetal heart beats, being caused by an obstacle on uterine contractions
- uterine souffle - is more blowing, being concomitant with the maternal pulse. It is determined by uteroplacental circulation
- foetal movements - which are perceived as irregular kicks, with diffuse tonality
- pulse of the maternal abdominal aorta
- maternal intestinal noises

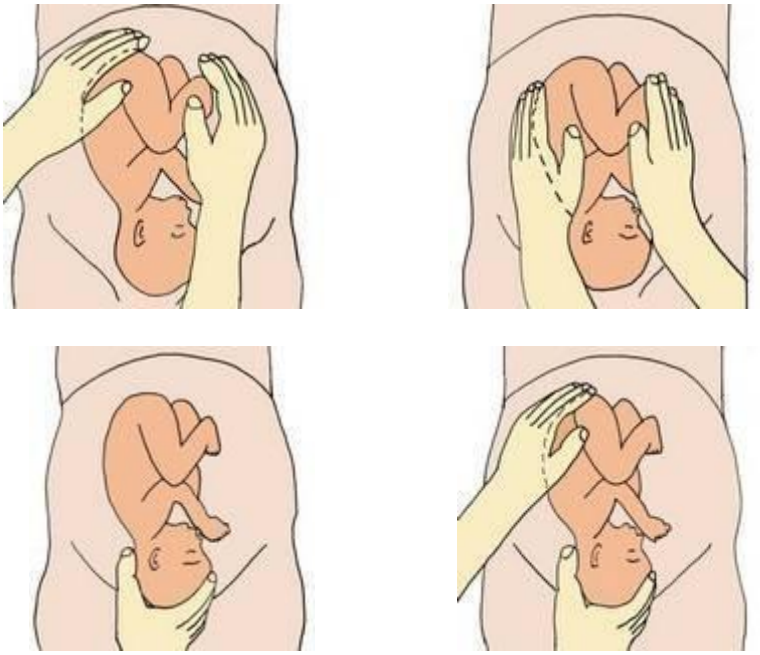


Figure 1. Leopold's Maneuvers

Cervical examination appreciates certain parameters that allow birth prognosis (Bishop Score), along with bimanual vaginal examination.

Table 1. Bishop score

Parameter	**0**	**1**	**2**	**3**
The position of the cervix	posterior	median	anterior	
Shortening of the cervix	30%	40-50%	60-70%	80%
The consistency of the cervix	firm	average	soft	
Dilation (cm)	0	1-2	3-4	over 5
The position of the skull	high, mobile	-2-1	-1-0	+1.+2

The score is obtained by summing up the 5 parameters. When the score is over 6, prognosis of vaginal delivery is good.

Biochemistry Investigation include vaginal secretion examination, Cyto-bacteriological examination, Babes Papanicolau cytotumoral examination, amniotic fluid examination

Pelvic Floor Muscle Assessment: The PERFECT Scheme

PERFECT is an acronym with

P representing power (or pressure, a measure of strength using a monomeric perineometer),

E = endurance, R = repetitions,

F = fast contractions, and

finally ECT = every

contraction timed.

Conclusion

Obstetric assessment is crucial in physiotherapy, especially in cardiopulmonary settings, to ensure safe and effective care for pregnant women and those with heart conditions. It allows for a comprehensive evaluation of the patient's physical status, including their heart and lung function, to develop personalized treatment plans that address potential risks and complications. By incorporating comprehensive obstetric assessment into their practice, physiotherapists can provide safe, effective, and personalized care for pregnant women and those with heart conditions, optimizing their physical health and well-being throughout the pregnancy and postpartum period.

Reference:

1. Physiotherapy in Obstetrics and Gynecology 2nd Edition
2. Laycock, D Jerwood, Pelvic Floor Muscle Assessment: The PERFECT Scheme, Physiotherapy, Volume 87, Issue 12,2001,Pages 631-642,