Curriculum

Diploma in Anaesthesiology (DA)

Bangabandhu Sheikh Mujib Medical University
Shahbagh, Dhaka.

CONTENTS

INTRODUCTION:

Diploma course in Anaesthesiology is very popular worldwide. Post graduation in Anaesthesiology is greatly changed with time to time like other medical branches. Now in Bangladesh all post graduation course are running under the Bangabandhu Sheikh Mujib Medical University. Previously there are about 11 medical institutions in Bangladesh offering Diploma in Anaesthesiology under different course and curriculum. All these institutes are not in same stander in respect of hospital services, in bed strength, facilities offered for training, availability of adequate teaching staff, number and type of surgeries done etc. So there is a high variability in the training received. Anaesthesia being a more clinical practice oriented subjects such variable training produces anaesthesiologists with different work experience and training. The recent upheaval in training and education has left junior anaesthesiologists much contend with, including a new career structure, curriculum and work place-based assessment.

More than 60 years of history of anaesthesia in Bangladesh out of over 165 years globally, current ratio of anaesthesiologist against population of Bangladesh is a great barrier to provide safe anaesthesia. Simultaneously for maintenance of professional standards and quality, together with the development the specialty, Bangladesh also

needs national and international training and structured assessment for teaching and learning methods. Surprisingly there is no uniformity in the curriculum and training being followed or in the method or pattern of conduction of examination for certification.

To formulate new and update curriculum and training program Bangabandhu Sheikh Mujib Medical University arranges a workshop with the senior resource persons in the arena of anaesthesia of Bangladesh. They have taken an initiative for uniform standard training, comprehensive curriculum and assessment techniques throughout the country. With their suggestion university have produced this new guide line.

1. Nomenclature and duration

Name of the course : **Diploma in Anaesthesiology (DA)**

Duration : Two academic years

2. Date of commencement : July of each year

3. Aims and objectives of the course: Curriculum Outline

1. **Rational and objectives:** Describes the background of the development of the curriculum, the structure of training and the purpose of the curriculum in medical training.
2. **Content of learning:** Syllabus section of the curriculum and learning issues, describing the knowledge, skills and attitudes that trainees need to learn.
3. **Trainee supervision and feedback:** Recommends how a trainee should be supervised during the training programme and how feedback on learning should be given.

4. **Assessment strategy:** Outlines the systems for assessment of competence for the curriculum.

Educational Purpose and Goals:

1. To develop specialist in the field of Anaesthesia, analgesia intensive care medicine and palliative care who posses knowledge, skills and attitudes that will ensure that they are competent to practice safely and effectively.
2. To develop appropriate foundation for lifelong learning.

General Objectives:

To develop a medical expert to have specialized knowledge, skill and expertise in the field of Anaesthesia, analgesia intensive care medicine and palliative care with professionalism directed to accountability and respect for others and be responsive to health needs of the society.

Specific Objectives:

The educational or academic and training process will go side by side with aimed to produce specialists in the field of Anaesthesia, analgesia intensive care medicine and palliative care who:

- Shall be able to assess the patients seeking Anaesthesia, analgesia intensive care medicine and palliative care treatment by obtaining patient's history, eliciting physical findings, formulating provisional diagnosis, deciding whether patient needs hospitalization or not.
- Shall acquire knowledge, competency and expertise in Anaesthesia, analgesia, intensive care medicine and palliative care practical skill and techniques during training periods and should be able to manage all types of emergencies and routine problems.
- Shall acquire a humanitarian approach and good communication skill with patients,

attendants, colleagues and other auxiliary staffs.

- Shall acquire professionalism aspires responsibility, accountability, honor and respect for others.
- Shall provide optimum health care to the Anaesthesia, analgesia intensive care medicine and palliative care patients..
- Shall be aware of one's professional limitations and be able to refer to appropriate centers/specialist when required.

4. Eligibility for admission:

a. MBBS/ equivalent degree recognized by BMDC
b. Minimum two years after passing MBBS or its equivalent degree recognizes by BMDC
c. Other government or university rule and regulations.

5. Course content:

Paper I (Basic Science customize)

Anatomy, Physiology, Basic/ General Pharmacology, Physics and Clinical measurement

Paper II (Basic Clinical) Clinical Pharmacology, Basic Anaesthesia, Pain and Palliative Care, Intensive Care Medicine

Paper III (Clinical Anaesthesia)

Anaesthesia for particular operation/ problem, Coexisting diseases and complications of anaesthesia)

6. Training rotations:

Respective department/ institute will arrange rotations duties in block by mutual co-operation with other departments/institutions.

The supervisors can schedule these rotations according to their own circumstances by adding more time in the same block or omitting the block which in not present in the respective institute.

Pre-operative assessment	1 month
General Surgery	3 months
Orthopaedics and trauma	2 months
Gynae. & Obs	3 months
Urology	2 months
ENT	6 weeks
Eye + ECT	1 month
ICU & post anaesthesia care unit	3 months
Neurosurgery	2 month
Paediatrics surgery	1 month
Cardiothoracic & Vascular unit	1 month
Cardiology	2 weeks
Radiology & Imaging	2 weeks
Pain & Palliative care	1 month
Dental and orofacial surgery	2 weeks
Anesthesia for offsite procedures	2 weeks
Exam preparatory period	2weeks

Total =24 Months

Training should be structured and supervised.

The aim at the end is to be competent and independent they should also know how to organize mass casualty.

1. Operating Room duty for skill development:

During the taught course period students will be placed in the operating room as a specified period except for the didactic class schedule.

2. Work Schedule

It is mandatory to work in the morning session (08.00-2.30pm) irrespective of any evening and night duty.

3. Evening and Night duty

Evening and night duties will be fixed by the Department as their own policy.

7. Summative Examination/Final Examination:

7.1 Summative or exit examination will be once in a year in July, the date will be determined by the university.

7.2 Written three papers examination will be on three successive days.

7.3 Clinical-practical and oral examination will be on a single day.

7.4 To pass, the candidate have to secure at least 60% marks in each of the three components of written (three paper combindly), Clinical-practical and oral examination.

7.5 Written questions: In each paper there will be four questions. In Group-A two questions and in Group-B two questions. Of them one will be Structured Essay type and one will be short Answer Questions type (five in number).

7.6 Clinical-practical: In clinical there will be one long case and minimum three short cases. In long case 30 minutes will be for history taking and examination and 15 minutes for crossing by two examiners. Fifteen minutes will be allotted for short cases. Two examiners will assess the candidate in long case. Two examiners will assess short cases

of opposite group of students. In practical there will be objective structured clinical evaluation (OSCE) consisting of ten stations. Communication skill, Resuscitation,

X-ray, ECG, Data/ Investigations interpretation, Drugs, CPR Anaesthetic Equipments, Measuring equipment, Referral/ Discharge note

7.7 Oral: Structured viva-voce. There will be two boards: In each board there will be two examiners. Fifteen minutes for each board equally divided into two examiners. There will be 4 examiners, Associate professor and above. 50% of the examiners will be external.

Components of examination	Paper	Marks allotted	Time	Pass marks
a. Written	Paper-I	100	3 hours	
	Paper-II	100	3 hours	
	Paper-III	100	3 hours	
	Total	**300**		**180**
b. Clinical & Practical (OSCE)		200		120
c. Oral		100		60

7.8 Questions and mark distribution

PAPER - I (Anatomy, Physiology, General Pharmacology and Physic and Clinical Measurement) Total Mark 100

Group: A (Customized) Basic & Applied 50

Anatomy: Short answer questions 5X5=25

a.
b.
c.
d
e.

Physiology. Short answer questions 5x5= 25

a.
b.
c.
d.
e.

Group: B (Customized) Basic & Applied 50

General Pharmacology

1. Short answer question

a.
b.
c.
d.
e.

Physics and Clinical Measurement 25

1. Short answer question (Basic Physics) 5x3= 15

a.
b.
c.

2. Short answer question (Clinical Measurement) 5x2=10

a.
b.

PAPER - II **100**

Group: A

(Clinical Pharmacology and Basic Anaeshesia) 50

1: Short answer questions / short notes (Clinical Pharmacology) 5X5= 25

a.
b.
c.
d.
e.

2: Short answer questions / short notes (Basic Anaeshesia) 5X5= 25

a.
b.
c.
d.
e.

Group: B **50**

(Pain and Palliative Care, Intensive Care Medicine)

Pain **5 X4 = 20**

Palliative Care **5 X 1 = 5**

1: Short answer questions

a.
b.
c.
d.
e.

Intensive Care Medicine

1: Structured essay questions 25

a.
b.
c.
d.
e.

Paper-III (Clinical Anaesthesia)		**100**
Group : A		**50**
1:	Structured essay questions	25
a.		
b.		
c.		
d.		
e.		
2:	Short answer questions	5x5=25
a.		
b.		
c.		
d.		
e.		
Group: B		**50**
1:	Structure essay questions	25
a.		
b.		
c.		
d.		
e.		
2:	Short answer questions / short notes	5x5= 25
a.		
b.		
c.		
d.		
e.		

Eligibility for appearing in the final examination:

a. Two years in-course training
b. 3 satisfactory 6 monthly report of formative assessment
c. 75% attendance in lectures, Seminar, Symposium and Journal club etc.
d. Satisfactorily completed logbook (to be prepared)

7. Formative assessment/Ongoing evaluation

There will formative assessment at the end of each six months of training by the supervisor/department or by the institute. Three satisfactory certificates will be pre-requisite along with others for appearing in the final exit examination. The last six month will end with summative examination

This includes the following:

A. THEORY EVALUATION: The theory paper should correlate with the curriculum covered during that period, which needs to be outlined right at the beginning to the student. The questions framed can be designed as follows:

1) Structured Essay Questions (SEQs)

II) Short Answer Question (SAQs)

III) Structured Clinical Assessment Examination (SCA)

IV) Problem based questions

B. TECHNICAL SKILLS COMPETENCY EVALUATIONS

Methods to be used performing anesthetic management on real patients (check lists of each skill and competency including log book evaluation)

1. Simulators
2. Objectives Structured Clinical Examination (OSCE)

The evaluation will be done either in the OT or ICU or PACU or Postoperative Wards.

C. PROBLEM SOLVING CASES:

Method to be used:

1. Case presentations (evaluation by Peers)
2. Simulated case cards
3. OT discussions
4. OSPE

D. ORAL SKILLS-ATTITUDINAL DEVELOPMENT

Method to be used:

1. Ability to present in seminars, case discussion in class room
2. Talking to patients in pre-anesthesia periods
3. Operation theatre management

E. CARDIOPULMONARY RESUSCITATION:

Method to be used:

1. Mannequins demonstration
2. Check list for evaluation

8. Core syllabus

BASIC SCIENCES

1. ANATOMY

Respiratory System

Mouth, nose, pharynx, larynx, trachea, main bronchi, segmental bronchi, structure of bronchial tree: differences in the child, blood supply, innervations and lymphatic drainage

Pleura, mediastinum and its contents

Lungs, lobes, microstructure of lungs

Muscles of respiration with innervations

Cardiovascular system

Heart, chambers, conducting system, blood and nerve supply. Pericardium

Great vessels, main peripheral arteries and veins

Fetal and materno - fetal circulation

Nervous system

Brain and its subdivisions

Spinal cord, structure of spinal cord, major ascending and descending pathways

Spinal meninges, subarachnoid and extradural space, contents of extradural space.

Length of cord in child and adult.CSF and its circulation

The peripheral nerve: spinal nerves, dermatomes, plexus of nerves. Nerves of arm, leg and foot, abdominal wall and intercostals nerves.

Autonomic nervous system: Sympathetic and parasympathetic innervations, sympathetic chain, ganglia and plexuses.

Cranial nerves.

Innervations of the larynx, Eye and orbit.

Anatomy of pain

Vertebral column, vertebral Canal and its contents.

Vertebrae, Sacrum, sacral hiatus, Ligaments of vertebral column

Liver

Kidney

Zones of anaesthetic interest

Thoracic inlet, Diaphragm, Intercostal Spaces, Abdominal Wall, Antecubital Fossa and Great Veins

Surface anatomy:

Surface anatomy of vertebral spaces, Structures in ante-cubital fossa, in axilla.

Large veins and anterior triangle of neck, Veins of leg and femoral triangle. Arteries of arm and leg.

Landmarks for tracheostomy, cricothyrotomy.

2. PHYSIOLOGY AND BIOCHEMISTRY

General

Organization of the human body and control of 'internal environment', variations with age

Function of cells; genes and their expression

Membrane physiology, Nerve and muscle: Transport of substances through cell membranes, Membrane potentials and Action potentials.

Contraction and excitation of skeletal and smooth muscles, Neuro muscular transmission
Motor unit. Protective mechanisms of the body.

Biochemistry

Acid base balance and buffers
Ions e.g. Na +, K+, Ca++, C1-, HC03
Cellular metabolism
Enzymes

Body fluids, functions, constituents and compartments.

Capillary dynamics and interstitial fluid
Osmolarity, osmolality, partition of fluids across membranes
Special fluids pleural, pericardial and peritoneal.
Edema. Osmosis and osmotic pressure.

Haematology and Immunology

Red blood cells: haemoglobin and its variants. Anemia and polycythemia, Blood groups and transfusion

Haemostasis and coagulation

White blood cells and the inflammatory response

Immunity, allergy and hypersensitivity

Heart/Circulation

Cardiac muscle contraction. The cardiac cycle: pressure and volume relationships Rhythmicity of the heart. Regulation of cardiac function.

Regulation of cardiac output, venous return.

Fluid challenge and heart failure

Neurological and humoral control of systemic blood pressures, blood volume and blood

Flow. (at rest and during physiological disturbances e.g. exercise, haemorrhage and Valsalva maneuver)

Role of kidney in control of pressures.

Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle and fluid exchange.

Characteristics of special circulations including: pulmonary, coronary, cerebral, renal, portal and foetal.

Renal system

Physiologic anatomy of the kidneys.

Multiple functions of the kidneys.

Blood flow and glomerular filtration and plasma clearance

Tubular function and urine formation

Assessment of renal functionand tests.

Regulation of blood volme, fluid and electrolyte.

Regulation of acid-base balance

Pathophysiology of acute and chronic renal failure

Respiratory System

Gaseous exchange, O2 and CO_2 transport,

Respiratory insufficiency- hypoxia, hyper and hypocapnia, hyper and hypobaric pressures.

Regulation of Respiration

Pulmonary ventilation: volumes, capacities, flows, and dead space

Artificial respiration. Effect of lPPV on lungs. Mechanics of ventilation: ventilation/perfusion abnormalities, acute and chronic ventilatory failure, effect of oxygen therapy

Non-respiratory functions of the lungs

Nervous System

Functions of nerve cells, synapses, and neurotransmitters.

Nerve fibers and their physiological classifications

Sensory receptor stimulation, transmission and processing of signals and somatic sensations.

The brain, brain stem and spinal cord: functional divisions, motor activity and the cord reflexes.

Intracranial pressure: cerebrospinal fluid, blood flow and metabolism.

Maintenance of posture

Autonomic nervous system: functions and adrenal medulla.

Pain: afferent nociceptive pathways, dorsal horn, peripheral and central mechanisms,

Liver

The physiologic anatomy, blood supply and metabolic functions.

Gastrointestinal

Gastric function; secretions, nausea and vomiting

Gut motility, sphincters and reflex control

Metabolism

Hormonal control of metabolism: regulation of plasma glucose, response to trauma

Physiological alterations in starvation, obesity, exercise and the stress response

Body temperature and its regulation

Endocrinology

Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors

Hypothalamic, pituitary, Adrenocortical, Thyroid hormones and Adrenal medulla Pancreas: insulin, glucagon, exocrine function and diabetes mellitus

Parathyroid hormone: Calcium, Phosphate and Vitamin D metabolism.

Pregnancy

Physiological changes associated with normal pregnancy

Materno-fetal, fetal and neonatal circulation

Functions of the placenta: placental transfer

Fetus: changes at birth

3. PHARMACOLOGY:

Trainees should have a good understanding of general pharmacological principles, together with knowledge of drugs likely to be encountered in (a) anaesthetic practice and (b) current treatment of patients presenting for anaesthesia.

A. General Pharmacology

Mechanism of drugs, Types of intermolecular bonds action

Concept of receptors. Characterization and classification, Dynamics of drug-receptor interaction, agonists, antagonists, partial agonists, inverse agonists. Receptor function, regulation of types and subtypes. Efficacy and potency. Tolerance G-protein-

coupled receptors: Post receptor signal transduction and second messengers Ionization of drugs, Isomerism, Drug interactions, Plasma Protein binding, drug metabolism Enzyme inductions and inhibition. Drug excretion, Adsorption and chelation Inhibition and promotion of drug uptake. Competitive protein binding. metabolites and other degradation products.

Drug uptake from: gastrointestinal tract, lungs, transdermal, subcutaneous, IM, IV, epidural, intrathecal routes.

Automated drug delivery system.
Timing of administration. Bioavailability and Factors determining biophase concentration
Factors affecting the drug dosages
Factors determining the distribution of drugs: perfusion, molecular size, solubility, protein binding
The influence of drug formulation on disposition
Distribution of drugs to organs and tissues: Body compartments

Influence of specialized membranes: tissue binding and solubility

Transfer of drugs across the membranes, physical properties affecting transfer,

Materno-fetal distribution

Distribution in CSF and extradural space

Modes of drug elimination

Metabolism in organs of excretion: phase I & II mechanisms

Intestinal and renal excretion and urinary pH

Pharmacokinetics and pharmacodynamics

Concept of a pharmacokinetic compartment, concepts of wash-in and wash-out curves.

Apparent volume of distribution

Clearance: concepts applied to whole body and individual organs

Effect of organ blood flow: Fick principle

Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy,

anaesthesia, trauma, surgery, smoking, alcohol and other drugs

Effects of acute organ failure (liver, kidney) on drug elimination

Pharmacodynamics: concentration-effect relationships : hysteresis

Pharmacogenetics: familial variation in drug response

Hereditary disorders with altered drug responses

Adverse reactions to drugs: hypersensitivity, allergy, anaphylactic and anaphylactoid reactions, Idiosyncrasy and blood dyscrasias.

Chemotherapeutic index

Legal aspects of medicines

B. Systemic Pharmacology

- Anaesthetic gases and vapours
- Hypnotics, sedatives and intravenous anaesthetic agents
- Systemic analgesics, Opioids and opioid antagonists
- Non-steroidal anti-inflammatory drugs
- Neuromuscular blocking agents and anticholinesterases

- Drugs acting on the autonomic nervous system: cholinergic, adrenergic agonists and antagonists
- Drugs acting on the heart, cardiovascular and the respiratory system
- Drugs acting on the uterus.
- Antihypertensive, Anticonvulsants, Anti-diabetic agents, Diuretics, Antibiotics and other antimicrobial agents
- Corticosteroids and other hormone preparations
- Antacids. Drugs influencing gastric secretion and motility
- Antiemetic, Antihistamines, Antidepressants, Anticoagulants, Antithrombotic, thrombolytic and haemostatic agents
- Local anaesthetic agents and adjuvants.
- Plasma substitutes.
- Chemical transmitters and enzymes.
- Vitamins.

4. PHYSICS AND CLINICAL MEASUREMENT

SI units**:** fundamental and derived units

Other systems of units where relevant to anaesthesia (e.g. mmHg, bar, atmospheres)

Simple mechanics: mass, force, pressure work and power. Diffusion. Osmosis.

Mathematical concepts: relationships and graphs.

Exponential functions and logarithms: wash-in, wash-out and tear away curves.

Heat, temperature and humidity. Physics of gases and vapours .Absolute and relative pressure.

The gas laws; triple point; critical temperature and pressure. Density and viscosity of gases.

Laminar and turbulent flow, Poiseuille's equation.

The Bernoulli principle. Vapour pressure

Saturated vapour pressure.

Measurement of volume and flow in gases and liquids. The pneumotachograph and other respirometers. Principles of surface tension.

Basicconcepts of electricity and magnetism. Capacitance, inductance and impedance.

Amplifiers: band with filters.

Sources of electrical interference, bridge circuits. Basic principles and safety of lasers.

Basic principles of ultrasound and the Doppler effect Principles of cardiac pacemakers and defibrillators. Electrical hazards: causes and prevention.

Electrocution, Fires and explosions. Diathermy and its safe use. Direct and indirect methods of blood pressure measurement. Principles of pulmonary artery wedge pressure measurement.

Cardiac output: Fick principle, thermodilution.

Measurement of gas and vapour concentrations (oxygen, carbon dioxide, nitrous oxide, and volatile anaesthetic agents) using infra-red, paramagnetic, fuel cell, oxygen electrode and mass spectrometry methods. Measurement of pH, $PaCO_2$, PaO_2.

Measurement of CO_2 production, oxygen consumption, respiratory quotient. Simple tests of pulmonary function e.g. peak flow measurement, spirometry. Capnography and Pulse Oximetry. Measurement of neuromuscular blockade. Measurement of pain.

Equipment and apparatus

Equipment design and standards.
Gas supply in bulk and cylinders.
Anaesthesia machine & breathing systems.
Devices to maintain the airway
(laryngoscopes, endotracheal tubes,
tracheostomy tubes LMA, face masks,
Different types of airways).
Ventilators.

Monitoring

- Anaesthesia record.
- Minimum monitoring standards.
- Additional monitoring when appropriate (including central venous pressure, pulmonary artery pressure, cardiac output, cerebral function, temperature, coagulation, blood loss, blood sugar).

5. BASIC ANAESTHESIA

This rotation will consist of six month duration and aims to give a foundation for the ongoing

development of clinical skills and abilities in anaesthesia and post-operative care. This provides a comprehensive description of resident's aims, learning objectives and assessment.

Aims:

This includes the following:

- Conducting general anesthesia and perioperative care for patients where risk is considered low.
- Understanding physiology, pharmacology, Physics, clinical measurement, and monitoring as applied in anaesthesia,
- Establishing a professional team approach with patients, families, colleagues and staff.
- Appraising evidence-based approaches to clinical problems.

Learning objectives:

These objectives are what trainees need to learn. They are presented as:

- Knowledge.
- Clinical management ("knows how") that applies knowledge and clinical skills to manage the patient.
- Skills (clinical and technical).
- Attitudes and behaviors.

1. Knowledge:

Trainees are expected to understand relevant principles, apply knowledge in practice, and to demonstrate abilities in the anaesthesia management of uncomplicated patients (for example ASA 1 and 2). These include the following:

a. Operating theatre suite environment:

- Planning and physical layout of an operating theatre suite, especially the operating rooms and post-anaesthesia recovery room.

- Lighting, safety, and infection and pollution control in operating rooms.
- Services and equipment in operating rooms and post-anaesthesia recovery room.
- Requirements of other anaesthesia environments outside operating rooms.
- Principles of staffing the operating room, including assistants to anaesthetist.
- Principles of management of an operating theatre suite.
- Informed consent.
- Regulations relating to restricted drugs as per national or state guidelines.
- Principles of occupational health and safety such as lifting and positioning patients, infection control and sharps policies.
- Dealing with an intra-operative death or mishap.

b. Preoperative Assessment

- Appropriate history taking.
- Physical examination including airway assessment, respiratory, cardiovascular and Neurological examinations.
- Referral to other specialists when necessary.
- Establishment of a rapport with the patient to provide reassurance, disclosure of risk, information and discussions on complementary medicine and informed consent.
- Communication and consultation skills face-to-face, by phone and in writing.
- Pulmonary function tests.
- Measurement of cardiovascular function.
- Interpretation of common radiology and imaging scans and other investigations.

c. Induction and maintenance of anaesthesia

- Applied cardiac and respiratory physiology.
- Applied pharmacology and variability in drug response.
- Selection and planning of the anaesthesia technique.
- Decision-making relating to postponement or cancellation of surgery.
- Routine inhalation and intravenous inductions.
- Maintenance of anaesthesia.
- Correct use of anaesthesia delivery systems.
- Application and interpretation of monitored variables.
- Use of muscle relaxants.
- Application of mechanical ventilation.
- Management of the airway and intraoperative complications outlined in "Drills" below.
- Common regional anaesthesia techniques (for example, epidural and spinal anaesthesia and upper limb blocks).
- Maintenance of accurate records.

d. Post anaesthesia care

Goals:

Understand the importance, purpose and components of the anesthesia record and the report from the attending anesthesiologist.

Use information about the patient that is received and observed on admission to the PACU and during care there for the following purposes:

1. To create a care plan for safe recovery, transport and immediate postoperative care.
2. To score the patient's condition according to the Aldrete scoring system.
3. To assess the patient's recovery and condition for a safe discharge or transfer.

Observe, recognize and learn to treat the most commonly occurring problems likely to arise in the Post Anesthesia Care Unit (PACU).

Understand the parameters must meet for safe discharge from the PACU to the followings:

1. Home
2. Inpatient Ward
3. Intensive care Unit

Student should be able to recognize and manage the followings:

1. Airway integrity and compromise, Hypoxia and oxygen therapy.
2. Arrhythmia
3. Hypertension
4. Hypotension
5. Pain prevention and relief
6. Nausea and vomiting
7. Decreased urine output
8. Emergence delirium
9. Delayed emergence from anesthesia
10. Shivering
11. Post operative pulmonary edema

2. Technical skills

Trainees will provide safe anaesthesia care and pain management for uncomplicated patients undergoing non-major surgery. In providing anaesthesia care, trainees should be competent in certain technical skills, such as the followings:

- Maintenance of an adequate airway.
- Rapid sequence induction.
- Advanced cardiac life support. (Mandatory to submit CPR training certificate during Final Exam)
- Aseptic techniques.
- Venous access.
- Central venous cannulation.
- ECG recording and interpretation.
- Lumbar puncture.

Trainees should be familiar with clinical protocols ("drills") in the delivery of safe anaesthesia care and be able to respond accordingly for crisis management. These include the following:

- Checking of the anaesthesia delivery system.
- Airway assessment.
- Identification and management of the following problems, which are commonly acute and may be life-threatening:
    - Inadequate airway; failed intubation, obstructed airway, oesophageal intubation, endobronchial intubation and unplanned extubation.

- Laryngospasm.
- Bronchospasm
- Hypertension.
- Hypotension
- Arrhythmias.
- Myocardial ischaemia
- Hypoxia
- Hypercarbia
- Hypoventilation
- Hyperventilation
- Anaphylaxis
- Residual neuromuscular blockade.
- Inadequate neuraxial blockade
- Seizures.

3. Attitudes and behaviors development

Trainees are expected to develop the attitudes and behaviors which are obligatory in specialist medical practice.

The student should develop attitudes that lead to:

Lifelong learning and updating.

Sympathetic communication with patient's relatives.

Sympathetic communication with patients.

Appropriate communication with colleagues to function in a group in OR/ ICU.

Become a teacher for Technicians, Nurses, Paramedical Staff and undergraduates.

Ability to discuss. Participate in case discussion and scientific presentations.

Ability to function as a leader in the operating room/ICU.

Ability to cope up with stress of long working hours, night rosters and in grave emergency situation.

6. Systemic diseases and anaesthesia

A. Anaesthesia for Otolaryngology

1. General considerations - Problems in ENT Surgery
2. Anaesthesia for ear surgery
3. Anaesthesia for operation on nose, sinuses, mouth and tonsillectomy including bleeding tonsils
4. Anaesthesia for endoscopies i.e. bronchoscopy.
5. Anaesthesia for surgery on larynx, trachea and neck
6. Lasers in ENT surgery
7. Difficult and shared airway in ENT surgery.

B. Anaesthesia for Ophthalmic surgery

OBJECTIVES

- Give Anesthesia for intra and extra ocular surgery
- To give monitored Anesthesia Care / to learn to sedation patients for MAC.
- To give Peribulbar & Retrobulbar blocks

1. Special requirements of ophthalmic surgery.
2. Normal intraocular pressure and its measurement
3. Formation of aqueous, circulation and fluctuations.
4. Preoperative assessment in ophthalmic cases.
5. Anaesthesia techniques - General
6. Penetrating eye injury management
7. Glaucoma surgery anaesthesia
8. Squint surgery anaesthesia
9. Anaesthesia for cataract surgery
10. Anaesthesia for operations on retina and vitreous
11. Regional anaesthesia for eye surgery and monitored anaesthesia care.

C. Anaesthesia for Neurosurgery

Basic principles of neuroanaesthesia

1. Intracranial pressure cerebral blood flow, $CMRO_2$, C.S.F. And effects of anaesthetic technique on above
2. Monitoring in neuroanaesthesia
3. Problems of posterior fossa surgery
4. Management of subarachnoid haemorrhage due to intra-cranial aneurysm
5. Management of a head injured patient
6. Brain death criteria

D. Anaesthesia for cardiac surgery

1. Pre-operative evaluation of cardiac patient
2. Principle of invasive monitoring Arterial Cardiovascular
3. Haemodynamic management of cardiac patient
   - Pre and intra operative
   - On the pump
   - In the I.C.U.

4. Induction of cardiac patient.
5. Maintenance of a cardiac patient during C ABG.
6. Closed heart surgery

E. Gynae & Obstetrics

1. Physiology of pregnancy and labour
2. Anaesthesia in early pregnancy
3. Pain relief in labour.
4. General anaesthesia in obstetrics.
5. Regional anaesthesia in obstetrics
6. Complications in obstetrical Anaesthesia
7. Anaesthesia for PIH and eclampsia
8. Medical diseases complicating pregnancy
9. Pain relief in labour
10. Emergencies in obstetrics
11. Maternal morbidity and mortality
12. Neonatal resuscitation

F. Paediatric surgery

1. Paediatric anatomy and physiology.
2. Routine preparation for surgery
    a) Preoperative fasting
    b) Basic lab tests
    c) Premedication
3. Pharmacology of anaesthetic agents, differences from adults.
4. Paediatric anaesthetic circuits
5. Paediatric induction
6. Management of paediatric airway
7. Monitoring during anaesthesia
8. Other special consideration in intraoperative management
9. Management of body temperature
10. Intravenous fluid therapy
11. Post operative analgesia in paediatric practice

G. Thoracic surgery (Basic)

1. Preoperative evaluation of thoracic surgery
   a. Preoperative preparation in thoracic surgery
   b. Surgical considerations which have anaesthetic implications
2. One lung anaesthesia (OLA).
   a. Indications of one lung anaesthesia
   b. Double lumen tubes. Management of OLA.
1. Monitoring in thoracic anaesthesia
   a. Choice of anaesthetic drugs
   b. Other intraoperative problems of thoracic anaesthesia e.g. blood loss, management of haemodynamic changes etc.
4. Management of postoperative pain.
   a. Early serious complications
   b. Indication of postoperative ventilation

H. Transplant Surgery

Know the basic principles of anesthetizing an immune compromised patient.

Principles of anesthetizing patient with end stage, renal / liver disease. Warm / cold ischemic time

I. Dental and Orofacial Surgery

Understand the principles of conscious sedation

Principles of anesthesia in a Dental Chair

Local Blocks for Dental Surgery

J. URO/ Genital procedures.

Become skilled in anesthetic techniques applicable to the genitourinary clinic

a. Transurethral resection of the prostate: recognize and treat hyponatremia; Know different anesthetic options; their advantages and disadvantages

b. Irrigation fluid options: know advantages and disadvantages of each

c. Anesthetic techniques for extracorporeal shock wave lithotripsy

d. Anesthetic considerations for percutaneous placement of nephrostomy

K. Anesthesia outside operating room

1. Radiology and interventional neuroradiology : know special anesthetic Considerations in these setting:

a. Dye allergies/ Anaphylaxis

b. Embolization

c. Examination for magnetic resonance imaging (MRI)

I. Monitoring

II. Equipment options in the MRI suite

III. General anesthetic / sedation techniques

2. Electroconvulsive therapy (ECT)

I. Preoperative

II. Anesthetic techniques and drug effects on seizure duration

III. Hemodynamic responses and appropriate treatment

2. **Anesthesia for Endoscopic procedures.**

L. Orthpaedic Surgery

M. Neonatal Surgery

N. Anaesthesia for the elderly

O. Daycase Surgery

P. Anaesthesia for intra abdominal Surgery

Q. Miscellaneous topics

1. Total intravenous anaesthesia
2. Blood transfusion
3. Anaesthesia for burns.

R. Trauma (Disaster Management & Resuscitation)

Basic and advanced cardiac life support, advanced trauma life support and pediatric life support training. They should be master in skills.

I. GOALS

a. Acquire improved ability to evaluate & triage the patient and formulate anesthetic plans, specially in the trauma patient

b. Acquire ability to administer operative anesthesia safely and rapidly

c. Acquire ability to identify, prevent and care for postoperative complications.

II. Objectives

A. Manage anesthesia for severely traumatized patients by doing the following as rapidly as possible

1. Evaluation
2. Placement of intravascular catheters

3. Airway intubation
4. Choose among anesthetic options, induce and maintain anesthesia safely

B. Perform a thorough preoperative evaluation and documentation

C. Postoperative Management

S. Regional Anesthesia

I. Goals:

- To teach anesthesia residents the art and sciences of regional anesthesia.
- Understand the anatomy, pathophysiology and appropriate management of complications and side effects of regional anesthesia techniques,- the test dose; total spinal, subdural blocks –assessment the treatment; risks of spinal, epidural hematoma and abscess – assessment and treatment; Postdural puncture headache – assessment and treatment; Pneumothorax – assessment and treatment; Physiology side

effects: sympathectomy, phrenic nerve block, intercostals nerve block –assessment and treatment; Peripheral nerve injury assessment and follow-up.

- To understand general principles of local anesthetic pharmacology, including the Pharmacodynamics and pharmacokinetics of various local anesthesia. This includes onset, duration, motor/ sensory differentiation and toxicity profile of various local anesthetics and allergy its treatment.
- To understand the principles and indications for various local anesthetic adjuvant including: Epinephrine, phenylephrine, narcotics, sodium bicarbonate, carbonation, hyaluronidase, alpha agonists, anticholinesterases
- To be familiar with the relevant anatomy for regional techniques, including: spinal canal and its contents, neural plexuses of the limbs, major autonomic ganglia.

- Be familiar with the physiology changes associated with spinal and epidural anesthesia.
- Understand the indications for and the contraindications to regional anesthetic techniques including central neuraxis blocks, peripheral nerve blocks, and sympathetic blocks.

II. Cognitive Skills: Rational selection of regional anesthesia technique and choice of local anesthetic for particular patient encounters.

- Ability to assess adequacy of regional anesthesia before the start of surgery and demonstrate appropriate plans for supplementation of inadequate blocks.
- Provide effective anxiolysis and sedation of patients by both pharmacologic and Interpersonal techniques.

- Select appropriate monitors for specific patient encounters and document performance of regional anesthetic adequately.

At the completion of this rotation, student should be able to demonstrate the following skills.

1. Stellate ganglion block
2. Brachial plexus blockade, interscalene block
3. Cervical epidural; superficial and deep cervical plexus block
4. Bier's block
5. Thoracic epidural/ catheter placement
6. Intercostals block
7. Interpleural analgesia
8. Lumber epidural / Catheter
9. Caudal block-adult and pediatric
10. Subarachnoid block
11. Femoral nerve block 3- in -1 block
12. Sciatic nerve block
13. Popliteal nerve block

14. Ankle block
15. Walking epidural
16. Pudendal nerve block
17. Trigger point injections
18. Miscellaneous blocks

T. Critical Incidents

Cyanosis, hypoxia, laryngospasm & bronchospasm occurring during induction, maintenance or recovery Failed intubation

Difficulty with intermittent positive pressure ventilation and sudden or progressive loss of minute volume

Sudden or progressive increase in peak inspiratory pressure

Aspiration; on induction, extubation, in recovery

Increasing end-tidal CO_2, decreasing end-tidal CO_2

Sudden hypotension and hypertension, Mismatched blood transfusion

7. INTENSIVE CARE

Goal

Understand the spectrum of critical illnesses requiring admission to ICU, recognize the critically ill patient who needs intensive postoperative care from the patient who does not require such care.

Principles of Managing a Critically ILL Medical patient

Cardiovascular

Diagnosis and acute management of shock (all forms), cardiac arrhythmias, cardiogenic pulmonary edema, acute cardiomyopathies, hypertensive emergencies, myocardial infarction.

Respiratory

Diagnosis and management of acute and chronic respiratory failure, status asthmaticus, smoke inhalation and airway burns, upper airway obstruction, including foreign bodies and infection, near drowning, adult respiratory distress syndrome. Use of pulmonary function tests including bedside spirometer.

Renal

Diagnosis and management of fluid, electrolyte disturbances and acid-base disorders. Indication and procedure of dialysis and haemofiltration.

Central Nervous System / Peripheral Nervous System.

Diagnosis and management of head injury, intra cranial haemorrhage, drug overdose, coma, myasthenia gravis, Guillain Barre syndrome, transversemyelitis, cervical myelopathy.

Metabolic and Endocrine

Diabetic ketoacidosis, hypo- adrenal crisis, pheochromocytoma, thyroid storm, myxedema coma

Infectious diseases

Diagnosis and management of hospital acquired and opportunistic infections, including acquired immunodeficiency syndrome.

Students should know how to protect cross infection risks to healthcare workers.

Hematological disorders

Diagnosis and management of defects in hemostatis & hemolytic disorders should be able to prescribe component therapy based on the result of coagulation profile in thrombotic disorders to diagnose deep vein thrombosis and know principle of anticoagulation and fibrinolytic therapy. Know the indication of plasmapheresis for acute disorders including neurologic and hematologic diseases.

Gastrointestinal disorders

To recognize and manage gastrointestinal bleeding, hepatic failure

Multiorgan failure

At the end students should be able to perform

A.

1. Radial arterial catheter and other sites as necessary
2. Central venous catheters
   a. Subclavian route

b. Internal or external jugular route

c. Femoral route

Pulmonary artery (PA) catheter (observe only)

B. Understand and interpret the following PA catheters variables, initiate appropriate therapy in response to change in them:

1. PA waveform
   a. Normal
   b. Pathologic
   c. PA wedge
2. Mixed venous oxygen saturation
3. Right ventricular ejection fraction
4. Thermodilution cardiac output
   a. Technological basis for cardiac output measurement
   b. Factors producing errors in cardiac output measurements

C. Management of cardiovascular instability

1. To know different fluid therapy option and when to use

2. To know the different inotropic drugs and when to use
3. To know how to use invasive monitoring devices to guide therapeutic use of fluids and inotropic drugs

D. Management of respiratory failure and postoperative pulmonary complications

1. To know how to use arterial blood gas and ventilatory variables to evaluate postoperative patients with respiratory failure.
2. Understand the operation of mechanical ventilators including different ventilatory modalities and how each is best used for management of respiratory failure and noninvasive including modes complications and mode of weaning.
3. Principles and applications of oxygen therapy.
4. Types of tracheostomy & complications

E. Pathophysiology and clinical manifestation of septicemia and its treatment

1. Diagnosis of sepsis in the postoperative patient including all the typical haemodynamic findings.
2. Appropriate tests to diagnose sepsis.
3. Use various monitoring devices to assist in managing sepsis; specifically understand the optimization of oxygen delivery to tissues in the septic patient and the appropriate management of fluids and vasopressors to accomplish these goals.
4. Different classes of antibiotics and antifungal agents and their use in treating sepsis.

F. Deliver appropriate nutritional support

1. Learn about the use of enternal nutrition in the patient who cannot tolerate input per oral.
2. Learn about the use of parental nutrition in the critically ill surgical/medical patient.
3. Interact with nutritional support services in planning nutrition for the critically ill patient.

G. Provide effective pain management and sedation postoperatively

1. Learn the appropriate use of pain management modalities in the ICU including:
   a. Patient controlled analgesia (PCA)
   b. Epidural and subarachnoid narcotics
2. Learn use of sedative / hypnotic drugs in the ICU for:
   a. Patient on ventilator.

Monitoring and Biostatistics:

Should be able to use prognostic indices such as acute physiology and chronic health evaluation (APACHE), therapeutic intervention scoring system (TISS) and know the concept of audit.

Ethical and legal aspects of critical care:

Know the legal importance of informed consents, Do not resuscitate orders, (DNAR), Withdrawing of therapy, Brain death, consent for organ retrieval explain / prepare.

Psychosocial issues:

Student should be able to communicate with distressed relatives, give the correct picture of a critical patient, but with compassion in view of critical nature of the illness, transport a critically ill patient/ resuscitate patient with acute traumatic injury.

8. PAIN MANAGEMENT

Learning objectives:

To achieve pain management during perioperative period proficiently.

Contents related to pain management:

A. Nature of pain

What is pain

- Acute pain
- Chronic pain

B. Basic mechanism of pain

- Modulation and gate control theory of pain.

C. Acute pain

- Clinical aspects of acute pain
- Transition from acute to chronic pain

D. Chronic pain

- Patho-physiology of chronic pain
- Clinical aspects of chronic pain

E. Evaluation of pain

- Clinical examination
- The measurement of pain
- Psychological evaluation.

Different methods of acute & chronic pain management:

A. Pharmacological method

a. Different nerve blocks

1. Epidural techniques
   - Cervical
   - Thoracic
   - Lumbar
   - Caudal

1. Brachial Plexus block.
2. Cervical Plexus block.

3. Wrist block
4. Digital block
5. Femoral & three- in-one block
6. Obturator nerve block
7. Penile block
8. Inguinal nerve block
9. Sympathetic nerve block
   - Stellate ganglion block
   - Celiac plexus block
10. Intra venous regional anaesthesia
    - Bier's block.

b. Analgesics & adjuvant in different routes

c. Pain Management Services:

1. Acute pain service (APS)

a. day case surgery

b. pain in children.

B. Non-pharmacological method:

1. TENS
2. Acupuncture
3. Psycho therapy

Cancer Pain:

1. Components of Pain
2. Barriers in its management
3. Oral opioids
4. Transdermal opioids
5. Parenteral drugs
6. Intraspinal opioids
7. Neurolytic technique
8. WHO treatment ladder

9. Palliative Care

A. Introduction to palliative care : About the basic principles of palliative care

B. Communication Skills, Ethical and Spiritual Issues

By the end of the section the student should be able to learn.

- The basic skills in communicating with a patient
- Strategy for breaking bad news handling the responses
- Ethical issues in palliative care
- Concept of spiritual distress

C. Management of Palliative Care Emergencies and Non-Malignant Disease

By the end of the section the candidate should be able to:

- Recognize the following common urgent problems and propose appropriate management for spinal cord compression, superior vena cava obstruction, haemorrhage, convulsion and hypercalcemia.
- Demonstrate how increased knowledge and understanding of the following conditions like end-stage respiratory disease, chronic heart failure, multiple sclerosis and motor neuron disease can improve the palliative management of patients.

D. The Last 48 Hours of Life , Practical Issues and Bereavement

By the end of the section the candidate should be able to learn:

Recognize the signs and symptoms when death is approaching

- Make a holistic assessment of the needs of the patient and their family at this stage.
- Recognize the manifestations of the grieving process in bereaved adults and children and describe ways to help them.

10. Procedural skill

A. FOLLOWING PROCEDURES SHOULD BE COMPLETED DURING CLINICAL ANAESTHESIA

1. Preoperative assessment
2. Premedication and drugs used for premedication
3. Endotracheal intubation and its complications
4. Monitoring of anaesthetized patient.
5. Perioperative fluid balance.
6. Positive pressure ventilation
7. Recovery and anaesthesia complications
8. Postoperative pain relief
9. Oxygen therapy
10. Emergency anaesthesia

11. Spinal anaesthesia
12. Epidural anaesthesia
13. Different types of block
14. Drug interactions and anesthesia
15. Cardio Pulmonary Resuscitation.
16. Management of shock and massive haemorrhage
17. Management of a difficult airway
18. ICU Management
19. Airway management. Different method of Endotracheal intubations and its complications
20. Management of a difficult airway
21. Fasting and emergency anaesthesia
22. Management of Postoperative Patient
23. Regional anaesthesia and analgesia
24. Blood Product and Blood transfusion
25. Chronic and cancer pain
26. Basic idea about palliative care.

B. DATA INTERPRETATIONS:

The student should be able to analyze data which include the following:

Electrocardiographs

Chest radiographs

ECHO

Neck and thoracic inlet films

CT scan

MRI

Hematology (including coagulation and sickle tests)

Electrolytes

Hormone assay

$_{P}$H and blood gases

Liver function tests

Renal function tests

Respiratory function tests

C. CASE BASED DISCUSSION TOPICS:

Universal precautions and good working practices (hand washing, gloves etc)

Use of protective clothing/gloves/masks etc

Aseptic techniques

Cross-infection: modes and common agents

Hepatitis and HIV infections: modes of infection: natural history: at-risk groups

Sterilization of equipment

Use of disposable filters and breathing systems

Preoperative Assessment

Premedication

Emergency Anaesthesia - Full stomach

IHD and Anaesthesia

Hypertension and Anaesthesia

D. Minimum Procedures/Cases to be Entered in Logbook

During the training period of two years, every event will be noted in LOG BOOK and signed by the supervisor nominated by the Department for each rotation. A complete and duly certified log book should be part of the requirement to sit for the final DA examination.

Log book should include adequate number of anaesthetic procedures, routine and emergency management of patients, case presentations, Journal club meeting.

- Record of all the cases done by them, either with a consultant or independently
- Record of any unusual or interesting anaesthetic problems they come across
- Record of presentations done in the department;
- Record of anaesthesia meetings attended in and outside Department.

I. Regional

Subarachnoid (SAB) = 50

Lumbar epidural (EDB) = 10

Caudal epidural block = 10

CSE = If any

Sciatic / Femoral nerve blocks = If any

Bier's block = 5

Ankle block = If any

Stellate Ganglion = If any

Brachial Plexus =5

Coeliac Plexus Block = If any

Trigger Point Injections = If any

Other peripheral N. Block =

Ophthalmic Blocks = Ifany

Field Block = 3

II. Anesthesia for:

Open Heart Surgery = 5 (observe)

Closed Heart surgery = 10 (observe)

Craniotomy = 15

Spine Surgery = 15

Joint replacement = If any

III. Intravenous techniques

Internal Jugular Cannulation = If any

External Jugular Cannulation = 3

Subclavian Vein Cannulattion = 5 do/observe

Peripheral Central Line =

Arterial Line Cannulation = 2

IV. Conduction of Cases:

ASA I = 80 (as independent)

ASA II = 35 (as independent)

ASA III = 20 (observation/supervision)

ASA IV = 8 (observation/supervision)

Labour analgesia= If any

Organ transplant=If any

Ccardiac compression= If any

Cardiac defibrillation= If any

O2 failure drill= If any

Mass casualty= if any

11. Writing case note (Case Book)

Each student will write at least 10 cases (History, Examination, Diagnosis, Records of Anaesthesia, Operation, Referral and follow up)

12. Learning process and issues

As a policy, active participation of student at all levels will be encouraged. Following teaching modalities will be employed:

1. Lectures

Didactic Lecture

The didactic lecture schedule will be two days a week or as decided by the respective department. One day is fixed for a Basic Science and other day for clinical topics related to anaesthesia, intensive care, pain and palliative care service.

2. Seminar, case presentation, presence in Journal Club, mortality, morbidity and other departmental meeting.
3. Group Discussions
4. Skill teaching (case based discussion) in operating theatres
5. Self study, assignments and use of internet
6. Tutorial
7. Problem based discussion
8. Emergency management
9. Skill/Procedure/Interpretation
10. Log Book

Tutorials

A. Related to ICU

1. Physiological effects of controlled ventilation
2. Indications of IPPV.
   How to set ventilatory parameters
   Care of ventilated patients
   Weaning criteria and difficult weaning
3. Tracheostomy
   a) Indication
   b) Physiological effects
   c) Technique
   d) Care
   e) Complications
4. Modes of ventilation
5. Design and function of an ICU

- Septic shock
- ARDS
- Acute renal failure
- Sedation and use of muscle relaxants in ICU
- Monitoring in ICU.

B. Anaesthesia apparatus

1. Vaporizers
2. Flow meters
3. Anaesthesia machine
4. Anaesthetic circuits
5. Others

C. Co-exting diseases and Anaesthesia

1. Anaesthesia for patients with cardiac disease
    a. Ischemic heart disease
    b. Valvular heart disease
    c. Congenital heart disease
2. Anaesthesia for patients with hypertension
3. Anaesthesia for patients with Chronic obstructive airway and Chronic restrictive lung disease.
4. Anaesthesia for patients with renal disease and biliary tract.
5. Anaesthesia for patients with liver disease.
6. Anaesthesia for patients with diabetes.
7. Anaesthesia for patients with thyroid disease.

8. Anaesthesia for patients with pituitary disease.
9. Anaesthesia for patients with neurological disease.
10. Anaesthesia for patients with haematological problems.
11. Anaesthesia for patients with inherited disease.
12. Anaesthesia for Pregnancy associated disease.
13. Anaesthesia for fluid, electrolyte and acid base disorders.

Diploma trainee's Block progress report

Name of the trainee :
Name of the course :
Name of the institute :
Period of block :

Session :
Reg. No:

Performance	Poor	Satisfactory	Good	Excellent
Written*				
Clinical-Practical*				
Oral*				
Attendance*				
Attitude				

* Poor: <50%, Satisfactory: ≥50-60%, Good: >60-75%, Excellent : >75%

Note: "Poor" grade in more than two performance during a particular block means deficient training and also cause disqualification for appearing in the final examination unless training in particular block is complete.

Signature: .....
Head of the Department
(Seal)

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