

DIPLOMA IN PERFUSION TECHNOLOGY

SYLLABUS

Preliminary Course

1) ANATOMY:

Heart, Blood vessels, Lungs, Kidney, Nervous system, Digestive system, Liver, Spleen, Endocrine system and congenital lesions.

2) PHYSIOLOGY

Heart and circulation, Conducting system within the heart, Control of cardiac functions, Cardiac output, Cardiac cycle, Heart block.

Basic review of cardiovascular system, Basic respiratory physiology, Basic fundamentals of Nervous system, Muscle physiology, Renal, Fluid and electrolyte, Blood and immunological system.

Details coverage of:

Blood, Blood flow, Blood gases and acid base balance, Oxygen and carbon dioxide transport, Electrolytes, Hypothermia, Cardiac haemodynamics, including congenital abnormalities, Basic ECG patterns, Microcirculation, Physiology and Pathophysiology of coagulation, Physiology of Haemodilution and plasma proteins.

3) PATHOLOGY

Blood vessels (atherosclerosis, medial necrosis), Heart (aneurismal changes, valvular lesions), Common congenital cardiac malformations requiring surgery, Common acquired heart disease, Ischemic heart diseases, Blood (results of exposure to foreign surfaces), Lungs (ARDS), Kidney (ischemia, acute tubular necrosis), Nervous system (results of embolism, ischaemia)

4) PHARMACOLOGY

Basic facts and pharmacological actions of drugs used in the cardiac operating room during perfusion:

Inotropes, Vasoactive agents, Anti-arrhythmic agents, Diuretics, Steroids, Antibiotics, Anaesthetic agents, Cardioplegia, Muscle relaxants, Beta blockers, Calcium antagonists, Anticoagulants, Antiplatelet drugs, Anti-hypertensives.

Detailed review of drugs, commonly added to the pump/oxygenator by the perfusionist and /or anaesthetist.

Mannitol, Sodium bicarbonate, Cardioplegic solutions, Potassium, magnesium and calcium ions, Heparin, Blood and blood products, Crystalloid and colloid solutions, Vaso-active drugs and Anaesthetic vapour agents.

5) BASIC PHYSICS AND CHEMISTRY

Gas laws, Solubility of gases, volume, pressure, flow, Mass, Density, Viscosity, Heat units, Temperature scales, Heat transfer, Diffusion/osmosis, Molarity, Concentrations.

6) BIOMEDICAL ELECTRONICS

Basic Electricity, Electronics, Principles of Electrical safety, Principles of recording biological signals, Principles of cardiac pacing and defibrillation.

7) INTRODUCTION TO PERFUSION TECHNOLOGY

History and principles of operation of oxygenators, Design and efficiency of heat exchangers, oxygenators, roller pumps. Biocompatibility of equipment and techniques, Sterilization techniques of equipment, Technical aspects of ultrafiltration.

SYLLABUS

Final Course

1) INSTRUMENTATION AND MEASUREMENT

Know the various methods and instruments for measuring the following parameters:

Temperature, cardiac output, Gas flow/concentrations, Physiological pressures, ECG, EEG, End-expired Co₂, Blood gases, Oxygen saturation, Electrolytes, Haemoglobin/Haematocrit, Activated coagulation.

Know methods to test equipment for accuracy.

- General information on artifact and distortion of physiological parameters and how they avoided.
- Quality controls.

2) DETAILS OF PERFUSION TECHNIQUES

Adult perfusion, Paediatric perfusion, Assessment of patient (via history) before bypass, Assessment of patient post bypass, Calculation of prime components, Selection of cannulae, Assembly of equipment, Priming of oxygenator, Going on and coming off bypass, Adverse effects of CPB

Monitoring and control of:

Flow/pressure, Haemodilution, Haemodynamic aspect of total Heart Lung Bypass, Metabolic aspects of total Heart Lung Bypass, Acid/base balance, Oxygen and carbon dioxide exchange, Patient core temperature, Anticoagulation, Hypothermia, Total circulatory arrest, Pressure, Flow, Resistance, Adequacy of perfusion, Myocardial preservation. Management of complications and disasters, Auto transfusion, Recording of bypass data, Check lists, Safety of perfusion, Power and equipment failures, Preventive maintenance.

3) PERFUSION EQUIPMENTS

Hardware: Heart-Lung machines/Centrifugal pumps, Pressure and low level alarm devices, Heart-lung heater/coolers, Mechanical/Electronic Flowmeters, Blenders, Temperature monitors, computerized perfusion data systems, Oxygen analysers, Cell savers, Intra-aortic ballon pumps.

Disposable: Various types of Membrane and bubble oxygenators, Reservoirs, Arterial filters, Pre-bypass filters, Arterial, Venous cannulae, Hemoconcentrator devices, Cardioplegia sets, filters, cannulae.

4) CLINICAL APPLICATION OF BYPASS TECHNIQUES

General bypass, Coronary, Valvular, Redos, Congenital, Ventricular assist, Isolated limb perfusion, ECMO, Total body washout.

Monitoring : Setup for ECG and intravascular pressure monitoring, Resuscitation and support, Sterilization within the hospital and Administrative aspects of perfusion.

5) OCCUPATIONAL ASPECTS OF PERFUSION

Infectious diseases, Precautions, Stress/fatigue, Professional standards and modes of conduct, Bioethics.

Management/Quality control:

Quality control, Quality assurance, Management.

6) POSTOPERATIVE INTENSIVE CARE UNIT MANAGEMENT

Basic Respiratory Physiology, Transducers, Types, Storage and standardization, Collection and handling of blood gas samples, Reflection of photometry and Techniques, calculations of Cardiac output.

Cardioverter : Defibrillators, Uses, Hazards

Resuscitation : Detection of Cardiac arrest, Emergency Resuscitation, Equipment for resuscitation.

Respirators : Mechanics of ventilation, Various types of ventilators, Volume ventilators, Pressure ventilators, Mechanical ventilators, Oxygen saturation monitor, Infusion pumps, ACT monitors.