STATE BOARD OF ALLIED MEDICAL SCIENCES ODISHA

Diploma in Perfusion Technology

(Two Years)

Perfusion Technology is the study of physiology and the pathology of the lungs and the allied respiratory organs of the human body. The course also throws considerable light on the associated equipment that is used to support or assume the function of the lungs and the heart during surgical procedures. Perfusion technologists operate the heart-lung machines and other high-end equipment under the guidance of the healthcare practitioner. These professionals monitor optimal blood pressure and intervene with appropriate pharmacological and mechanical manipulation**.**

Job Descriptions

Perfusionists are responsible for preparation of the heart-lung machine and any other equipment critical to the specific operation.

The perfusionist must verify the functionality of the equipment. When the patient is connected to the machine, the perfusionist will continuously monitor the patient's status to manage the rate of blood circulation, balance the hemodynamics, maintain body temperature, stabilize blood composition and oversee other monitoring devices.

The primary surgeon will work with the anesthesiology team to direct any use of pharmacological interventions or blood transfusions-- both of which are carried out by the perfusionist.

The perfusionist shouldremain in close communication with the surgical team to keep them informed of the patient's condition throughout the surgery.

All of these health care professionals working together must focus on the patient's needs to ensure a successful outcome.

The perfusionist will be responsible for measuring various blood parameters and other indicators to identify appropriate mechanical intervention techniques, appropriate pharmacological treatments, and precise thermal manipulation techniques needed to maintain a viable physiological condition in the patient.

Programme: Diploma in perfusion technician course.

Duration: Two years course.

Eligibility: +2Sciencewith Physics, Chemistry & Biology or equivalent degree.

Examination: Examination rules will be as per guideline of Odisha State Allied Board.

ATTENDANCE:A Student will be eligible to appear in the semester and university examination if he /she has attended minimum75% theory classes and 85% practical classes.

Board Examination: A student will be eligible to appear in the board examination if he/she has secured 50% in each internal assessment (both Theory and Practical) done at the end of doneattheend of sixth month each year.

PATTERN OF QUESTIONS (Board Examination)

1. Multiple choice question 2X15=30
2. Reasoning questions 3 X 5 = 15
3. Short Notes 5X5 =25
4. Long Question (Choice) 10X1 =10

The duration of the examination is 2hours.

EXAMINATION PATTERN

FIRST YEAR- INTERNAL ASSESSMENT (HALF YEARLY), THEORY, PRACTICAL.

SECOND YEAR- INTERNAL ASSESSMENT (HALF YEARLY), THEORY, PRACTICAL.

PAPER	INTERNAL ASSESSMENT(THEORY-20,PRACTICAL-20,LOGBOOK-10)		FULL MARK-THEORY-80 PRACTICAL-20	
	FULL MARK	PASS MARK	FULL MARK	PASS MARK
PAPER I	50	25	100	50
PAPER II	50	25	100	50

SECOND YEAR

PAPER	INTERNAL ASSESSMENT(THEORY-20,PRACTICAL-20,LOGBOOK-10)		FULL MARK-THEORY-80 PRACTICAL-10 IA-10	
	FULL MARK	PASS MARK	FULL MARK	PASS MARK
PAPER I	50	25	100	50
PAPER II	50	25	100	50

COURSE SCHEDULE IN FIRST YEAR

Syllabus for First Year-FIRST SEMESTER	
PAPER I	**BASIC HUMAN SCIENCES** Basics of Anatomy Basics of Physiology Basics of Bio-chemistry Computer application **PHYSICAL SCIENCES** Pathology Microbiology Pharmacology
Syllabus for First Year-SECOND SEMESTER	
PAPER II	Introduction to Perfusion Technology Patient care and basic nursing Basics of Pumps, Oxygenators, Alters & blood components Basics of Medical Disorders Biostatistics and Research Methodology.
Syllabus for Second Year-THIRD SEMESTER	
PAPER I	Conduct of Cardiopulmonary bypass, priming solutions and Cannulation techniques Myocardial protection and various drugs used in CPB. Cardiac, Thoracic and Vascular surgical disorders.
Syllabus for Second Year-FOURTH SEMESTER	
PAPER II	Effects on various organs during CPB and introduction to IABP and ECMO. Medical Ethics Special situations in Perfusion Technology Cardiac Support Devices, DHCA and Blood conservation Techniques Hospital Management

Anatomy (30 HOURS THEORY,20 HOURS PRACTICAL)

Objectives:

At the end of the course the student Should be able to:

Describe the structure, composition and functions of the organ systems of human body.
Describe how the organ systems function and interrelate.
T Learn basic technical terminology and language associated with anatomy.

Learning Objectives: Skills

Use the process of prosection to investigate anatomical structure.
Use the microscope to learn anatomical or histological structure.
Learn how to study, interpret and care for anatomical specimens.

Unit I

Organization of the Human Body
Introduction to the human body
Definition and subdivisions of anatomy
Anatomical position and terminology
Cell - Definition of a cell, shapes and sizes of cells
- Parts of a cell - cell membranes, cytoplasm, sub cellular organelles.
Cell Division - Definition and main events in different stages of mitosis and meiosis.
Tissues - Tissues of the body
- Definition and types of tissues
- Characteristics, functions and locations of different types of tissues
- Epithelial tissue - definition, classification with examples
- Glands- classification with examples

Unit II

Maintenance of the Human Body 12hrs

1. Cardio-vascular system.

Types and general structure of blood vessels. Structure and types of arteries and veins. Structure of capillaries. Shape, size, location, coverings, external and internal features of heart. Structure of heart wall. Conducting system and blood supply of the heart. The systemic arteries and veins. Name, location, branches and main distribution of major arteries and veins.

2. Lymphatic system.

Lymph, lymphatic vessels, name, location and features of the lymphoid organs.

3. Respiratory system.

Names of organs of respiration, Location and features of nose, pharynx, larynx, trachea, bronchi, lungs and pleura.

4. Digestive system.

Names of organs of digestion. Location and features of mouth, pharynx, esophagus, stomach, small and large intestines. Location and features of salivary glands, pancreas, liver and gall bladder.

5.Urinary system.

Names of urinary organs, location and features of kidney, ureter, urinary bladder and urethra.

6.Nervous system.

Sub-divisions of the nervous system Brain - Sub-divisions, location external features and internal tructure of medulla oblongata, pons, mid-brain, cerebellum and cerebrum.
Spinal cord - Location, extent, spinal segments, external features and internal structure.

Practical :

1. Demonstration of parts of microscope and its uses.
2. Demonstration of skeleton and joint.
3. Demonstration of deltoid and gluteus maximus, Cubital fossa.
4. Demonstration of heart and its blood supply, demonstration of major arteries of upper limb and lower limb, histology of cardiac muscle and histology of vessels.
5. Demonstration of location and parts of lungs, histology of trachea and lungs.
6. Demonstration of location of stomach, small and large intestines. Location and features of pancreas, liver and gall bladder.
7. Demonstration of location and features of kidney, ureter, urinary bladder and urethra. Histology of urinary system except urethra.

Recommended Books.

Hand book of Anatomy BD Chaurasia
Basics in Human Anatomy for B.Sc. Paramedical Courses 1st edition 2008 Jaypee Publishers.

Physiology (30 hours Theory,20 hours Practical)

Objectives

At the end of the semester students should be able to describe
1. Blood cell counts
2. Nerve and muscle functions
3. Cardiac functions
4. Pulmonary functions
5. Renal functions
6. The actions of various hormones
7. Functions of Central nervous system and special senses

Unit -I
General physiology and Blood
General Physiology
- Organization of the cell and its function, homeostasis
- Transport across cell membrane
- Membrane Potentials - Resting Membrane Potential & Action Potential
- Body Fluid Compartments - Normal Values

Blood
- Introduction: composition and function of blood.
- Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation.
- Structure, function, concentration, physiological variation, methods of estimation of haemoglobin.
- White blood cells: production, function, count.
- Platelets: origin, normal count, morphology & functions.
- Plasma proteins: types, functions
- Haemostasis: definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting - Blood groups: ABO system, Rh system. Blood grouping & typing, cross matching. Rh system: Rh factor, Rh incompatibility. Blood transfusion: indication. transfusion reactions.

- Anticoagulants: classification, examples and uses.

Anaemias: morphological and etiological classification, -Blood indices: CI, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume, normal values.

Digestive System

- Physiological anatomy of gastro intestinal tract, functions of digestive system.

Respiratory system

- Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles.

Cardiovascular system

- Heart: Physiological Anatomy, Nerve supply.
- Properties of cardiac muscle, cardiac cycle:
- Conducting System of Heart, Origin and Spread of Cardiac Impulse
- Electrocardiogram (ECG) waves and normal duration. Recording
- Cardiac Cycle: Phases and Volume Changes
- Normal heart sounds, areas of auscultation. Pulse: jugular, radial pulse,
- Cardiac output : definitions of stroke volume, cardiac index, factors Affecting It. measurement of Cardiac output.
- General principles of circulation
- Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension. Factors affecting it and regulation

Muscle nerve physiology, Nervous system and Special senses

Muscle nerve physiology

- Classification and properties of neuron and neuroglia. Classification of nerve fibers
- Classification of muscle, structure of skeletal muscle,
- Neuromuscular junction. Transmission across nmj
- Excitation contraction coupling. muscle tone, fatigue, rigor mortis

Practicals

1. Haemoglobinometry.
2. Haemocytometry
3. Total leucocyte count.
4. Total Red blood cell count.
5. Determination of blood groups.
6. Differential WBC count.
7. Determination of clotting time, bleeding time.
8. Erythrocyte sedimentation rate (ESR). Determination of packed cell Volume, Calculation of Blood indices: CI, MCH, MCV, MCHC.
9. Blood pressure recording.
10. Spirometery, Artificial Respiration

Recommended Books Recent Editions

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy, Arya Publication.
2. Dr.Venkatesh. D and Dr.Sudhakar H. S. Basic of Medical Physiology, Wolter-Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology. New Central Book.

Basic Biochemistry

Unit I

Chemistry of Cell & Chemistry of Carbohydrates, Proteins, Lipids &Nucleotides-

Cell- Structure & Function of Cell Membrane, Subcellular Organelles and their Functions.

Carbohydrates- Definition, Classification & Biological importance of carbohydrates, Derivatives of Monosaccharides.
Proteins- Definition & Classification of amino acids & Proteins, Biologically important peptides Plasma proteins, Immunoglobulins.
Lipids- Definition, Classification & Biological importance and Functions of Lipids.
Structure and functions of Cholesterol, types and functions of Lipoproteins.
Nucleotides- Structure and Functions of DNA & RNA. Biologically important nucleotides.

Unit II

Enzymes & Acid base balance

Enzymes- Definition and Classification. Factors affecting enzyme activity. Coenzymes and Cofactors. Enzyme inhibition & Regulation of enzyme activity
Acid Base balance- Acids, Bases & Body Buffers, Regulation of pH, Acid base disorders.

Unit III

Vitamins & Minerals

Vitamins-Classification, Sources, RDA, Functions(in brief), deficiency manifestations and hypervitaminosis.
Minerals- Classification, Sources, RDA, Functions (in Brief), deficiency manifestations of the following: calcium, phosphorous, iron, copper, iodine, zinc, fluoride, magnesium, selenium, sodium, potassium and chloride.

Unit IV

Nutrition, Blood chemistry & Urine Chemistry

Nutrition- Nutrients, Calorific value of food, BMR, SDA, respiratory quotient and its applications, Balanced diet based on age, sex and activity, biological value of proteins,
nitrogen balance, Protein energy malnutrition, Total parenteral nutrition, dietary fibers.
Blood chemistry- Biochemical components & their reference ranges in normal & diseased states.
Urine chemistry- Biochemical components & their reference ranges in normal & diseased states
23.

Unit V

Clinical Biochemistry-

Specimen Collection- Blood, Urine and Body fluids.
Preanalytical, analytical and postanalytical errors
Clinical Biochemistry- Parameters to diagnose Diabetes & Cardiovascular diseases.
Diagnostic enzymology, Assessment of arterial Blood gas status and electrolyte balance,
Point of Care Testing. Renal Function tests(in brief), Liver function tests(in brief),
Biomedical Waste Management.

Practicals

1. General Reactions of Carbohydrates.
2. Color reactions of Proteins.
3. Reactions of Non Protein nitrogenous substances.
4. Demonstration of pH meter, Colorimeter and spectrophotometer.
5. Demonstration of Chromatography and Electrophoresis.

Applied Pathology (50 hours Theory,20 hours practical)

UNIT I

* Atherosclerosis-definition, risk factors, pathogenesis, morphology and complications
* Ischemic heart disease: Myocardial infarction- definition, pathogenesis, morphology and complications
* Hypertension- Benign and malignant hypertension: pathogenesis, pathology and Complications.

UNIT II

* Heart failure-Right and left heart failure: causes, pathophysiology and morphology
* Rheumatic heart disease and infectious endocarditis- definition, etiopathogenesis, morphology and complications
* Congenital heart disease- Types and atrial septal defect; aneurysms- types and morphology; cardiomyopathies in brief

UNIT III

* Atelectasis - types, Adult respiratory distress syndrome - causes , pathogenesis and morphology; pulmonary edema- classification, causes and morphology
* Chronic obstructive pulmonary disease- Chronic bronchitis, emphysema, asthma, bronchiectasis: Definition, etiopathogenesis and morphology
* Restrictive pulmonary diseases- Definition, categories, pathogenesis and morphology.

UNIT IV

* Pneumoconiosis-types, asbestosis, coal workers pneumoconiosisetiopathogenesis and morphology
* Pulmonary embolism, infarction, pulmonary hypertension-Definition, etiopathogenesis and morphology
* Pneumonia-Classification of pneumonias; Lobar pneumonia and bronchopneumonia - etiology, pathology and complications

UNIT V

* Clinical manifestations of renal diseases
* Glomerular lesions in systemic diseases- diabetes, amyloidosis and systemic lupus erythematosus
* Pericardial and pleural effusions- causes and microscopy

Practicals:

1. Urine examination: physical, chemical, microscopy
2. Blood grouping & Rh typing
3. Hemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR).
4. Charts
5. Specimens.

* Atherosclerosis
* Pneumonia
* Tuberculosis
* Infarct - lung
* Contracted kidney
* Hydronephrosis

Reference Books (latest edition).

1 Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
2 Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
3 Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai.
4 Text Book of Medical Laboratory Technology RamanikSood
5 Practical Haematology Sir John Dacie Churchill Livingstone, Lond
6 Hand-Book of Medical Laboratory Technology CMC Vellore
7 Basic Haematological Techniques Manipal Manual

Microbiology (50 hours Theory,20 hours practical)

Unit - I

General Microbiology

1. Morphology and classification of microorganisms.

2. Growth, nutrition and multiplication of bacteria
3. Sterilization and Disinfection - Principles and use of equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants.
4. Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule.
5. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.

Unit - II

Bacteriology Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteriumdiphtheriae, Clostridia, Enterobacteriaceae - Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes.

Unit III

Mycobacteriology & Parasitology Mycobacteria- classification, pathogenesis, lab diagnosis and prevention.

Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

Unit IV

Mycology

Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium).

Unit V

Virology

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.

Unit VI

Sterilization and disinfection

- Sterilization and disinfection - classification, principle, methods
- Central sterile supply department.
- Disinfection of instruments used in patient care
- Disinfection of patient care unit
- Infection control measures for ICUs

Unit VII

Health care associated infections

- Surgical site infections
- Urinary tract infections
- Ventilator associated pneumonia
- Catheter associated blood stream infections
- Antibiotic associated diarrhea

Practicals:

1. Compound microscope and its application in microbiology.
2. Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, Mac conkey medium, L J media, Robertson cooked meat media, MacConkey agar with LF & NLF, Nutrient agar with staph colonies.Anaerobic culture, Methods and Antibiotic susceptibility test.
3. Demonstration of common serological tests: Widal, VDRL, ASLO, CRP, RF, Rapid tests for HIV, Hbsag and HCV.
4. Grams staining.
5. Acid fast staining.

6. Principles and practice of Biomedical waste management.
7. Stool Microscopy.
8. Disinfection of wards, operation theatres and laboratoryand air sampling methods

Recommended Books Recent Editions.

1. Anathanarayana&Panikar: Medical Microbiology ,University Press.
2. Parasitology by Chatterjee - Interpretation to Clinical Medicine.
3. Textbook of Microbiology - Baveja, Arya Publications
4. Textbook for Laboratory technicians by RamnikSood. Jaypee Publishers

Pharmacology(50 hours theory,20 hours practical)

Unit I

General Pharmacology, ANS, PNS

Sources of Drugs
Route of drug administration
Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion)
Pharmacodynamics (Mechanisms of action)
Adverse drug reactions
ANS : ADRENERGIC Drugs - Adrenaline, Noradrenaline, Ephidrine, Dopamine, Dobutamine.
Anti adrenergic - Phentolamine, Phenoxybenzamine, Prazocin, Tamsulosin, Propranolol, Atenolol, Carvidelol.
Cholinergic drugs-Acetyl choline, Pilocarpine, Neostigmine, Organophosphorous compounds
Anti cholinergicagents-Atropine, Glycopyrrolate, Ipratropium Bromide, Dicyclomine.

Unit II

PNS, CVS, Renal System

Skeletal muscle relaxants - D Tubocurarine, Succinyl choline, Diazepam, Dantroline Local anaesthetics - lignocaine, la + vasoconstrictor CVS - ionotropic agents - Digoxin, Antianginal drugs - GTN, Antihypertensives - Betablockers (Propranolol, Atenolol, carvidelol), CCBs (Nifedeine), Diuretics (Thiazide, Furesemide, ace inhibitors, ARBs, Clonidine Drugs used in treatment of different types of shock, Plasma expanders Renal system - Diuretics Furosemide, Thiazide, Spiranolactone Antidiuretics – Vasopressin.

Unit III

CNS, Blood

CNS - general Anaesthetics - nitrous oxide, Halothane, iv anaesthetics Sedative hypnotics - diazepam, barbiturates, zolpidem.
Antiepileptics - Phenytoin, carbamezapine, phenobarbitone, valproate Opioid analgesics - morphine, pethidine, codeine.
NSAIDS - Aspirin, Diclofenacibuprofen, Selective COX2 inhibitors Respiratory system-treatment of cough And Bronchial asthma.
Blood - Hematinics, Anticoagulants - Warfarin, Heparin Thrombolytics& Antiplatelet drugs - streptokinase,/ aspirin, clopidogrel.

Unit IV

GIT, Chemotherapy

GIT - drugs used in peptic ulcer - ppi, H2 blockers, Antacids Antiemetics - Metaclopromide, Domperidone, Ondensetron Purgatives & Laxatives-bran, ispaghula, Lactulose, Bisacodyl&senna
Drugs used in Diarrhoea- ORS, Super ORS, Antimotility drugs (loperamide, diphenoxylate)
Chemotherapy - general considerations MOA, Resistance, Prophylaxis Sulfonamides, trimoxazoles, Quinolones Tetracyclines, chloramphenicol Betalactam antibiotics.

Unit V

Chemotherapy, Hormones.

Aminoglycosides
Macrolides, other antibiotics (vancomycin, linezolid) & treatment of UTI

Antifungal (clotrimazole, flucanozole)
Antiviral (Acyclovir, Few drugs used in HAART,)
Cancer chemotherapy
(names, common Adverse effects, general principles in the treatment of cancer)
Hormones - Corticosteroids its uses and adverse effects,
Treatment of Diabetes mellitus(insulin, Metformin, Glibenclamide)

PracticalsSyllabus :

Dosage forms
Solid Dosage forms
Liquid Dosage forms
Gaseous Dosage forms
Oral route
Parentral routes
Novel routes
Fixed dose combination - Amoxycillin + clavulinic acid - cotrimoxazole, Lignocaine + Adrenaline
Drug stations - Adrenaline, dopamine, Dobutamine)
Drug stations - Corticosteroids (hydrocortisone, prednisalone, inhaltional steroids)
Drug stations - common antibiotics (amoxycillin, ciprofloxacin, Azithromycin, Metronidazole, Cephalosporins)
Drug stations - Insulin preparations
Instrument & devices (Nasogastric tube, laryngoscope, Different Cathetors, nebulizers, Inhalers, Rotahalers)

Recommended Books Recent Editions.

1. K.D. Tripathi, Essentials of Medical Pharmacology.
2. PadmajaUdaykumar -Pharmacology for Allied Sciences.
3. R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and Pharmacotherapeutics.

Introduction to Perfusion Technology(40hours Theory,30hours Practical)

UNIT I

History and evolution of Cardiac Surgery & Cardiopulmonary Bypass.

Dr John Gibbons Heart Lung Machine
* Cross circulation (Gross Well) technique
* Hypothermic Cardiac Surgery
* Advent of Cardiopulmonary Bypass

UNIT II

Basic Principles of:

* Extracorporeal Circulation
* Extracorporeal gas exchange
  Biocompatible Materials used in Perfusion
  Aseptic techniques and Sterility in perfusion.

UNIT III

Basics of diagnostic techniques

* Chest X-ray
* ECG
* Echo
* Coronary Angiography
* Nuclear Cardiology
* Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile,
  Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes

UNIT IV

Basic components used in CPB Heart
lung machine,
Oxygenator,
Heater cooler unit
Blood cardioplegia device
ACT Machine
Basics of general Anaesthesia.
Types of anaesthesia - general anaesthesia, regional anaesthesia ,local anaesthesia Drugs in anaesthesia- Propofol, Thiopentone, Keatamine, Etomidate, Muscle relaxants- Vercuronium, Pancuronium, Atracurium Benzodiazepine- Midazolam, Diazepam, Inhalations agents - Halothane, Sevoflurane, Isoflurane.

UNIT V

Basics of monitoring
Setting up of ECG machine
Pressure transducer
Syringe and peristaltic pumps
Anaesthesia Monitors
Pulse oximeters
Temperature probes and Thermoregulatory monitoring
Defibrillators
Fibrillators
ACT (Activated Clotting Time)

Practical syllabus
1 Chest X-ray
2 ECG
3 Echo
4 Coronary Angiography
5 Nuclear Cardiology, ACT Machine
6 Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile.
Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes, Heart lung machine
Oxygenator
Heater cooler unit
Blood cardioplegia device
ACT Machine
Setting up of ECG machine
Pressure transducer
Syringe and peristaltic pumps
Anaesthesia Monitors
Pulse oximeters
Temperature probes and Thermoregulatory monitoring
Defibrillators
Fibrillators
ACT Activated Clotting Time

Medical Ethics

General considerations of Medical Ethics
1. Medical Ethics - Introduction
2. Three cor contents in Medical Ethics - Best interest, autonomy unrights
3. Doctors, patient & Profession

Special considerations of Medical Ethics
1. Consent

2. Confidentiality
3. Genetics
4. Reproductive Medicine
5. Mental Health
6. End of life and organ transporentation
7. Research & clinical Trials

PATIENT CARE AND BASIC NURSING (20 hours Theory and 30 hours Practical)

Objectives:

To learn about patient care and basics of nursing activities, communication and documentation, infection control, medication administration and wound care.

Unit I -

Introduction, Communication and Documentation - 12 hours

1. Introduction to Patient Care:

a) Principles of patient care
b) Types of patients (gender, age, diseases, severity of illness, triage)

2. Communication & Documentation:

a) Communication with doctors, colleagues and other staffs.
b) Non-verbal communication, Inter-personnel relationships.
c) patient contact techniques, communication with patients and their relatives

3. Documentation:

a. Importance of documentation,
b. initial and follow up notes;
c. documentation of therapy, procedures and communication

Unit II -

Universal Precautions and Infection Control - 10 hours

4. Universal Precautions and Infection Control:

a) Hand washing and hygiene.
b) Injuries and Personal protection, Insulation and safety procedures.
c) Aseptic techniques, sterilization and disinfection.
d) Disinfection and Sterilization of devices and equipment
e) Central sterilization and supply department
f) Biomedical Medical waste management

Unit III -

Medication Administration and Transport of patient - 14 hours

5. Medication Administration:

a) Oral / Parenteral route
b) Parenteral medication administration: Intra venous, intra muscular, subcutaneous, intra dermal routes, Intra venous Infusion
c) Aerosol medication administration, Oxygen therapy
d) Intravenous fluids,
e) Blood and blood component transfusion

6. Position and Transport of patient:

a) Patient position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bed making, rest and sleep.56
b) Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheel chair, transferring from bed to stretcher.
c) Transport of ill patients (inotropes, intubated / ventilated patients)

Unit IV -

Bedside care and monitoring

7. Bedside care:

a) Methods of giving nourishment: feeding, tube feeding, drips, transfusion.
b) Recording of pulse, blood pressure, respiration, saturation and temperature.
c) Bed side management: giving and taking bed pan, urine container.
d) Observation of stools, urine, sputum, drains
e) Use and care of catheters and rubber goods.
f) Care of immobile/bed ridden patients, bed sore and aspiration prevention

8. Monitoring of Patient:

a) Pulse, ECG (Cardiac Monitor), Oxygen Saturation, Blood Pressure, Respiration.
b) Multi parameter monitors, Capnography and End Tidal CO2 (ETCO2)
c) Hydration, intake and output monitoring
d) Monitoring ventilator parameters: Respiratory Rate, Volumes, Pressures, Compliance, Resistance

Unit IV -

Wound care and first aid

9. Dressing and wound care:

a) Bandaging: basic turns, bandaging extremities, triangular bandages and their application.
b) Surgical dressing: observation of dressing procedures.
c) Suture materials and suturing techniques
d) Splinting
e) Basic care of patient with burns

10. First Aid and Basic Life Support (BLS)

Practical:

1. Demonstration of Patient care Procedures:
   a) Positioning of patient, transport of the patient, Dressing and Bandaging, Care of inter costal drain tube, Insertion of naso-gastric tube and feeding
   b) Phlebotomy and obtaining blood samples, Arterial Blood sampling for ABG
   c) Injections: intra muscular, intra venous, sub cutaneous, intra dermal
   d) Insertion of intra venous catheter and infusion of medications, blood transfusion
   e) Recording of ECG and monitoring of patient
   f) Oxygen therapy: oxygen cannula, masks. Aerosol therapy: nebulization, inhalers.
   g) Suctioning and care of artificial airway
   h) Insertion of urinary bladder catheter
2. Uses, principles, advantages and disadvantages of instruments and Devices in patient care
3. First aid and Basic Life Support (BLS)

Practical Exam Pattern:

Spotters, Drugs, Instruments and devices - identification and usage, demonstration of patient care procedures.

Reference Books:

1. Principles and practice of Nursing - Sr Nancy
2. Introduction to Critical Care Nursing - Mary Lou Sole
3. First Aid - Redcross society guidelines
4. Basic Life Support (BLS) - American Heart Association guidelines

Basics of Medical Disorders (50 hours Theory,20 hours Practical)

Objective:

To learn about basic concepts of common medical disorders and its therapeutic options.

Unit I -

Cardiac and Respiratory diseases

1. Cardio vascular diseases
   a. Hypertension, Ischemic heart diseases, Myocardial Infarction,

arrhythmias
b. Heart failure, shock - types, causes
2. Respiratory diseases
a. Pneumonia, tuberculosis,
b. Chronic obstructive pulmonary disease, asthma
c. Pleural effusion, pneumothorax
d. Interstitial lung disease

Unit II -

Neurological, Renal, GI and infectious diseases

3.Neurological diseases
a. Polio myelitis, Gullian Barre Syndrome, Myasthenia Gravis, epilepsy /seizure disorder, cerebro vascular accident / stroke
4. Renal Diseases
a. Acute kidney injury
b. Chronic Kidney Disease
5. Gastro intestinal and Liver Diseases
a. Gastritis / APD, peptic ulcer
b. Acute gastroenteritis
c. Hepatitis, Hepatic failure, alcoholic liver disease
6. Infectious diseases: Dengue, malaria, leptospirosis

UnitIII -

Blood, fluid, electrolyte and acid base abnormalities

7. Blood loss and Anemia, thrombocytopenia
8. Fluid Electrolyte imbalance and corrective methods
9. Acid Base abnormalities and corrective methods

UnitIV -

Pulmonary Oedema, Sepsis and MODS

10. Pulmonary Oedema, Acute Lung Injury and Acute Respiratory Distress Syndrome
11. Sepsis, multi-organ failure, Multi-organ dysfunction syndrome

Unit V -

Health problems in Specific conditions and Toxicology

12. Health problems in specific conditions
a. Pregnancy - antenatal care, disorders in pregnancy
b. Children and new born
c. Obesity
d. Diabetes mellitus
e. HIV infections and AIDS
f. Elderly subjects and disability
g. Brief mention about endocrine disorders
13. Poisoning and drug over dosing
a. Classification of poisons
b. Principles of treatment of poisoning and Primary care
c. Poisons and drug over dosing requiring ventilation
14. Miscellaneous
a. Drowning
b. Hanging

Practical:

1. History Taking and clinical examination, monitoring of patient.
2. Therapeutic options for various diseases and conditions

Biostatistics and Research Methodology (20 hours Theory and 20 hours Practical)

Unit I.

Introduction and Presentation of data

Meaning , Branches of Statistics, Uses of statistics in medicine, Basic concepts, Scales of measurement, Collection of data, Presentation of data; Tabulation, Frequency Distribution, Diagrammatic and Graphical Representation of Data.

Unit II.

Measures of central tendency and Measures of Variation Arithmetic Mean (Mean), Median, Mode, Partition values, Range, Interquartile range , Mean Deviation, Standard Deviation, Coefficient of Variation.

Unit III.

Probability and standard distributions

Definition of some terms commonly encountered in probability, Probability distributions; Binomial distribution, Poisson distribution, Normal distribution, Divergence from normality; Skewness and kurtosis.

Unit IV.

Census and Sampling Methods

Census and sample survey, Common terms used in sampling theory, Non-probability (Non random) Sampling Methods; Convenience sampling, Consecutive Sampling, Quota sampling, Snowball sampling, Judgmental sampling or Purposive sampling, Volunteer sampling, Probability (Random) Sampling methods; Simple random sampling, Systematic Sampling, Stratified Sampling, Cluster sampling, Multi-stage sampling, Sampling error, Non-sampling error.

Unit V.

Inferential statistics

Parameter and statistic, Estimation of parameters; Point estimation, Interval Estimation, Testing of hypothesis; Null and alternative hypotheses, Type-I and Type-II Errors. 63.

Research Methodology

Unit I -

Introduction to research methodology Types of research; Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs.

Qualitative, Conceptual vs. Empirical, Some other types of Research

Unit II -

Study Designs-Observational Studies, Epidemiological study designs; Observational studies, ,Descriptive studies; Case reports, Case series, Analytical studies; Case control studies, Cohort studies, Cross sectional

Unit III Experimental Studies

Experimental studies (Intervention studies); Randomized control trials (Clinical trials), Field trials, Community trials.

Unit IV

Uses of Epidemiology

Unit V

Applicationof study Designs in Medical Research

Recommended Books

1. K.R.Sundaram, S.N.Dwivedi and V Sreenivas (2010): Medical statistics, principles and methods, BI Publications Pvt Ltd, New Delhi.

2. NSN Rao and NS Murthy (2008): Applied Statistics in Health Sciences, Second Edition, Jaypee Brothers Medical Publishers (P) Ltd.
3. J.V.Dixit and L.B.Suryavanshi (1996): Principles and practice of biostatistics, First Edition, M/S BanarsidasBhanot Publishers.

Conduct of Cardiopulmonary Bypass, Priming Solutions and Cannulation Techniques (60 hours Theory,20 hours Practical)

UNIT I

Cardiopulmonary Bypass Circuitry

* Adult circuit
* Paediatric circuit
* Neonatal circuit

UNIT II

Cannulation Techniques

* Arterial cannulation- Aortic, femoral, iliac
* Venous cannulation- SVC, IVC, RA, femoral vein
* Cardioplegia cannulation- Antegrade, Retrograde, Osteal

UNIT III

Priming solutions and Haemodilution in CPB

Crystalloids
Ringer lactate
Normal saline
Plasmalyte A
Dextrose
Colloids - Hetastarch
Albumin
FFP
Additional drugs used in them - Mannitol, Heparin, Bicarbonate

UNIT IV

Conduct of CPB Chart
Review and selection of Equipments
Assembling the circuit:
Priming and Setting occlusion
Initiation of CPB and Gas management.
Venting of the Heart and Cardiotomy Suction
Pre-CPB checklist
Pre weaning off bypass checklist
Cardioplegia dosage and management
ABG and ACT management
Adequacy of Perfusion
Weaning From CPB
66

UNIT V

Renal System - Presentation, Diagnosis and Management

ARF Acute renal failure
CRF Chronic renal failure
Why and when do we do Haemodialysis
Types of Dialysis
CNS Aetiology, presentation and diagnosis of
Hemiplegia
Paraplegia
Stroke
Cerebral haemorrhage

Practical syllabus

1 Adult circuit
2 Paediatric circuit
3 Neonatal circuit
4 Arterial cannulation- Aortic, femoral, iliac
5 Venous cannulation- SVC, IVC, RA, femoral vein
6 Cardioplegia cannulation- Antegrade, Retrograde, Osteal
7 Assembling the circuit:
8 Priming and Setting occlusion
9 Initiation of CPB and Gas management.
10 Venting of the Heart and Cardiotomy Suction
11 Cardioplegia dosage and management
12 ABG and ACT management
13 Adequacy of Perfusion
Pre-CPB checklist
Pre weaning off bypass checklist

Myocardial Protection and Various Ddrugs used in CPB (60 hours Theory and 40 hours Practical)

UNIT I

Myocardial protection

a) Crystalloid Cardioplegia - St Thomas solution, Del Nido solution, Custodiol HTK solution - Histidine-Tryptophan-Ketoglutarate

b) Blood cardioplegia delivery Devices- MPS myocardial protection system, Cardioplegia reservoir.

UNIT II

Drugs used in CPB:
Vasodilators- Sodium Nitroprusside, Nitrogycerine,
Vasoconstrictors- Phenylephrine,
Anti Arrhythmics- Amiodarone, Magnesium, Lignocaine
Diuretic- Frusemide, Mannitol
Anticoagulants- Heparin, Low molecular Weight heparin, DabagantrinArgatroban
Protamine
Steroids- Dexamethasone

UNIT III

a) Coagulation management during CPB and its reversal
- Heparin Pharmacology
- Heparin Dosing And Monitoring
- Heparin Resistance
- Alternatives To Unfractionated Heparin
- Heparin-Induced Thrombocytopenia
- Protamine Pharmacology
- Protamine reaction

b) Temperature management during CPB
- Temperature monitoring sites
- Types of hypothermia
- Temperature gradient

UNIT IV

Inhalation agents-

Sevoflurane, Isoflurane Analgesics- Fentanyl, Morphine Sedatives- Midazolam, Thiopentone
Antiplatelets- Aspirin, Clopidogrel, Ticlopidine, Prasugrel 68.

UNIT V

Sodium Bicarbonate
Potassium Chloride
Heparin and its alternatives
Inotropes-
Adrenaline,
Noradrenaline,
Dopamine,
Dobutamine,
Milrinone
Vasopressin
Levosimendan

Practical syllabus
St Thomas solution,
Del Nido solution,
Custodiol HTK solution -Histidine-Tryptophan-Ketoglutarate
MPS myocardial protection system,
Cardioplegia reservoir
Vasodilators- Sodium Nitroprusside, Nitroglycerine,
Vasoconstrictors- Phenylephrine,
Anti Arrhythmics- Amiodarone, Magnesium, Lignocaine
Diuretic- Frusemide, Mannitol
Anticoagulants- Heparin, Low molecular Weight heparin
Protamine
Steroids- Dexamethasone
Sodium Bicarbonate
Potassium Chloride
Heparin and its alternatives- Bivalirudin, Argatroban,
Adrenaline,
Noradrenaline,
Dopamine,
Dobutamine,
Milrinone
Vasopressin
Levosimendan

Cardiac, Thoracic and Vascular Surgical Disorders
(60 hours Theory and 100 hours Clinical Posting)

UNIT I

IHD (Ischaemic Heart Disease)
ACS - angina types - typical, atypical
STEMI
NSTEMI
MI
Cardiomyopathy-Types, presentation, diagnosis and management of
Presentation, Diagnosis and Management of
Left ventricular failure
Right ventricular failure

UNIT II

Rheumatic Heart Disease-

Causes, presentation, diagnosis and management of
Mitral stenosis
Mitral regurgitation
Aortic regurgitation
Aortic stenosis
Tricuspid regurgitation
Tricuspid stenosis

UNIT III

Congenital Heart Disease,
presentation, diagnosis and management of
Atrial septal defect
VSD
PDA
TOF
TGA
TAPVC
Coarctation of aorta

UNIT IV

Vascular Diseases-
Classification, presentation, diagnosis and management of Aneurysms and dissections
Ascending aorta
Arch of aorta
Descending thoracic aorta
70

UNIT V

Respiratory System
Presentation, Diagnosis and Management
Chronic obstructive airway diseases
Bronchial asthma
Pneumonia
HN_{11}
Pneumothorax
Haemothorax
Basics of PFT and its interpretation

Practicals syllabus

Case scenarios of adult heart disease, congenital heart disease and thoracic vascular disease and lung diseases mentioned in the above units

Recommended Books (Recent Edition)

1 Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)
2 Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
3 Cardiopulmonary Bypass Cambridge University- SunitGhosh , Florian Falter, Davis J.Cook (Editors)
4 Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte

Effects on Various Organs During CPB and Introduction to IABP and ECMO (30 hours Theory and 20 hours Practical)

UNIT I

Effect of CPB
Effect of CPB on CNS
Effect of CPB on Respiratory System
Effect of CPB on Renal system
Effect of CPB on Hepatic system
UNIT II
Effect of CPB on Immune system
Effect of CPB on Endocrine system
Systemic Inflammatory Response Syndrome
Heparin Resistance
Heparin Induced Thrombocytopenia
Protamine Reactions

UNIT III
Introduction to IABP
Parts of IABP machine
Parts of IABP balloon
Insertion sites
Different IABP sizes
Indications, steps of insertion and removal, complications and contraindications

UNIT IV
Introduction to ECMO
Components of ECMO circuits
Indications and contraindications to ECMO
Types of ECMO

UNIT V
Safety devices in CPB
Level detector
Bubble detector
Pressure sensor
Pump slave
Hand cranks
Pulsatile Perfusion

Practical syllabus
Level detector
Bubble detector
Pressure sensor
Pump slave
Hand cranks
Pulsatile Perfusion
Introduction to IABP
Indications, steps of insertion and removal, complications and contraindications

Special Situations in Perfusion Technology (Theory-40,Practical-30)

UNIT I
CPB CHECK LIST
Prebypass check list
Initiation of CPB
Maintenance of CPB

Weaning of CPB

UNIT II
CPB special conditions
Foetal circulation
CPB in pregnancy
Reperfusion injury

UNIT III
CPB in Infants & Children
Selection of circuit
Selection of cannulae
Blood prime

UNIT IV
Management of CPB in Cyanotic patients
Blood Gas Management
ABG
VBG
calculation of circulating haematocrit
Various priming options

UNIT V
Hemo-concentration
* Conventional ultrafiltration CUF
* Modified Ultra filtration MUF

Practical Syllabus
Assembling of CPB circuit
Initiation of CPB
Maintenance of CPB
* Weaning of CPB Conventional ultrafiltration CUF
* Modified Ultra filtration MUF

Cardiac Support Devices, DHCA and Blood Conservation Techniques (Theory-40hours,Practical-20 hours)

UNIT I
Intra Aortic Balloon Pump (IABP) in detail
Indications, and contraindications
Setting up of IABP
Steps of insertion
Steps of removal
Identification and Management of complications

UNIT II 12hrs
Cardiac Support Devices
Extra Corporeal Life Support (ECMO / ECLS)
Ventricular Assist Devices (LVAD / RVAD)
Artificial Heart

UNIT III 12hrs

Blood conservation techniques in Cardiac Surgery
Preoperative
Peri Operative
Post Operative
Cell Saver

UNIT IV
Deep Hypothermic Circulatory Arrest (DHCA)
Steps Taken Before Going On DHCA
Antegrade& Retrograde Cerebral Perfusion
Alpha stat management
Ph stat management
Non hypothermic cardiac surgeries

UNIT V
Minimal Invasive Cardiac Surgeries
CPB for Minimal Invasive Cardiac Surgeries
CPB for Non Cardiac Surgeries
Recent advances in Perfusion

Practical Syllabus

Intra Aortic Balloon Pump (IABP) in detail
Deep Hypothermic Circulatory Arrest (DHCA)
Antegrade& Retrograde Cerebral Perfusion

Recommended Books

1 Cardiopulmonary Bypass Principles and practice Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor)
2 Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
3 Cardiopulmonary Bypass Cambridge University- SunitGhosh , Florian Falter, Davis J.Cook (Editors)
4 Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP,FPP (editor)
5 ECMO, Extracorporeal cardiopulmonary Support in Critical Car, Red Book, Gail M.Annich (author) Publisher: Extracorporeal Life Support Organization.

Hospital Management (Theory-20 hours)

1. **Quality Concepts:** Definition of Quality, Dimensions of Quality, Basic concepts of Total Quality Management, Quality Awards. Accreditations for hospitals:
   Understanding the process of getting started on the road to accreditation, National and International Accreditation bodies, overview of standards- ISO (9000 & 14000 environmental standards), NABH, NABL, JCI, JACHO.

2. **Hospital Information System:** Hospital Information System Management andsoftware applications in registration, billing, investigations, reporting, wardmanagement and bed distribution, medical records management, materialsmanagement and inventory control, pharmacy management, dietary services,management, information processing. Security and ethical challenges.

3. **Inventory Control:** Concept, various costs of inventory, Inventory techniques- ABC, SDE / VED Analysis, EOQ models. Storage: Importance and functions ofstorage. Location and layout of stores. Management of receipts and issue of materialsfrom stores, Warehousing costs, Stock verification.

4. **Equipment Operations management:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS,outsourcing of maintenance services, quality and reliability, concept of failure,equipment history and documents, replacement policy, calibration tests, spare parts stocking techniques and polices.

5. **Biomedical Waste Management:** Meaning, Categories of Biomedical Wastes, Colour code practices, Segregation, Treatment of biomedical waste-Incineration and its importance. Standards for waste autoclaving, microwaving. Packaging,Transportation & Disposal of biomedical wastes.