CLINICAL CARDIO-RESPIRATORY CONDITIONS

Examination at the end of: IV Year

Instruction hours: 125

Marks: Theory 80 + 20 IA.

COURSE DESCRIPTION:

This course introduces the student to the cardio - thoracic conditions which commonly cause disability. Particular effort is to be made to avoid burdening the student with any detail pertaining to diagnosis which will not contribute to their understanding of the limitations imposed by cardio - thoracic pathology on the functioning of the individual.

COURSE OBJECTIVES:

The objective of this course is after 125 hours of lectures & demonstrations, in addition to clinics, the student will be able to demonstrate an understanding of cardio - thoracic conditions causing disability and their management.

COURSE OUTLINE:

A. ANATOMY AND PHYSIOLOGY: [25 hours]

1. **Describe in detail the anatomy of the thoracic cage.**
2. **Describe in detail the anatomy of the lungs, bronchi and bronchopulmonary segments.**
3. **Relationship of the bony thorax and the lungs to each other and to the abdominal contents.**
4. **Briefly describe the variations in the bony cage in the following conditions:**
   a. **Cervical ribs: thoracic outlet syndrome**
   b. **Rickets - rickety rosary**
   c. **Depression deformities: pectus excavatum**
   d. **Protrusion deformities: pectus carinatum (pigeon chest)**
   e. **Scoliosis**

f. Kyphosis

g. Rare deformities: sternal clefts, absent sternum, Poland syndrome, fused ribs, absent ribs, Jenunes disease.

5. Describe the movements of the thorax: Bucket handle, pump handle.

6. List the muscles of respirations involved in inspiration and expiration (including accessory muscles of respiration).

7. List the mechanical factors involved in breathing. Describe briefly factors affecting lung compliance and airway resistance.

8. Describe in detail the cough reflex.

9. List the factors affecting diffusion of oxygen and carbon-dioxide in the lungs. Explain ventilation, perfusion and their inter relationship.

10. Describe the physiological control of respiration and highlight the function of the medullary and pontine respiratory centres and central and peripheral chemoreceptors.

11. Pulmonary function assessment: Briefly describe the pulmonary function tests and their use; briefly outline the basis and value of blood gas analysis.

12. Describe in brief the anatomy of the heart and its blood supply and briefly outline the electrical activity or the myocardium and normal ECG.

13. Describe the mechanism for maintenance of blood pressure.

14. Fundamentals of ECG recording and basic interpretation.

15. Briefly describe the principles of Echocardiography: M-mode, Doppler (trans thoracic and trans oesophageal echocardiography)

16. Briefly outline the principles of cardio vascular stress testing.

17. Basics of arrhythmias, syncope and its management.

18. Principles, indication and methodology of temporary and permanent pacemarker implantation

19. Fundamentals of cardiac catheterization: angioplasty, percutaneous balloon mitral valvotomy, pulmonary valvotomy, aortic valvotomy, device closure of patent ductus arteriosus, atrial septal defects, ventricular septal defects.

20. Outline the energy expenditure of various common daily activities.

B. CARDIAC SURGERY: [20 hours]

1. Introduction to cardiac surgery: define extra cardiac operations, closed intra-cardiac operations and open cardiac operations.

2. Principles of cardiopulmonary bypass and its complications. Define hypothermia and deep circulatory arrest.

3. Myocardial preservation techniques during cardiopulmonary bypass.

4. Principles of left heart bypass (left aorta femoral bypass), femoral bypass, Gotts shunt, minimally access surgery, port access surgery

5. Cardiac conditions requiring closed heart surgery:

   a. Congenital diseases: Patent ductus arteriosus, coarctation of aorta.

   b. Acquired heart diseases: mitral stenosis

6. Cardiac conditions requiring open heart surgery: briefly describe the pathophysiology, clinical presentations and management of the following conditions:

   a. Congenital diseases: atrial septal defect, ventricular septal defects, pulmonary stenosis, tetralogy of Fallot, double outlet right ventricle. transposition of great vessels, AV canal defect.
   b. Acquired diseases: mitral stenosis, mitral regurgitation, aortic stenosis, aortic regurgitation, and mixed valvular lesions.
      Coronary artery disease: clinical presentation, pathophysiology and management: PTCA and stenting, off pump coronary artery bypass

surgery (OPCAB), on pump coronary artery bypass grafting, minimally invasive direct coronary artery bypass (MIDCAB).

7. Intra aortic balloon pump: principles, indications, advantages and disadvantages
8. Fundamental principles of ventricular assist devices
9. Cardiac transplantation
10. Principles of robotic surgery in cardiac surgery

C. THORACIC SURGERY: [30 hours]

1. Pathophysiology of various forms of chest trauma. Cardiac tamponade.

2. Describe very briefly the clinical features and management of the following: simple and multiple rib fractures, flail chest, stove in chest, pneumothorax, hemothorax, hemopneumothorax. Lung contusion, laceration, injury to heart, great vessels and injury to the tracheo-bronchial tree.

3. Empyema thoracis: definition, causes, management. Briefly describe intercostals drainage, rib resection, decortication and window operation.

4. Pulmonary Tuberculosis: clinical presentation, pathology, and management. List the manifestations of pulmonary tuberculosis and briefly describe tuberculoma, bronchiectasis sicca, bronchostenosis. Clinical presentation of destroyed lung and management. Management of hemoptysis. Define massive hemoptysis and the strategies involved in the management of patients with massive hemoptysis including bronchial artery embolization, cryoablation.

5. Outline briefly the clinical features and management of the following suppurative lesions of the lung; bronchiectasis, lung abscess, bronchopneumonia & aspergillosis.

6. Outline briefly the clinical features and management of carcinoma lung.

7. Outline the extent, use and complications of the following surgical incisions: anterolateral thoracotomy, posterolateral thoracotomy and median sternotomy.

8. Describe and define the following and the post-operative management of patients who have undergone wedge resection, segmentectomy, lobectomy, bilobeotomy, pneumonectomy, pleuropneumonectomy & tracheostomy.

9. Describe in detail the preopertive assessment and management of a patient posted for thoracotomy.

10. One lung anaesthesia: principle, indications and contraindications.

11. Video — assisted thoracoscopy surgery: principle, indications, contraindications and advantages.

12. Describe the principles of cardio-pulmonary resuscitation, cardiac massage, artifical respiration, defibrillators and their uses.

13. Advanced life support system

D. INTENSIVE CARE: [25 hours]

1. Outline briefly the principles of various ventilators and their use.
2. Tracheostomy: definition, indications, procedure, complications and advantages.
3. Describe in detail the following post-operative procedures: management of endotracheal / endonasal tube, tracheal suction.
4. Weaning the patient from the ventilator, extubation technique, post extubation care.

E. MISCELLANEOUS: [20 hours]

1. Briefly outline the management of a patient after a myocardial infarction.
2. Briefly outline the management of a patient with chronic obstructive airway disease.

F. RECENT ADVANCES: [5 hours]

1. Transcatheter aortic and mitral valve implantation.

References: -

1. **Cardiac Rehabilitation by Piyush Jain.**
2. **Davidsons principles & practice of medicine.**
3. **Text book of Heart, Chest & Vascular diseases for Physiotherapist - Patrica Adowine.**

PHYSIOTHERAPY IN

CARDIORESPIRATORY CONDITIONS

Examination at the end of: IV Year

Instruction hours : 110

i) Theory 80 marks

ii) Practical 60 marks

iii) Oral 20 marks.

iv) Internal — Theory : 20

Practical: 20

COURSE DESCRIPTION:

This course serves to integrate the knowledge gained by the students in clinical cardiorespiratory conditions with skills gained in exercise therapy, electrotherapy and massage, thus enabling them to apply these in clinical situations of dysfunction due to cardiorespiratory pathology.

COURSE OBJECTIVES:

The objective of this course is that after 110 hours of lectures, demonstrations, practicals and clinicals the student will be able to identify cardiorespiratory dysfunction, set treatment goals and apply their skills in exercise therapy, electrotherapy and massage in clinical situations to restore cardiorespiratory function.

COURSE OUTLINE:

A. ANATOMY: [5 hours]

1. Cardio vascular system:
   - Mediastinum: divisions and contents

- Pericardium: thoracic wall: position, shape and parts of the heart, conducting system, blood supply and nerve supply of the heart, names of the blood vessels and their distribution in the body, region wise.

2. Respiratory system:
   - Outline of the respiratory passages.
   - Pleura and lungs: position, parts, relations, blood supply and nerve supply.
   - Lungs — emphasis on bronchopulmonary segments and their applied aspects.
   - Diaphragm: origin, insertion, nerve supply and action
   - Intercostal muscles and accessory muscles of respiration: origin, insertion, nerve supply and action.

3. Thorax
   - List the main bones and joints of thoracic cage. Mention the boundaries and contents of thoracic cavity.
   - Analyse pump handle and bucket handle movement of ribs.
   - Surface anatomy of heart and lungs.

B. PHYSIOLOGY: [5 hours]

1. Cardiovascular system:
   - Properties of cardiac muscle, cardiac cycle.
   - ECG, heart sounds, cardiac output.
   - Factors regulating the action of the heart.
   - Blood pressure, its maintenance and regulation.
   - Renal circulation, pulmonary circulation
   - Vascular mechanics
   - Lymph factors affecting its flow.
2. Respiratory system:
   - Defence mechanism in the respiratory tract, mucociliary transport, mechanics of respiration.
   - Transport of blood gases, acid base balance.
   - Neural and chemical regulation of respiration.

C. GENERAL OVERVIEW: ASSESSMENT [10 hours]

— Describe physical assessment in cardio respiratory dysfunction.

1. Inspection: posture (recumbent, erect orthopneic): breathing pattern (rate, rhythm and pattern, use of accessory muscles), chest movement (symmetry, intercostals and diaphragmatic components), chest deformity (barrel chest, pigeon chest); spinal deformity (scoliosis, kyphosis, kyphoscoliosis); sputum (colour, type, volume, consistency); cough (types, productive / non-productive, presence of a normal cough reflex).
2. Palpation: Tactile and vocal fremitus, mobility of cervical and thoracic spine, shoulder girdle, rib cage.
3. Percussion: dullness and hyperresonance.
4. Auscultation: Normal and abnormal breath sounds.
5. Measurement: Chest expansion at different levels (axiliary, nipple, xiphoid); exercise tolerance (six minute walking test).
6. Cardiac dysfunction: evaluation of risk factors, respiratory system evaluation, heart rate rhythm.
7. Physical assessment in post-operative lung and cardiac conditions: surgery details, date, duration, events, types and extent, incision, vitals, drains, pain, ROM, thoracic cavity, neck, shoulder girdle, thoracic spine, chest excursion, air entry, sputum, posture, neurological complications, exercise tolerance.

D. GENERAL OVERVIEW: PHYSICAL TREATMENT: [15 hours]

1. Describe indications, goals and procedure of breathing exercise. Describe diaphragmatic breathing, localized basal expansion, apical expansion, specific segmental exercise raising the resting respiratory level.

2. Describe chest mobilization exercises.
3. Describe relaxation positions for the breathless patient: high side, lying, sitting, relaxed sitting, forward lean, standing, relaxed standing.
4. Describe controlled breathing during walking and during functional activity.
5. Describe exercise for the breathless patient: exercise tolerance testing and exercise programme.
6. Describe the technique of huffing and coughing, forced expiratory technique, vibratory chest shaking and percussion, autogenic drainage, active cycle of breathing, inspiratory muscle training and flutter.
7. Describe techniques of postural drainage, including indications, general precautions and contra indications, preparation of drainage of individual bronchopulmonary segments, modified postural drainage and continuing postural drainage as a home programme.
8. Outline the history of mechanical respiration. Define the following terms a) respirator b) lung ventilator c) resuscitators d) body ventilator e) electrosimulator f) IPPB g) PEEP h) CPAP i) SIMV j) NEEP. Classify ventilators by their cycling control (volume cycling, pressure cycling, time cycling and mixed cycling). Describe the principles of operation of commonly used ventilators and outline the use of the following types: I) bear II) Bennett III) Emerson IV) Bird.

   Outline the principles of aerosol therapy. Describe the physical properties of aerosols and their deposition in the alveoli. Describe the principles of operation of nebulisers.
9. Outline the principles of humidification therapy and methods of correcting humidity deficits. Describe the principles of operation of pass — over humidifiers and bubble — diffusion aerosol therapy. Describe the physical properties of aerosols and their deposition in the alveoli. Describe the principles of operation of nebulisers.
10. Outline the principles of humidification therapy and methods of correcting humidity deficits. Describe the principles of operation of pass — over humidifiers and bubble — diffusion humidifiers.
11. Describe techniques of sterile nasopharyngeal and endotracheal suctioning.

E. PHYSIOTHERAPY IN OBSTRUCTIVE LUNG DISEASES: [10 hours]

1. Assess: Effort of breathing, extent of wheeze, pattern of breathing, sputum production, chest deformity, exercise tolerance (patients effort tolerance).

2. Identify problems: Decreased outflow due to bronchospasm, anxiety due to difficulty in ventilation, exhaustion due to increased work of disturbed breathing. Increased secretions which are difficult to remove, decreased exercise tolerance.

3. Demonstrate treatment techniques: Relaxation postures and techniques, reassurance and education about disease, controlled breathing, breathing exercise, postural drainage, vibratory shaking, huffing and coughing, graduated exercise programme and posture correction.

F. PHYSIOTHERAPY IN CHEST INFECTIONS: [7 hours]

1. **Assess: Sputum, cough, fever and dysponea.**

2. Identify problems: Productive cough with risk of hemoptysis, exhaustion due to increased work of breathing, chest deformity, decreased exercise tolerance.

3. Demonstrate treatment techniques: Postural drainage with use of adjuncts, percussion, vibration, huffing and coughing to expectorate, mobilizing exercises to thorax and graduated exercise.

G. PHYSIOTHERAPY IN RESTRICTIVE LUNG DISORDERS: [10 hours]

1. Assess: Chest expansion at different levels, mobility of thorax and spine, posture (kyphosis or scoliosis) and tests for exercise tolerance (six minute walking test).

2. Identify problems: Decreased expansion of lung due to restriction of chest wall movement causing decreased ventilation, defective posture and decreased exercise tolerance.

3. Demonstrate treatment techniques: Vigorous mobilizing exercises to thorax and spine, breathing exercise to increase ventilation and drain secretions, exercises for posture correction, graduated exercises to increase tolerance.

H. PRINCIPLES OF INTENSIVE CARE PHYSIOTHERAPY: [10 hours]

Describe the principles of intensive care therapy.

1. Demonstrate knowledge of the following equipment: endotracheal tubes, tracheostomy tubes, humidifier, ventilators, high frequency ventilators, differential ventilators, CPAP masks, Suction pump, electrocardiogram, pressure monitors — arterial, central venous, pulmonary artery and pulmonary wedge: intracranial and temperature monitors.

2. Assess : Special instructions pertaining to any operation performed, respiration, level of consciousness, colour, blood pressure, pulse, temperature, sputum expectorated (colour and quantity), drugs (time of last dose of analgesic given), drains, presence of pacemaker or intraaortic balloon pump. ECG and blood gas results. Describe chest radiograph with respect to expansion of lungs, size of heart, presence of secretions and placement of chest tubes.

I. PHYSIOTHERAPY AFTER PULMONARY SURGERY: [10 hours]

Pre operative:

1. **Assess : special instructions pertaining to operative procedure performed, breath sounds, cyanosis, respiratory rate, temperature and pulse, blood pressure, drainage from pleural drain (bubbling or winging), sputum expectorated, analgesia, movements of chest wall (symmetry) position of patient and effort of breathing, chest radiograph and blood gases.**

2. **Identify problems: Pain due to intercostal drain in situ, decreased air entry, retained secretions, decreased movements of the shoulder of affected side, decreased mobility and poor posture.**

3. **Demonstrate treatment techniques: deep breathing and segmental breathing exercises, vibrations, percussions, huffing and coughing, full range active assisted arm exercises, ankle foot exercises, trunk exercises, posture correction, positioning of patient, IPPB inhalations.**

J. PHYSIOTHERAPY AFTER CARDIAC SURGERY: [11 hours]

Pre operative:

1. **Assess patients medical history, normal breathing pattern of patient, pulse, respiratory rate, BP. Thoracic mobility, posture and patients exercise tolerance.**

2. **Identify problems: Excess secretions, decreased mobility of thorax, defective posture, decreased exercise tolerance. Demonstrate treatment techniques: Explain to the patients about their operation and about the incision. ICU. Endotracheal tube, central lines, nasogastric tube, catheter, ECG, leads, drains, peripheral lines, temperature probe etc. Teach breathing exercises, slanting of incision, huffing and coughing, correct posture, range of motion, exercises to trunk and shoulder, active exercises to ankle and foot. Post operative: Assess special instructions pertaining to operative procedure performed, type of incision, blood pressure, pulse rate, respiration, colour, time of last analgesic dose, drains, temperature, ECG. chest x-ray and blood gases.**

Post operative:

1. **Identify problems: Pain, decreased air entry, retained secretions, reduced arm and leg movements. Decreased mobility.**

2. **Demonstrate treatment techniques: Deep breathing exercises, suctioning, active / assisted exercises to arm and leg, graduated exercise programme.**

K. PHYSIOTHERAPY IN GENERAL SURGERY: [7 hours]

1. **Assess the patients medical history, past treatment, breathing pattern, ability to cough and pain.**

2. **Identify problems: Pain, increased secretions. Defective posture and correction and graduated exercise programme.**

3. **Demonstrate treatment techniques: Breathing exercise, huffing and coughing, mobilizing exercise, posture correction and graduated exercise programme.**

K. PHYSIOTHERAPY IN REHABILITATION AFTER MYOCARDIAL INFARCTION: [6 hours]

1. **Describe the role of the physiotherapist in a coronary care unit during the first 48 hours.**

2. **Describe the principles of formulation of an exercise programme, bed exercises, walking, stair climbing.**

3. **Describe a home exercise programme and advise leisure activities.**

4. **Describe physiotherapy for complications after myocardial infarction: chest infection, cerebral embolism and shoulder hand syndrome.**

M. PERIPHERAL VASCULAR DISEASES: [4 hours]

1. **Outline the pathology, distribution and symptoms of atherosclerosis, intermittent claudication, Buergers disease, Raynauds disease and arterial embolus.**