RAWALPINDI MEDICAL UNIVERSITY

UNIVERSITY RESIDENCY PROGRAM

MS ANAESTHESIOLOGY

Table of contents

SECTION – I

MISSION STATEMENT

The mission of MS Anesthesiology Residency Program of Rawalpindi Medical University is:

1. To provide exemplary medical care, treating all patients who come before us with uncompromising dedication and skill.
2. To passionately teach our junior colleagues and students as we have been taught by those who preceded us.
3. To treat our colleagues and hospital staff with kindness, respect, generosity of spirit, and patience.
4. To foster the excellence and well-being of our residency program by generously offering our time, talent, and energy on its behalf.
5. To support and contribute to the research mission of our medical center, nation, and the world by pursuing new knowledge, whether at the bench or bedside.
6. To promote the translation of the latest scientific knowledge to the bedside to improve our understanding of disease pathogenesis and ensure that all patients receive the most scientifically appropriate and up to date care.
7. To promote responsible stewardship of medical resources by wisely selecting diagnostic tests and treatments, recognizing that our individual decisions impact not just our own patients, but patients everywhere.
8. To promote social justice by advocating for equitable health care, without regard to race, gender, sexual orientation, social status, or ability to pay.
9. To extend our talents outside the walls of our hospitals and clinics, to promote the health and well-being of communities, locally, nationally, and internationally.
10. To serve as proud ambassadors for the mission of the Rawalpindi Medical University MS Anesthesiology Residency Program for the remainder of our professional lives.

1. Introduction:

A. Graduate medical education is the crucial step of professional development between medical college and autonomous clinical practice. It is in this vital phase of the continuum of medical education that trainees learn to provide optimal patient care under the supervision

of faculty members who not only instruct, but serve as role models of excellence, compassion, professionalism, and scholarship.

Graduate medical education transforms medical students into physicians who care for the patients and hence community; create and integrate new knowledge into practice; and educate future generations of physicians to serve the public. Practice patterns established during graduate medical education persist many years later.

Graduate medical education has a core tenet the graded authority and responsibility for patient care. The care of the patients is undertaken with appropriate faculty supervision and conditional independence, allowing trainees to attain the knowledge, skills, attitudes, and empathy required for autonomous practice. Graduate medical education develops physicians who focus on excellence in delivery of safe, equitable, affordable, quality care; and the health of population they serve. Graduate medical education values the strength that a diverse group of physicians brings to medical care.

Graduate medical education occurs in clinical settings that establish the foundation for practice-based and lifelong learning. The professional development of the physician continues through faculty modeling of the effacement of self-interest in a humanistic environment that emphasizes joy in curiosity, problem-solving, academic rigor, and discovery. This transformation is often physically, emotionally, and intellectually demanding and occurs in a variety of clinical learning environment committed to graduate medical education and the well-being of patients, trainees, fellows, faculty members, students, and all the members of the health care team.

B. Definition of specialty

The practice of medicine dealing with the peri-operative management of patients. This includes the peri-operative/peri-procedural management of patients during surgical and other therapeutic and diagnostic procedures. This management encompasses the pre-operative preparation of the patient and their peri-operative maintenance of

normal physiology, as well as, the post-operative relief and prevention of pain.

An anaesthesiologist is skilled in the management and diagnosis of critically-ill patients, including those experiencing cardiac arrest, and in the diagnosis and management of acute, chronic, and cancer related pain. These goals are achieved through a thorough understanding of physiology and pharmacology, and the ability to conduct, interpret, and apply the results of medical research. Finally, the anesthesiologist is skilled in the leadership

An anaesthesiologist is skilled in the management and diagnosis of critically-ill patients, including those experiencing cardiac arrest, and in the diagnosis and management of acute, chronic, and cancer related pain. These goals are achieved through a thorough understanding of physiology and pharmacology, and the ability to conduct, interpret, and apply the results of medical research. Finally, the anesthesiologist is skilled in the leadership of health services delivery, prudent fiscal resource stewardship, and quality improvement, as well as the supervision, education, and evaluation of the performance of personnel, both medical and paramedical, involved in the peri-operative and peri-procedural care.

STATUTES

Nomenclature Of The Proposed Course

The name of degree programme shall be **MS Anaesthesiology**. This name is well

recognized and established for the last many decades worldwide.

Course Title:

MS Anaesthesiology

Training Centers:

Department Of Anesthesiology and critical care at Allied hospitals of Rawalpindi Medical University(RMU).

Duration of Course:

The duration of MS Anaesthesiology course shall be five (5) years with structured training in a recognized department under the guidance of an approved supervisor.

Year 1 & 2:

After admission in MS Anaesthesiology Program the first two years will offer:

a. Introduction and orientation to anesthesiology during the 1st 6 months.

b. Mandatory workshops (Appendix E).

c. The research project will be designed and the synopsis be prepared during this period and submitted for aproval by the AS&RB of the university.

d. Core training in Anesthesia and the basic principles of Surgery and Medicine related to anesthesia. The training in the basic principles of General Surgery and Internal Medicine will be carried out in the department of Anaesthesia by the faculty of Anaesthesia.

At the end of 2nd Calender year the candidate shall take up Intermediate Examination.

Year 3, 4 & 5:

During Year 3 & 4 of the Program, there shall be focus on subspecialty anesthesia training. Year 5 will allow the resident to focus on subspecialty of interest and submit the final thesis before the final MS examination.

The candidate will undergo clinical training in the discipline to achieve the educational objectives (knowledge & Skills) along with rotation in all the subspecialties of Anaesthesiology during the 3rd, 4th & 5th years of the programm. The clinical training shall be competency based following ACGME Guidelines.
The Research & thesis Component shall be completed over the five years duration of the course. Research can be done as one block or it can be done as regular periodic rotation over five years.

Admission Criteria

Applications for admission to MS Training Programs of will be invited through advertisement in print and electronic media mentioning closing date of applications and date of Entry Examination.
Eligibility: The applicant on the last date of submission of applications for admission must possess the:

i) Basic Medical Qualification of MBBS or equivalent medical qualification recognized by Pakistan Medical & Dental Council.
ii) Certificate of one year's House Job experience in institutions recognized by Pakistan Medical & Dental Council Is essential at the time of interview. The applicant is required to submit Hope Certificate from the concerned Medical Superintendent that the House Job shall be completed before the Interview.
iii) Valid certificate of permanent or provisional registration with Pakistan Medical & Dental Council.
Admission will be made through Central Induction policy of the Government of the Punjab in all PG Institutions.

Registration and Enrollment

- Total number of students enrolled for the course must not exceed 2 per supervisor/year.
- The maximum number of trainees that can be attached with a supervisor at a given point of time (inclusive of trainees in all years/phases of MS training), must not exceed 6.
- The University will approve supervisors for MS courses.

- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered with RMU as per prescribed Registration Regulation.
- Once a resident has joined an Anaesthesia training program, he will not be allowed to switch from Anaesthesia to another specialty as a result of upgradation.

AIMS AND OBJECTIVES OF THE COURSE

AIM

The aim of five years MS program in Anaesthesiology is to produce a

trainee/ resident that demonstrate competencies in all six areas of ACGME competences:

GENERAL OBJECTIVES

1. To provide a broad experience in anesthesia, including its interrelationship with other disciplines.

2. To enhance medical knowledge, clinical skills, and competence in anesthetic procedures.

3. To cultivate the correct professional attitude and enhance communication skill towards patients, their families and other healthcare professionals.

4. To enhance sensitivity and responsiveness to community needs and the economics of health care delivery.

5. To enhance critical thinking, self-learning, and interest in research and development of patient service.

6. To cultivate the practice of evidence-based practice and critical appraisal skills.

7. To inculcate a commitment to continuous medical education and professional development.

8. To inculcate a commitment to continuous medical education and professional development.

9. To acquire competence in managing acute anesthetic emergencies and identifying problems in patients.

10. To encourage the development of skills in communication and collaboration with the community towards health care delivery.

11. To foster the development of skills in the critical appraisal of new methods of investigation and/or treatment.

12. To reinforce self-learning and commitment to continued updating in all aspects of anesthesiology.

13. To encourage contributions aiming at advancement of knowledge and innovation in anesthesia through basic and/or clinical research and teaching of junior trainees and other health related professionals.

14. To acquire professional competence in training future trainees in anesthesia at Rawalpindi Medical University.

SPECIFIC OBJECTIVES

A. Medical Knowledge

Trainee must demonstrate knowledge of established and evolving

biomedical, clinical, epidemiological and social- behavioral sciences, as well as the application of this knowledge to patient care.

1. The development of a basic understanding of core anesthesiology concepts, including anatomy , physiology, pharmacology , pathophysiology and anesthetic management and critical care.
2. Residents must demonstrate appropriate medical knowledge in the topics related to the anesthetic care of patients, including:
   a) practice management to address issues such as:
   (a).(i) operating room management;
   (a).(ii) evaluation of types of practice;
   (a).(iii) health care finance, legislative, and regulatory issues;
   (a).(iv) billing arrangements;
   (a).(v) professional liability;
   (a).(vi) fiscal stewardship of health services delivery.

   (b) management skills, to include basic knowledge of organizational culture, decision making,change management, conflict resolution, and negotiation and advocacy;
   (c) care of the patient in the continuum of the peri-operative period, to include collaboration with medical and surgical colleagues to:
   (c).(i) optimize preoperative patient condition; and,
   (c).(ii) optimize recovery;
   (d) management of the specific needs of patients undergoing diagnostic or therapeutic procedures outside of the surgical suite.
3. Psychological and social aspects of medical illnesses.

4. Effective use and interpretation of investigation and special diagnostic procedures.

5. Critical analysis of the efficacy, cost-effectiveness and cost-utility of treatment modalities.

6. Patient safety and risk management

7. Medical audit and quality assurance

8. Ethical principles and medico legal issues related to medical illnesses.

9. Updated knowledge on evidenced-based medicine and its implications for diagnosis and treatment of medical patients.

10. Familiarity with different care approaches and types of health care facilities towards the patients care with medical illnesses, including convalescence, rehabilitation, palliation, long term care, and medical ethics.

11. Knowledge on patient safety and clinical risk management.

12. Awareness and concern for the cost-effectiveness and risk-benefits of various advanced treatment modalities.

B. Patient Care and Procedural Skills

Trainee must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.

(1).(a) Residents must demonstrate competence in fundamental clinical skills of medicine, including: (a).(i) obtaining a comprehensive medical history;

(a).(ii) performing a comprehensive physical examination;

(a).(iii) assessing a patient's medical conditions;

(a).(iv) making appropriate use of diagnostic studies and tests;

(a).(v) integrating information to develop a differential diagnosis; and,

(a).(vi) implementing a treatment plan.

(1).(b) Residents must demonstrate competence in anesthetic management, including care for:

(b).(i) patients younger than 12 years of age undergoing surgery or other procedures requiring anesthetics;

(b).(i).(a) This experience must involve care for 100 patients younger than 12

years of age.

(b).(i).(b) Within this patient group, 20 children must be younger than three years of

age, including five younger than three months of age.

(1).(b).(ii) patients who are evaluated for management of acute, chronic, or cancer-related pain

disorders;

(1).(b).(ii).(a) This experience must involve care for 20 patients presenting for initial evaluation of pain.

(1).(b).(ii).(b) Residents must be familiar with the breadth of pain management, including clinical experience with interventional pain procedures.

(1).(b).(iii) patients scheduled for evaluation prior to elective surgical procedures;

(1).(b).(iv) patients immediately after anesthesia, including direct care of patients in the post-

anesthesia-care unit, and responsibilities for management of pain, hemodynamic changes, and emergencies related to the post-anesthesia care unit; and,

(1).(b).(v) critically-ill patients.

(1).(c) Residents must achieve competence in the delivery of anesthetic care to:

(1).(c).(i) patients undergoing vaginal delivery;

(1).(c).(i).(a) This experience must involve care for 40 patients.

(1).(c).(ii) patients undergoing cesarean sections;

(1).(c).(ii).(a) This experience must involve care for 20 patients.

(1).(c).(iii) patients undergoing cardiac surgery;

(1).(c).(iii).(a) This experience must involve care for 20 patients.

(1).(c).(iii).(b) The care provided to 10 of these patients must involve the use of

cardiopulmonary bypass.

(1).(c).(iv) patients undergoing open or endovascular procedures on major vessels, including

carotid surgery, intrathoracic vascular surgery, intra-abdominal vascular surgery, or peripheral vascular surgery;

(1).(c).(iv).(a) This experience must involve care for 20 patients, not including surgery

for vascular access or repair of vascular access.

(1).(c).(v) patients undergoing non-cardiac intrathoracic surgery, including pulmonary surgery and surgery of the great vessels, esophagus, and the mediastinum and its structures;

(1).(c).(v).(a) This experience must involve care for 20 patients.

(1).(c).(vi) patients undergoing intracerebral procedures, including those undergoing intracerebral endovascular procedures;

(1).(c).(vi).(a) This experience must involve care for 20 patients, the majority of which

must involve an open cranium.

(1).(c).(vii) patients for whom epidural anesthetics are used as part of the anesthetic technique or

epidural catheters are placed for peri-operative analgesia;

(1).(c).(vii).(a) This experience must involve care for 40 patients.

(1).(c).(viii) patients undergoing procedures for complex, immediate life-threatening pathology;

(1).(c).(viii).(a) This experience must involve care for 20 patients.

(1).(c).(ix) patients undergoing surgical procedures, including cesarean sections, with spinal anesthetics;

(1).(c).(ix).(a) This experience must involve care for 40 patients.

(1).(c).(x) patients undergoing surgical procedures in whom peripheral nerve blocks are used as part of the anesthetic technique or peri-operative analgesic management;

(1).(c).(x).(a) This experience must involve care for 40 patients.

(1).(c).(xi) patients with acute post-operative pain, including those with patient-controlled

intravenous techniques, neuraxial blockade, and other pain-control modalities;

(1).(c).(xii) patients whose peri-operative care requires specialized techniques, including:

(1).(c).(xiii) a broad spectrum of airway management techniques, to include laryngeal masks, fiberoptic intubation, and lung isolation techniques, such as double lumen endotracheal tube placement and

endobronchial blockers;

(1).(c).(xiv) central vein and pulmonary artery catheter placement, and the use of transesophageal

echocardiography and evoked potentials; and,

(1).(c).(xv) use of electroencephalography (EEG) or processed EEG monitoring as part of the procedure, or adequate didactic instruction to ensure familiarity with EEG use and interpretation.

(1).(c).(xvi) patients undergoing a variety of diagnostic or therapeutic procedures outside the surgical suite.

(1).(c).(xvi).(a) This must include competency in: using surface ultrasound and transesophageal and transthoracic echocardiography to guide the performance of invasive procedures and to evaluate organ function and pathology as related to anesthesia, critical care, and resuscitation;

(1).(c).(xvii) understanding the principles of ultrasound, including the physics of ultrasound transmission, ultrasound transducer construction, and transducer selection for specific applications, to include being able to obtain images with an understanding of limitations and artifacts;

(1).(c).(xviii) obtaining standard views of the heart and inferior vena cava with transthoracic

echocardiography allowing the evaluation of myocardial function, estimation of central venous pressure, and gross pericardial/cardiac pathology (e.g., large pericardial effusion);

(1).(c).(xix) obtaining standard views of the heart with transesophageal echocardiography allowing the evaluation of mycardial function and gross pericardial/cardiac pathology (e.g., large pericardial effusion);

(1).(c).(xx) using transthoracic ultrasound for the detection of pneumothorax and pleural effusion;

(1).(c).(xxi) using surface ultrasound to guide vascular access (both central and peripheral) and to guide regional anesthesia procedures; and,

(1).(c).(xxii) describing techniques, views, and findings in standard language.

2. Residents must be able to perform all medical, diagnostic, and surgical procedures considered essential for the area of practice. This includes technical proficiency in taking informed consent, performing by using appropriate indications, contraindications, interpretations of findings and evaluating the results and handing the complications of the related procedures mentioned in the syllabus. Including but not limited to:
    a. Cardiopulmonary resuscitation
    b. Central venous cannulation
    c. Epidural Catheter insertion
    d. Abdominal paracentesis
    e. Pleural tapping and biopsy
    f. Endotracheal intubation
    g. Lumbar puncture & Spinal Anesthesia
    h. Chest drain insertion
    i. Arterial Blood gases sampling and Arterial cannulation.
    j. Intravenous Cannulation.
    k. nasogastric and orogastric tube insertion
    l. Peripheral nerve blocks
    m. Tracheostomy.

3. Residents should be able to interpret basic laboratory data as related to the disorder/disease.

4. Basic understanding of routine laboratory and ancillary tests including complete blood count, chemistry panels, ECG, chest x-rays, pulmonary function tests, and body fluid cell counts.

5. Practice evidence—based learning with reference to research and scientific knowledge pertaining to their discipline through comprehensive training in Research Methodology.

6. Ability to recognize and appreciate the importance of cost-effectiveness of treatment modalities.

C. Practice-based Learning and Improvement

Trainee must demonstrate the ability to investigate and Evaluate their care of patients, to appraise and assimilate Scientific evidence, and to continuously improve patient care.

Based on constant self-evaluation and life-long learning.

Trainee are expected to develop skills and habits to be able to meet the following goals:

- Identify strengths, deficiencies, and limits in one's knowledge and expertise;
- Set learning and improvement goals;
- identify and perform appropriate learning activities;
- Systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;
- Incorporate formative evaluation feedback into daily practice;
- Locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;
- Use information technology to optimize learning; and,
- Participate in the education of patients, families, students, residents and other health professionals.

D. Interpersonal and Communication Skills

Trainee must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals.

Trainees are expected to:

- Communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;
- Communicate effectively with physicians, other health professionals, and health related agencies;
- Work effectively as a member or leader of a health care team or other professional group;
- Interact with consultants in a respectful, appropriate manner.
- Act in a consultative role to other physicians and health professionals; and, maintain comprehensive, timely, and legible medical records, if applicable.
- Maintain a comprehensive anesthesia record for each patient, including evidence of pre- and post-operative anesthesia assessment, the drugs administered, the monitoring employed, the techniques used, the physiologic variations observed, the therapy provided, and the fluids administered; and,
- Create and sustain a therapeutic relationship with patients, engage in active listening, provide information using appropriate language, ask clear questions, provide an opportunity for comments and questions.

E. Professionalism

Trainees are expected to demonstrate behaviors that reflect a commitment to continuous professional developmental, ethical practice, an understanding and sensitivity to diversity and a responsible attitude towards their patients, their profession, and society.

Trainee are expected to demonstrate:

- compassion, integrity, and respect for others;
- Responsiveness to patient needs that supersedes self- interest;
- Respect for patient privacy and autonomy;
- Accountability to patients, society and the profession;

- Sensitivity and responsiveness to a diverse patient population.
- Adhere to principles of confidentiality, scientific/academic integrity, and informed consent.
- Recognize and identify deficiencies in peer performance.
- Understand and demonstrate the skill and art of end of life care.

F. Systems-based Practice

Trainee must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

Trainee is expected to:

- Work effectively in various health care delivery settings and systems relevant to their clinical specialty;
- Coordinate patient care within the health care system relevant to their clinical specialty;
- Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population- based care as appropriate;
- Advocate for quality patient care and optimal patient care systems;
- Understand the limitations and opportunities inherent in various practice types and delivery systems, and develop strategies to optimize care for the individual patient.
- Work in inter-professional teams to enhance patient safety and improve patient care quality; and,
- Participate in identifying system errors and implementing potential systems solutions.

Scheme of the Course of MS Anaesthesiology program

A summary of five years course in MS Anesthesiology is presented as under

Course Structure	Components	Examination
At the End of **2nd year of the program**	• Basic Principal of Surgery & Medicine related to core Anaesthesia (as outlined in the curriculum)	Intermediate examination at the end of 2nd year of MS Anaesthesiology programme. **1. Written Paper** • MCQs= 100questions • SEQs = 10 questions **2. Clinical, TOACS/OSCE & ORAL** • Clinical Examination (Long case, Short cases, TOACS/OSCE & ORAL)
End of 5th Year of the Program	**Clinical component of M.S. Aaesthesiology** **Professional Education in Anaesthesiology** Training in Anaesthesiology during 3rd, 4th & 5th year of MS Anaesthesiology programme, with compulsory & optional rotations in relevant fields **Research component** **Research and Thesis Writing:** Research work / Thesis writing must be completed and thesis be submitted atleast 6 months before the end of final year of the program.	Final examination in specialized components of Anaesthesiology at the end of 5th year of MS Anaesthesiology programme. ▪ **Written:** Papers 1 & 2: Problem-based questions in the subject • MCQs = 200 • SEQs = 10 ▪ Paper 1 • 100 = MCQs • 5 = SEQs ▪ Paper 2 • 100 = MCQs • 5 = SEQs ▪ **Clinical, TOACS/OSCE & ORAL** Clinical Examination (Long case, Short cases) Oral Exam ▪ **Continuous Internal Assessment** Thesis examination with defense at the end of fifth (5th) year of MS Anaesthesiology program

Methods of Teaching & Learning during course conduction

All MS Anaesthesiology trainees will be rotated in peri –operative management of patients undergoing different surgeries and in internsive care unit including the following:

Preoperative assessment	ENT AND EYE surgery
Post-operative and recovery room care	Orthopaedic surgery
Day surgery	Urological Surgery
General Surgery	Gynaecological surgery
Trauma & Emergency	Obstetrics
Pediatric surgery	ICU & Critical care
Neurosurgery	Cardiothoracic & vascular surgery
Burns / Plastic surgery	Pain medicine

1. ***Mandatory Workshops:*** residents achieve hands on training while participating in mandatory workshops of Research Methodology, Advanced Life Support, Communication Skills, Computer & Internet and Clinical Audit. Specific objectives are given in detail in the relevant section of Mandatory Workshops.
2. ***Core Faculty Lectures (CFL):*** Lectures are still an efficient way of delivering information. Good lectures can introduce new material or synthesize concepts students have through text-, web-, or field-based activities. ***Buzz groups*** can be incorporated into the lectures in order to promote more active learning.

3. ***Introductory Lecture Series (ILS):*** Various introductory topics are presented by subspecialty and general medicine faculty to introduce interns to basic and essential topics in internal medicine.

4. ***Seminar Presentation:*** Seminar is held in a noon conference format. Upper level residents present an in-depth review of a medical topic as well as their own research. Residents are formally critiqued by both the associate program director and their resident colleagues.

5. ***Journal Club Meeting (JC):*** A resident will be assigned to present, in depth, a research article or topic of his/her choice of actual or potential broad interest and/or application. Two hours per month should be allocated to discussion of any current articles or topics introduced by any participant. Faculty or outside researchers will be invited to present outlines or results of current research activities. The article should be critically evaluated and its applicable results should be highlighted, which can be incorporated in clinical practice. Record of all such articles should be maintained in the relevant department

6. ***Small Group Discussions/ Problem based learning/ Case based learning:*** Traditionally small groups consist of 8-12 participants. Small groups can take on a variety of different tasks, including problem solving, role play, discussion, brainstorming, debate, workshops and presentations. Generally students prefer small group learning to other instructional methods. From the study of a problem students develop principles and rules and generalize their applicability to a variety of situations PBL is said to develop problem solving skills and an integrated body of knowledge. It is a student-centered approach to learning, in which students determine what and how they learn.

Case studies help learners identify problems and solutions, compare options and decide how to handle a real situation.

7. ***Evening Teaching Rounds:*** During these sign-out rounds, the inpatient Chief Resident makes a brief educational presentation on a topic related to a patient currently on service, often related to the discussion from morning report. Serious cases are mainly focused during evening rounds.
8. ***Clinico-pathological Conferences:*** The clinicopathological conference, popularly known as CPC primarily relies on case method of teaching medicine. It is a teaching tool that illustrates the logical, measured consideration of a differential diagnosis used to evaluate patients. The process involves case presentation, diagnostic data, discussion of differential diagnosis, logically narrowing the list to few selected probable diagnoses and eventually reaching a final diagnosis and its brief discussion. The idea was first practiced in Boston, back in 1900 by a Harvard internist, Dr. Richard C. Cabot who practiced this as an informal discussion session in his private office. Dr. Cabot incepted this from a resident, who in turn had received the idea from a roommate, primarily a law student.
9. ***Evidence Based Medicine (EBM)*:** Residents are presented a series of noon monthly lectures presented to allow residents to learn how to critically appraise journal articles, stay current on statistics, etc. The lectures are presented by the program director.
10. ***Clinical Audit based learning:*** "Clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria…Where indicated, changes are implemented…and further monitoring is used to confirm improvement in

healthcare delivery." *Principles for Best Practice in Clinical Audit (2002, NICE/CHI)*

11. ***Peer Assisted Learning:*** Any situation where people learn from, or with, others of a similar level of training, background or other shared characteristic. Provides opportunities to reinforce and revise their learning. Encourages responsibility and increased self-confidence. Develops teaching and verbalization skills. Enhances communication skills, and empathy. Develops appraisal skills (of self and others) including the ability to give and receive appropriate feedback. Enhance organizational and team-working skills.
12. ***Morbidity and Mortality Conference (MM)*****:** The M&M Conference is held occasionally at noon throughout the year. A case, with an adverse outcome, though not necessarily resulting in death, is discussed and thoroughly reviewed. Faculty members from various disciplines are invited to attend, especially if they were involved in the care of the patient. The discussion focuses on how care could have been improved.
13. ***Self-directed learning:*** self-directed learning residents have primary responsibility for planning, implementing, and evaluating their effort. It is an adult learning technique that assumes that the learner knows best what their educational needs are. The facilitator's role in self-directed learning is to support learners in identifying their needs and goals for the program, to contribute to clarifying the learners' directions and objectives and to provide timely feedback. Self-directed learning can be highly motivating, especially if the learner is focusing on problems of the immediate present, a potential

positive outcome is anticipated and obtained and they are not threatened by taking responsibility for their own learning.

14. ***Learning through maintaining log book: it is*** used to list the core clinical problems to be seen during the attachment and to document the student activity and learning achieved with each patient contact.
15. ***Learning through maintaining portfolio:*** Personal Reflection is one of the most important adult educational tools available. Many theorists have argued that without reflection, knowledge translation and thus genuine "deep" learning cannot occur. One of the Individual reflection tools maintaining portfolios, Personal Reflection allows students to take inventory of their current knowledge skills and attitudes, to integrate concepts from various experiences, to transform current ideas and experiences into new knowledge and actions and to complete the experiential learning cycle.
16. ***E-learning/web-based medical education/computer-assisted instruction:*** Computer technologies, including the Internet, can support a wide range of learning activities from dissemination of lectures and materials, access to live or recorded presentations, real-time discussions, self-instruction modules and virtual patient simulations. distance-independence, flexible scheduling, the creation of reusable learning materials that are easily shared and updated, the ability to individualize instruction through adaptive instruction technologies and automated record keeping for assessment purposes.
17. ***Research based learning:*** All residents in the categorical program are required to complete an academic outcomes-based research project during their training. This project can consist of original bench top laboratory research, clinical research or a combination of both. The research work shall

be compiled in the form of a thesis which is to be submitted for evaluation by each resident before end of the training. The designated Faculty will organize and mentor the residents through the process, as well as journal clubs to teach critical appraisal of the literature.

A crisp detail about modern Tools of Assessment intended to be used for the course

- **360-DEGREE EVALUATION INSTRUMENT- MULTI-SOURCE FEEDBACK (MSF):**
  360-degree evaluations consist of measurement tools completed by multiple people in a person's sphere of influence. Evaluators completing rating forms in a 360-degree evaluation usually are superiors, peers, subordinates, and patients and families. Most 360-degree evaluation processes use a survey or questionnaire to gather information about an individual's performance on several topics (e.g., teamwork, communication, management skills & decision-making). Most 360-degree evaluations use rating scales to assess how frequently a behavior is performed (e.g., a scale of 1 to 5, with 5 meaning "all the time" and 1 meaning "never"). The ratings are summarized for all evaluators by topic and overall to provide feedback. Evaluators provide more accurate and less lenient ratings when the evaluation is intended to give formative feedback rather than summative evaluations. A 360-degree evaluation can be used to assess ACGME criteria including interpersonal and communication skills, professional behaviors, and some aspects of patient care and systems-based practice.

- **CHART STIMULATED RECALL ORAL EXAMINATION (CSR)**
  In a chart stimulated recall (CSR) examination patient cases of the examinee (resident) are assessed in a standardized oral examination. A trained and experienced physician examiner questions the examinee about the care provided probing for reasons behind the work-up, diagnoses, interpretation of clinical findings, and treatment plans. The examiners rate the examinee using a well-established protocol and scoring procedure. In efficiently designed CSR oral exams each patient case (test item) takes 5 to 10 minutes. A typical CSR exam is two hours with one or two physicians as examiners per separate 30 or 60-minute session. These exams assess clinical decision-making and the application or use of medical knowledge with actual patients.

- **CHECKLIST EVALUATION**
  Checklists consist of essential or desired specific behaviors, activities, or steps that make up a more complex competency or competency component.

Typical response options on these forms are a check ( ) or "yes" to indicate that the behavior occurred or options to indicate the completeness (complete, partial, or absent) or correctness (total, partial, or incorrect) of the action. The forms provide information about behaviors but for the purpose of making a judgment about the adequacy of the overall performance, standards need to be set that indicate, for example, pass/fail or excellent, good, fair, or poor performance. Checklists are useful for evaluating any competency and competency component that can be broken down into specific behaviors or actions. Documented evidence for the usefulness of checklists exists for the evaluation of patient care skills (history and physical examination, procedural skills) and for interpersonal and communication skills. Checklists have also been used for self-assessment of practice-based learning skills (evidence-based medicine). Checklists are most useful to provide feedback on performance because checklists can be tailored to assess detailed actions in performing a task.

- **OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE)**

  In an objective structured clinical examination (OSCE) one or more assessment tools are administered at 12 to 20 separate standardized patient encounter stations, each station lasting 5-10 minutes. Between stations candidates may complete patient notes or a brief written examination about the previous patient encounter. All candidates move from station to station in sequence on the same schedule. Standardized patients are the primary assessment tool used in OSCEs, but OSCEs have included other assessment tools such as data interpretation exercises using clinical cases and clinical scenarios with mannequins, to assess technical skills. OSCEs have been administered in most of the medical schools worldwide, many residency programs, and by the licensure board examinations. The OSCE format provides a standardized means to assess: physical examination and history taking skills; communication skills with patients and family members, breadth and depth of knowledge; ability to summarize and document findings; ability to make a differential diagnosis, or plan treatment; and clinical judgment based upon patient notes.

- **PROCEDURE, OPERATIVE, OR CASE LOGS**

  Procedure, operative, or case logs document each patient encounter by medical conditions seen, surgical operation or procedures performed. The

logs may or may not include counts of cases, operations, or procedures. Patient case logs currently in use involve recording of some number of consecutive cases in a designated time frame. Operative logs in current use vary; some entail comprehensive recording of operative data by CPT code while others require recording of operations or procedures for a small number of defined categories.

Logs of types of cases seen or procedures performed are useful for determining the scope of patient care experience. Regular review of logs can be used to help the resident track what cases or procedures must be sought out in order to meet residency requirements or specific learning objectives. Patient logs documenting clinical experience for the entire residency can serve as a summative report of that experience; as noted below, the numbers reported do not necessarily indicate competence.

- **PATIENT SURVEYS**

  Surveys of patients to assess satisfaction with hospital, clinic, or office visits typically include questions about the physician's care. The questions often assess satisfaction with general aspects of the physician's care, (e.g., amount of time spent with the patient, overall quality of care, physician competency (skills and knowledge), courtesy, and interest or empathy). A typical patient survey asks patients to rate their satisfaction with care using rating categories (e.g., poor, fair, good, very good, excellent). Each rating is given a value and a satisfaction score calculated by averaging across responses to generate a single score overall or separate scores for different clinical care activities or settings. Patient feedback accumulated from single encounter questionnaires can assess satisfaction with patient care competencies (aspects of data gathering, treatment, and management; counseling, and education; preventive care); interpersonal and communication skills; professional behavior; and aspects of systems-based practice (patient advocacy; coordination of care). If survey items about specific physician behaviors are included, the results can be used for formative evaluation and performance improvement.

- **PORTFOLIOS**

  A portfolio is a collection of products prepared by the resident that provides evidence of learning and achievement related to a learning plan. A portfolio typically contains written documents but can include video- or audio-

recordings, photographs, and other forms of information. Reflecting upon what has been learned is an important part of constructing a portfolio. In addition to products of learning, the portfolio can include statements about what has been learned, its application, remaining learning needs, and how they can be met. In graduate medical education, a portfolio might include a log of clinical procedures performed; a summary of the research literature reviewed when selecting a treatment option; a quality improvement project plan and report of results; ethical dilemmas faced and how they were handled; a computer program that tracks patient care outcomes; or a recording or transcript of counseling provided to patients. Portfolios can be used for both formative and summative evaluation of residents. Portfolios are most useful for evaluating mastery of competencies that are difficult to evaluate in other ways such as practice-based improvement, use of scientific evidence in patient care, professional behaviors, and patient advocacy. Teaching experiences, morning report, patient rounds, individualized study or research projects are examples of learning experiences that lend themselves to using portfolios to assess residents.

- **RECORD REVIEW**

  Trained staff in an institution's medical records department or clinical department perform a review of patients' paper or electronic records. The staff uses a protocol and coding form based upon predefined criteria to abstract information from the records, such as medications, tests ordered, procedures performed, and patient outcomes. Record review can provide evidence about clinical decision-making, follow-through in patient management and preventive health services, and appropriate use of clinical facilities and resources (e.g., appropriate laboratory tests and consultations). Often residents will confer with other clinical team members before documenting patient decisions and therefore, the documented care may not be directly attributed to a single resident but to the clinical team.

- **SIMULATIONS AND MODELS**

  Simulations used for assessment of clinical performance closely resemble reality and attempt to imitate but not duplicate real clinical problems. Key attributes of simulations are that: they incorporate a wide array of options resembling reality, allow examinees to reason through a clinical problem with little or no cueing, permit examinees to make life-threatening errors

without hurting a real patient, provide instant feedback so examinees can correct a mistaken action, and rate examinees' performance on clinical problems that are difficult or impossible to evaluate effectively in other circumstances. Simulation formats have been developed as paper-and-pencil branching problems (patient management problems or PMPs), computerized versions of PMPs called clinical case simulations (CCX®), role-playing situations (e.g., standardized patients (SPs), clinical team simulations), anatomical models or mannequins, and combinations of all three formats. Mannequins are imitations of body organs or anatomical body regions frequently using pathological findings to simulate patient disease. The models are constructed of vinyl or plastic sculpted to resemble human tissue with imbedded electronic circuitry to allow the mannequin to respond realistically to actions by the examinee. Virtual reality simulations or environments (VR) use computers sometimes combined with anatomical models to mimic as much as feasible realistic organ and surface images and the touch sensations (computer generated haptic responses) a physician would expect in a real patient. The VR environments allow assessment of procedural skills and other complex clinical tasks that are difficult to assess consistently by other assessment methods. Simulations using VR environments have been developed to train and assess anesthesiologists managing life-threatening critical incidents during surgery and residents responding to cardio-pulmonary incidents on a full-size human mannequin. Written and computerized simulations have been used to assess clinical reasoning, diagnostic plans and treatment for a variety of clinical disciplines as part of licensure and certification examinations. Standardized patients as simulations are described elsewhere.

- **<u>STANDARDIZED ORAL EXAMINATION</u>**

  The standardized oral examination is a type of performance assessment using realistic patient cases with a trained physician examiner questioning the examinee. The examiner begins by presenting to the examinee a clinical problem in the form of a patient case scenario and asks the examinee to manage the case. Questions probe the reasoning for requesting clinical findings, interpretation of findings, and treatment plans. An examinee can be tested on 18 to 60 different clinical cases. These exams assess clinical decision-making and the application or use of medical knowledge with realistic patients. Multiple-choice questions are better at assessing recall or understanding of medical knowledge.

- **WRITTEN EXAMINATION (MCQ)**
  A written or computer-based MCQ examination is composed of multiple-choice questions (MCQ) selected to sample medical knowledge and understanding of a defined body of knowledge, not just factual or easily recalled information. Each question or test item contains an introductory statement followed by four or five options in outline format. The examinee selects one of the options as the presumed correct answer by marking the option on a coded answer sheet. Only one option is keyed as the correct response. The introductory statement often presents a patient case, clinical findings, or displays data graphically. Medical knowledge and understanding can be measured by MCQ examinations. Comparing the test scores on in-training examinations with national statistics can serve to identify strengths and limitations of individual residents to help them improve. Comparing test results aggregated for residents in each year of a program can be helpful to identify residency training experiences that might be improved.

- **mini-Clinical Evaluation Exercise (mini-CEX)**
  This tool evaluates a clinical encounter with a patient to provide an indication of competence in skills essential for good clinical care such as history taking, examination and clinical reasoning. The trainee receives immediate feedback to aid learning. The can be used at any time and in any setting when there is a trainee and patient interaction and an assessor is available.

- **Direct Observation of Procedural Skills (DOPS)**
  A DOPS is an assessment tool designed to evaluate the performance of a trainee in undertaking a practical procedure, against a structured checklist. The trainee receives immediate feedback to identify strengths and areas for development.

- **Case-based Discussion (CbD)**
  The CbD assesses the performance of a trainee in their management of a patient to provide an indication of competence in areas such as clinical reasoning, decision-making and application of medical knowledge in relation to patient care. It also serves as a method to document

conversations about, and presentations of, cases by trainees. The CbD should focus on a written record (such as pre-op assessment, intra-op management, post-op/ recovery room discharge notes).

- **Acute Care Assessment Tool (ACAT)**
  The ACAT is designed to assess and facilitate feedback on a doctor's performance during their practice on the Acute Medical Take. Any doctor who has been responsible for the supervision of the Acute Medical Take can be the assessor for an ACAT.

- **Audit Assessment (AA)**
  The Audit Assessment tool is designed to assess a trainee's competence in completing an audit. The Audit Assessment can be based on review of audit documentation OR on a presentation of the audit at a meeting. If possible the trainee should be assessed on the same audit by more than one assessor.

- **Teaching Observation (TO)**
  The Teaching Observation form is designed to provide structured, formative feedback to trainees on their competence at teaching. The Teaching Observation can be based on any instance of formalized teaching by the trainee who has been observed by the assessor. The process should be trainee-led (identifying appropriate teaching sessions and assessors).

- **Decisions on progress (ARCP)**
  The Annual Review of Competence Progression (ARCP) is the formal method by which a trainee's progression through her/his training programme is monitored and recorded. ARCP is not an assessment – it is the review of evidence of training and assessment. The evidence to be reviewed by ARCP panels should be collected in the trainee's ePortfolio.

Intermediate Examination MS Anaesthesiaology

All candidates admitted in MS Anaesthesiaology course shall appear in Intermediate Examination at the end of 2nd calendar year.

Eligibility Criteria: The candidate of M.S. Anaesthesiaology appearing in Intermediate Examination of the Programme are required.

a) To have submitted certificate of completion of mandatory workshops.

b) To have submitted certificate of completion of first two years of training from the supervisor/ Supervisors of rotations.

c) To have submitted CIS assessment proforma from his/her own supervisor on 03 monthly basis and also from his/her supervisors during rotation, achieving a cumulative score of 75%.

d) To have submitted certificate of approval of synopsis or undertaking / affidavit that if synopsis not approved with 30 days of submission of application for the Intermediate Examination, the candidate will not be allowed to take the examinations and shall be removed from the training program.

e) To have submitted evidence of payment of examination fee.

Intermediate Examination Schedule and Fee

a) Intermediate Examination at completion of two years training, will be held twice a year.

b) There will be a minimum period of 30 days between submission of application for the examination and the conduction of examination.

c) Examination fee will be determined periodically by the University.

d) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.

e) The Controller of Examinations will issue Roll Number Slips on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee.

Written Part of Intermediate Examination

- MCQs = 100 questions
- SEQs = 10 questions

50% Principals of Internal Medicine

50% Principals of General Surgery

Total Marks = 300

Clinical, TOACS/OSCE & ORAL

- 4 Short Courses = 100 Marks
- 1 Long Course = 50 Marks
- TOACS/OSCE & ORAL = 50 Marks

Total = 200

Declaration of Results

The Candidate will have to score 50% marks in written, clinical and Toacs/OSCE & Oral components and a cumulative score of 60% to be declared successful in the Intermediate Examination.

A maximum of four consecutive attempts (availed or unavailed) will be allowed in the Intermediate Examination during which the candidate will be allowed to continue his training program. If the candidate fails to pass his Intermediate Examination within the above mentioned limit of four attempts, the candidate shall be removed from the training program, and the seat would fall vacant, stipend/ scholarship if any would be stopped.

Final Examination MS Anaesthesiology

(at the end of 5th year of the Program)

Eligibility Criteria:

To appear in the Final Examination the candidate shall be required:

i) To have submitted the result of passing Intermediate Examination.

ii) To have submitted the certificate of completion of training, issued by the Supervisor which will be mandatory.

iii) To have achieved a cumulative score of 75% in Continuous Internal assessments of all training years.

iv) To have got the thesis accepted and will then be eligible to appear in Final Examination.

v) To have submitted no dues certificate from all relevant departments including library, hostel, cashier etc.

vi) To have submitted evidence of submission of examination fee.

Final Examination Schedule and Fee

a) Final examination will be held twice a year.

b) The candidates have to satisfy eligibility criteria before permission is granted to take the examination.

c) Examination fee will be determined and varied at periodic intervals by the University.

d) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.

e) The Controller of Examinations will issue an Admittance Card with a photograph of the candidate on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee. This card will also show the Roll Number, date / time and venue of examination.

Components of Final Examination

- Written Part of Final Examination Total marks 500
- Clinical & Toacs/OSCE & Oral Total marks 500
- Contribution of CIS to the Final Examination Total marks 100
- Thesis Evaluation Total marks 400

Written Part of Final Examination

a) There will be two written papers which will cover the whole syllabus of the specialty of training with total marks of 500.

b) The written examination will consist of 200 single best answer type

Multiple Choice Questions (MCQs) and 10 Short Essay Questions (SEQs) .

c) The candidates scoring 50% marks in multiple choice question paper and short essay question paper will pass the written part of the final examination and will become eligible to appear in the clinical and oral examination.

d) The written part result will be valid for three consecutive attempts for

appearing in the Clinical and Oral Part of the Final Examination. After

that the candidate shall have to re-sit the written part of the Final Examination.

Clinical and Toacs/OSCE & Oral

a) The Clinical and Oral Examination will consist of 04 short cases, 01 long case and Oral Examination with 01 station for a pair of Internal and External Examiner Each short case will be of 07 minutes duration, 05 minutes will be for examining the patient and 02 minutes for discussion. The Oral Examination will consist of laboratory data assessment, interpretation of Radiology images, ECG and others.

b) The Total Marks of Clinical & Oral Examination will be 500 and to be divided as follows:

- Short Cases Total Marks = 200
- Long Case Total Marks = 100
- TOACS/OSCE & ORAL Total Marks = 200

c) A panel of four examiners will be appointed by the Vice Chancellor and of these two will be from RMU whilst the other two will be the external examiners. Internal examiner will act as a coordinator. In case of difficulty in finding an Internal Examiner in a given subject, the Vice Chancellor would, in consultation with the concerned Deans, appoint any relevant person with appropriate qualification and experience, outside the University as an examiner.

d) The internal examiners will not examine the candidates for whom they have acted as Supervisor and will be substituted by other internal examiner.

e) The candidates scoring 50% marks in each component of the Clinical & Oral Examination will pass this part of the Final Examination.

f) The candidates will have two attempts to pass the final examination with normal fee. A special administration fee of Rs.10,000 in addition to normal fee or the amount determined by the University from time to time shall be charged for further attempts.

Declaration of Result

For the declaration of result

I. The candidate must get his/her Thesis accepted.

II. The candidate must have passed the final written examination with

50% marks and the clinical & oral examination securing 50% marks.

The cumulative passing score from the written and clinical/ oral examination shall be 60%. Cumulative score of 60% marks to be calculated by adding up secured marks of each component of the examination i.e written and clinical/ oral and then calculating its percentage.

III. The MS degree shall be awarded after acceptance of thesis and success in the final examination.

IV. On completion of stipulated training period, irrespective of the result (pass or fail) the training slot of the candidate shall be declared vacant.

Submission / Evaluation of Synopsis

1. The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on university website.

2. The research topic in clinical subject should have 30% component related to basic sciences and 70% component related to applied clinical sciences.

The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.

3. Synopsis of research project shall be submitted by the end of the 2nd year of MS program. The synopsis after review by an Institutional Review Committee, shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / D0ean /Head of the institution.

Submission of Thesis

1. Thesis shall be submitted by the candidate duly recommended by the Supervisor.

2. The minimum duration between approval of synopsis and submission of thesis shall be one year.

3. The research thesis must b0e compiled and bound in accordance with the

Thesis Format Guidelines approved by the University and available on website.

4. The research thesis will be submitted along with the fee prescribed by the University.

Thesis Examination

a) The candidate will submit his/her thesis at least 06 months prior to completion of training.

b) The Thesis along with a certificate of approval from the supervisory will be submitted to the Registrar's office, who would record the date / time etc. and get received from the Controller of Examinations within 05 working days of receiving.

c) The Controller of Examinations will submit a panel of eight examiners within 07 days for selection of four examiners by the Vice Chancellor. The Vice Chancellor shall return the final panel within 05 working days to the Controller of Examinations for processing and assessment. In case of any delay the Controller of Examinations would bring the case personally to the Vice Chancellor.

d) The Supervisor shall not act as an examiner of the candidate and will not take part in evaluation of thesis.

e) The Controller of Examinations will make sure that the Thesis is submitted to examiners in appropriate fashion and a reminder is sent after every fifteen days.

f) The thesis will be evaluated by the examiners within a period of 06 weeks.

g) In case the examiners fail to complete the task within 06 weeks with 02 fortnightly reminders by the Controller of Examinations, the Controller of Examinations will bring it to the notice of Vice Chancellor in person.

h) In case of difficulty in find an internal examiner for thesis evaluation, the Vice Chancellor would, in consultation with the concerned Deans, appoint any relevant person as examiner in supersession of the relevant Clause of the University Regulations.

i) There will be two internal and two external examiners. In case of difficulty in finding examiners, the Vice Chancellor would, in consultation with the concerned Deans, appoint minimum of three, one internal and two external examiners.

j) The total marks of thesis evaluation will be 400 and 60% marks will be required to pass the evaluation.

k) The thesis will be considered / accepted, if the cumulative score of all the examiners is 60%.

l) The clinical training will end at completion of stipulated training period but the candidate will become eligible to appear in the Final Examination at completion of clinical training and after acceptance of thesis. In case clinical training ends earlier, the slot will fall vacant after stipulated training period.

Award of MS Anaesthesiology Degree

After successful completion of the structured courses of MS Anaesthesiology and qualifying Intermediate and Final examinations (written, Clinical, TOACS/OSCE & ORAL and Thesis), the degree with title **MS Anaesthesiology** shall be awarded.

SECTION – II

Details of curriculum of MS ANAESTHESIOLOGY Program

RAWALPINDI MEDICAL UNIVERSITY

RAWALPINDI

1) Curriculum for Intermedite Examination
2) Curriculum for final Examination

CURRICULUM

TABLE OF CONTENTS

For Intermediate Module

I. Basic Principles of Surgery & Medicine related to Anesthesia

A. BASIC SCIENCES

- Anatomy
- Physics, Monitoring, and Anesthesia Delivery Devices
- Mathematics
- Pharmacology

B. CLINICAL SCIENCES:

Anesthesia Procedures, Methods, and Techniques

- Evaluation of the Patient and Preoperative Preparation.
- Regional Anesthesia
- General Anesthesia
- Monitored Anesthesia Care and Sedation
- Intravenous Fluid Therapy During Anesthesia
- Complications (Etiology, Prevention, Treatment)
- Postoperative Period

C. ORGAN-BASED BASIC AND CLINICAL SCIENCES

- Central and Peripheral Nervous Systems.
- Respiratory System
- Cardiovascular System
- Gastrointestinal / Hepatic Systems
- Renal and Urinary Systems/ Electrolyte Balance

- Hematologic System
- Endocrine and Metabolic Systems
- Neuromuscular Diseases and Disorders

D. SPECIAL PROBLEMS OR ISSUES IN ANESTHESIOLOGY

- Physician Impairment or Disability: Substance Abuse, Fatigue, Aging, Visual and Auditory Impairment
- Ethics, Practice Management, and Medicolegal Issues

FOR FINAL EXAMINATION

II. Advanced Topics in Anesthesiology

A. BASIC SCIENCES

- Physics, Monitoring, and Anesthesia Delivery Devices
- Pharmacology

B. CLINICAL SCIENCES: Anesthesia Procedures, Methods, and Techniques.

- Regional Anesthesia
- Special Techniques

C. ORGAN-BASED BASIC AND CLINICAL SCIENCES.

- Central and Peripheral Nervous Systems
- Respiratory System
- Cardiovascular System
- Gastrointestinal / Hepatic Systems
- Renal and Urinary Systems / Electrolyte Balance: Clinical Science
- Hematologic System
- Endocrine and Metabolic Systems: Clinical Science
- Neuromuscular Diseases and Disorders: Clinical Science

D. CLINICAL SUBSPECIALTIES.

- Painful Disease States
- Pediatric Anesthesia
- Obstetric Anesthesia
- Otorhinolaryngology (ENT) Anesthesia: Airway Endoscopy; Microlaryngeal Surgery; Laser Surgery, Hazards, Complications (Airway Fires, Etc.)

- Anesthesia for Plastic Surgery, Liposuction
- Anesthesia for Laparoscopic Surgery; Cholecystectomy; Gynecologic Surgery; Gastric Stapling; Hiatus Hernia Repair; Anesthetic Management; Complications
- Ophthalmologic Anesthesia, Retrobulbar and Peribulbar Blocks; Open Eye Injuries
- Orthopedic Anesthesia; Tourniquet Management, Complications, Regional vs. General Anesthesia
- Trauma Anesthesia
- Anesthesia for Ambulatory Surgery
- Geriatric Anesthesia/Aging
- Critical Care

E. SPECIAL PROBLEMS OR ISSUES IN ANESTHESIOLOGY

- Electroconvulsive Therapy
- Organ Donors: Pathophysiology and Clinical Management
- Radiologic Procedures; CT Scan; MRI-Anesthetic Implications/Management, Anesthesia in Locations Outside the Operating Rooms
- Ethics, Practice Management, and Medicolegal Issues

Basic Topics in Anesthesiology

A. Basic Sciences

1. Anatomy

a. Topographical Anatomy as Landmarks

1) Neck: Cricothyroid Membrane, Internal and External Jugular Veins, Thoracic Duct, Carotid and Vertebral Arteries, Stellate Ganglion, Cervical Spine Landmarks (Vertebra Prominens, Chassaignac's Tubercle)

2) Chest: Pulmonary Lobes, Cardiac Landmarks, Subclavian Vein

3) Pelvis and Back: Vertebral Level of Topographical Landmarks, Caudal Space

4) Extremities: Relationship of Bones, Nerves, and Arteries

5) Dermatome Anatomy: Sensory and Motor

b. Radiological Anatomy

1) Chest (Including CT and MRI)

2) Brain and Skull (Including CT and MRI)

3) Spine (Cervical, Thoracic, Lumbar), Including CT and MRI

4) Neck (Including Doppler Ultrasound for Central Venous Access)

c. Clinical Anatomy

1) Upper Extremity

a) Bones

b) Vasculature

c) Innervation

2) Lower Extremity

a) Bones

b) Vasculature

c) Innervation

2. Physics, Monitoring, and Anesthesia Delivery Devices

a. Mechanics

1) Pressure Measurement of Gases, Liquids

2) Transducers, Regulators, Medical Gas Cylinders

3) Principles of Ultrasound: Obtaining an Image, Resolution, Depth, Frequency, Resonance

4) Principles of Doppler Ultrasound

b. Flow Velocity

1) Viscosity-Density; Laminar-Turbulent Flow

2) Flowmeters: Rotameter

c. Properties of Liquids, Gases, and Vapors

1) Diffusion of Gases

2) Solubility Coefficients

3) Relative and Absolute Humidity

4) Critical Temperature, Critical Pressure

d. Gas Laws

e. Vaporizers

1) Vapor Pressure and Calculation of Anesthetic Concentrations

2) Vaporizer Types and Safety Features

f. Uptake and Distribution of Inhalation Agents

1) Uptake and Elimination Curves; Effect of Ventilation, Circulation, Anesthetic Systems

2) Concentration Effect

3) Second Gas Effect

4) Nitrous Oxide and Closed Spaces

g. Physics of Anesthesia Machine/ Breathing System

1) Principles: Resistance, Turbulent Flow, Mechanical Deadspace, Rebreathing, Dilution, Leaks, Gas Mixtures, Humidity, Heat

2) Components: Connectors, Adaptors, Mask, Endotracheal Tube, Reservoir Bag Unidirectional Valves, Corrugated Breathing Tubes, Laryngeal Mask Airways, Airway Pressure Relief Valve

3) Characteristics

a) Circle Systems: Closed and Semi-Closed; Adult; Pediatric

b) Non-Circle Systems: Insufflation; Open; Semi-Open

c) Portable Ventilation Devices (Self-Reinflating, Non-Self-Reinflating), Non-Rebreathing Valves

d) CO2 Absorption: Principles, Canisters, Efficiency

e) Toxicity: Compound A, Carbon Monoxide

4) Oxygen Supply Systems: FiO2

5) Waste Gas Evacuation Systems

6) Safety Features (Proportioning Devices, Rotameter Configuration, Pressure Fail-Safe)

h. Monitoring Methods

1) Neuromuscular Function: Nerve Stimulators, Electromyography (Emg)

2) Ventilation: Respirometers, Inspiratory Force, Spirometry, Flow-Volume Loops
3) Gas Concentrations: O2, CO2, Nitrogen, Anesthetic Gases and Vapors

4) Temperature

5) Oxygen: Oximetry, Co-Oximetry, Pulse Oximetry

6) Blood Pressure - Noninvasive, Invasive

7) Heart Function: Heart Tones, Electrocardiogram

i. Instrumentation

1) Arterial and Venous Blood Gases: Electrodes for pH, PO2, PCO2, Calibration, Temperature Corrections, Errors

2) Gas Concentrations: Infrared Absorption, Mass Spectrometry, Raman Scatter Analysis

3) Pressure Transducers: Resonance, Damping

4) Non-Invasive Blood Pressure (BP) Measurement: Doppler, Oscillometry, Korotkoff Sounds, Palpation

5) Blood Warmers, Autotransfusion Devices

6) Body Warming Devices: Forced Air, Heating Lamps, Insulation Devices, Warming Blankets, Water-Flow “Second Skin” Devices

j. Ventilators

1) Classifications: Flow Generation vs. Pressure Generation

2) Principles of Action: Assistors, Controllers, Assist-Control; Pressure- Limited, Volume-Limited; FiO2 Control; Periodic Sigh, Inverse Ratio, High Frequency

Ventilation, Intermittent Mandatory Ventilation (IMV), Synchronized IMV, Pressure Support, Airway Pressure Release Ventilation (APRV), Pediatric Adaptation, Non-Invasive Techniques: Biphasic Positive Airway Pressure (BIPAP), Others

3) Monitors; Pressure (Plateau, Peak), Oxygen, Apnea, Inspiratory/Expiratory Ratio, Dynamic Compliance, Static Compliance

k. Alarms and Safety Features:

Operating Room, Electrical, Anesthesia Machine, Ventilators, Capnometer, Oxygen, Hemodynamic Monitors

l. Defibrillators:

Automatic Internal, External, Implantable; Energy, Cardioversion, Types of Waveforms (Monophasic, Biphasic); Paddle Size and Position; Automated External Defibrillators (AEDs)

m. Electrical; Fire and Explosion Hazards; Basic Electronics

1) Source of Ignition; Static

2) Prevention: Grounding, Isolation Transformers

3) Macro and Micro Current Hazards

4) Safety Regulations;

5) Risk Factors for Intraoperative Fire

3. Mathematics

a. Simple Math: Logarithms; Graph of Simple Equations; Exponential Function, Analysis of Biologic Curves

b. Statistics: Sample and Population; Probability; Mean, Median, and Mode; Standard Deviation and Error; T-Test; Chi-Square; Regression

Analysis/Correlation; Analysis of Variance, Power Analysis, Meta-Analysis, Confidence Intervals, Odds Ratio, Risk Ratio, Bland-Altman Plot

4. Pharmacology

a. General Concepts

1) Pharmacokinetics and Pharmacodynamics, Protein Binding; Partition Coefficients; PKA; Ionization; Tissue Uptake; Compartmentalization and Exponential Models

a) Pharmacokinetics of Neuraxial Drug Administration: Epidural and Subarachnoid

b) Tolerance and Tachyphylaxis

2) Termination of Action

a) Elimination; Biotransformation; Context-Sensitive Half-Time

b) Impact of Renal Disease

c) Impact of Hepatic Disease

3) Drug Interactions

a) Enzyme Induction and Inhibition

b) Hepatic Blood Flow

c) Drug-Drug Binding

d) Alternative and Herbal Medicines: Perioperative Implications

4) Drug Reactions (Anaphylactoid, Anaphylaxis, Idiosyncratic)

b. Anesthetics-Gases and Vapors

1) Physical Properties

2) Mechanism of Action

3) Effects on Central Nervous System (CNS)

4) Effects on Cardiovascular System

5) Effects on Respiration

6) Effects on Neuromuscular Function

7) Effects on Renal Function

8) Effects on Hepatic Function

9) Effects on Hematologic and Immune Systems

10) Biotransformation and Toxicity

11) Minimum Alveolar Concentration (MAC), Factors Affecting Mac

12) Trace Concentrations, OR Pollution, Personnel Hazards

13) Comparative Pharmacodynamics

c. Anesthetics-Intravenous (Opioid and Non-Opioid Induction and Anesthetic Agents)

1) Opioids

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

- Intravenous
- Epidural and Intrathecal

a) Metabolism and Excretion

b) Effect on Circulation

c) Effect on Respiration

d) Effect on Other Organs

e) Side Effects and Toxicity

f) Indications and Contraindications

2) Barbiturates

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

3) Propofol

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

4) Etomidate

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

5) Benzodiazepines

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

i) Antagonism

6) Ketamine

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

7) Dexmedetomidine

a) Mechanism of Action

b) Pharmacokinetics and Pharmacodynamics

c) Metabolism and Excretion

d) Effect on Circulation

e) Effect on Respiration

f) Effect on Other Organs

g) Side Effects and Toxicity

h) Indications and Contraindications

d. Anesthetics - Local

1) Uptake, Mechanism of Action

2) Biotransformation and Excretion

3) Comparison of Drugs and Chemical Groups

4) Prolongation of Action

5) Local Anesthetic Side Effects

a) CNS: Seizures, Cauda Equina Syndrome, Transient Neurological Symptom

b) Cardiac

c) Allergy

d) Preservatives/Additives

e) Methemoglobinemia

f) Local Anesthetic Systemic Toxicity

- American Society for Regional Anesthesia Checklist for Local Anesthetic Systemic
- Intravenous Lipid Emulsion for Local Anesthetic Systemic Toxicity

e. Muscle Relaxants (Depolarizing, Non-Depolarizing)

1) Mechanism of Action

2) Pharmacokinetics and Pharmacodynamics, Abnormal Responses

3) Prolongation of Action; Synergism

4) Metabolism and Excretion

5) Side Effects and Toxicity

6) Indications and Contraindications

7) Antagonism of Blockade

8) Drug Interactions (Antibiotics, Antiepileptics, Lithium, Magnesium, Inhalational Anesthetics)

B. Clinical Sciences: Anesthesia Procedures, Methods, and Techniques

1. Evaluation of the Patient and Preoperative Preparation

a. Physical Examination Including Airway Evaluation

b. Laboratory Evaluation

- American Society of Anesthesiologists (ASA) Preoperative Testing Guidelines
- American College of Cardiology/American Heart Association Guidelines for Perioperative Cardiovascular Evaluation

c. ASA Physical Status Classification

d. Preparation for Anesthesia/Premedication

1) Interaction with Chronic Drug Therapy; Interaction with Anesthetic Agents

2) Adverse Reactions to Premedications; Patient Variability, Dose Response Curves, Side Effects

3) Specific Problems in Disease States: Hyperthyroidism and Hypothyroidism, Drug Abuse, Glaucoma, Uremia, Increased CSF Pressure, Chronic Steroid Ingestion, Obesity, Obstructive Sleep Apnea, Depression, COPD, Hypertension

4) Pediatric and Geriatric Doses, Routes of Administration

5) Role in Patients with Allergies

6) NPO and Full Stomach Status; Implications for Airway Management, Choice of Anesthesia Technique and Induction of Anesthesia; Gastric Emptying Time; Preoperative; Full Stomach and Induction of Anesthesia; Practice Guidelines for Preoperative Fasting

- Alteration of Gastric Fluid Volume and pH, Sphincter Tone

7) Continuation vs. Discontinuation of Chronic Medications: Antihypertensives, Anti-Anginal, Antihyperglycemics, Antidepressants, Platelet Inhibitors, Etc.

8) Prophylactic Cardiac Risk Reduction: Beta-Adrenergic Blockers, Etc.

9) Prophylactic Antibiotics

a) Indications

b) Risks of Administration

c) Drug Interactions

2. Regional Anesthesia

a. General Topics: Premedication, Patient Position, Equipment, Monitoring and Sedation

b. Spinal, Epidural, Caudal, Combined Spinal/Epidural

1) Indications, Contraindications

2) Sites of Actions

3) Factors Influencing Onset, Duration, and Termination of Action

4) Systemic Toxicity, Test Dose

5) Complications; Precipitating Factors, Prevention, Therapy, Implications of Anticoagulants and Platelet Inhibitors: American Society of Regional Anesthesia and Pain Medicine (ASRA) Guidelines

6) Physiologic Effects (GI, Pulmonary, Cardiac, Renal)

c. IV Regional:

Mechanism, Agents, Indications, Contraindications, Techniques, Complications

d. Transversus Abdominis Plane Blocks: Indications, Risks, Side Effects

3. General Anesthesia

a. Stages and Signs of Anesthesia; Awareness Under Anesthesia

b. Techniques: Inhalational, Total Intravenous, Combined Inhalational/Intravenous

c. Airway Management

- Assessment/Identification of Difficult Airway: Anatomic Correlates, Mallampati Classification, Range of Motion
- Techniques for Managing Airway: Awake vs. Asleep, Use vs. Avoidance of Muscle Relaxants, Drug Selection, Retrograde Intubation Techniques, ASA Difficult Airway Algorithm
- Devices: Flexible Fiberoptic, Rigid Fiberoptic, Transillumination, Laryngoscope Blades, Alternative Intubating Devices, Video Laryngoscopes
- Alternatives and Adjuncts: Laryngeal Mask Airway (Traditional and Modified), Esophageal Obturator Airways, Occlusive Pharyngeal Airways
- Transcutaneous Or Surgical Airway: Tracheostomy, Cricothyroidotomy, Translaryngeal Or Transtracheal Jet Ventilation
- Endobronchial Intubation: Double-Lumen Endobronchial Tubes; Bronchial Blockers, Placement and Positioning Considerations, Postoperative Considerations
- Intubation and Tube Change Adjuncts: Bougies, Jet Stylettes, Soft and Rigid Tube Change Devices; Complications

- Endotracheal Tube Types: Tube Material (Polyvinyl Chloride, Silicone, Laser-Resistant, Silver Impregnated, Other), Tube Tip Design (Murphy Eyes, Flexible Tip, Moveable Tip, Short- Bevel), Cuff Design (High vs. Low Volume/Pressure, Cuffed Vs Uncuffed, Cuff Shape), Cuff Pressure Management (Lanz Valves, Active Management, Pilot Balloon, Inflation Valve), Specific Tube Types (Wire-Reinforced, Nasal and Oral Rae®, Microlaryngeal, Supraglottic Secretion Suctioning, Other), Microlaryngoscopy; Laser Safe

d. ASA Monitoring Standards

4. Monitored Anesthesia Care and Sedation

a. Techniques

b. Risks and Complications

c. ASA Guidelines for Sedation, Sedation Guidelines for Non- Anesthesiologists

d. Indications/Contraindications

5. Intravenous Fluid Therapy During Anesthesia

a. Water, Electrolyte, Glucose Requirements and Disposition

b. Crystalloid vs. Colloid

c. Fluid Requirements and Fluid Deficit Calculations

d. Normal Saline vs. Lactated Ringers' vs. Plasmalyte vs. D5W

e. Enhanced Recovery After Surgery Protocol for Fluid Therapy

6. Complications (Etiology, Prevention, Treatment)

a. Trauma

1) Upper Airway, Epistaxis

2) Larynx, Trachea, and Esophagus

3) Eyes: Corneal Abrasions, Blindness, Post-op visual loss

4) Vascular; Arterial and Venous Thrombosis; Thrombophlebitis; Sheared Catheter, Intra- Arterial Injections, Air Embolism, Cardiac/Vascular Perforations, Pulmonary Artery Rupture

5) Neurological: Pressure Injuries of Mask, Tourniquet, Body Position, Intraneural Injections, Retractors, Peripheral Neuropathies

6) Burns

b. Chronic Environmental Exposure; Fertility, Teratogenicity, Carcinogenicity, Scavenging

c. Temperature

1) Hypothermia: Etiology, Prevention, Treatment, Complications (Shivering, O2 Consumption), Prognosis

2) Nonmalignant Hyperthermia; Complications, Treatment

d. Bronchospasm

e. Anaphylaxis

1) Latex Allergy

2) Other

f. Laryngospasm

g. Postobstructive Pulmonary Edema

h. Aspiration of Gastric Contents

i. Malignant Hyperthermia

1) Genetics

2) Pathophysiology

7. Postoperative Period

a. Pain Relief

1) Pharmacologic

a) Drugs: Opioids, Agonist-Antagonists, Local Anesthetics, Alpha-2 Agonists, Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), N-Methyl-D-Aspartate (NMDA) Receptor Blockers, tricyclic antidepressants (TCA), selective serotonin reuptake inhibitor (SSRI)

b) Routes: Oral, Subcutaneous (SC), Transcutaneous, Transmucosal, Intramuscular (IM), Intravenous (IV), Including Patient-Controlled Analgesia (PCA), Epidural, Spinal, Interpleural, Other Regional Techniques

2) Other Techniques; Transcutaneous Electrical Nerve Stimulation (TENS); Cryotherapy; Acupuncture, Hypnosis

b. Respiratory Consequences of Anesthesia and of Surgical Incisions

c. Cardiovascular Consequences of General and Regional Anesthesia: Differential Diagnosis and Treatment of Postoperative Hypertension and Hypotension

d. Nausea and Vomiting

1) Physiology; Etiology; Risk Factors, Preventive Strategies

2) Use of Antacids, Histamine-2 (H2) Blockers, Metoclopramide, Transdermal Scopolamine, Droperidol, Serotonin Antagonists, Proton Pump Inhibitors, Dexamethasone, Multimodal Therapy, Acupressure/Acupuncture

e. Neuromuscular Consequences: Residual Paralysis, Muscle Soreness, Recovery of Airway Reflexes

f. Neurologic Consequences of Anesthesia: Confusion, Delirium, Cognitive Dysfunction, Failure to emerge from anesthesia

C. Organ-Based Basic and Clinical Sciences

1. Central and Peripheral Nervous Systems

a. Physiology

1) Brain

a) Cerebral Cortex; Functional Organization

b) Subcortical Areas: Basal Ganglia, Hippocampus, Internal Capsule, Cerebellum, Brain Stem, Reticular Activating System

c) Cerebral Blood Flow

- Effect of Perfusion Pressure, Ph, PaCO2, PaO2, and Cerebral Metabolic Rate for O2 (CMRO2); Inverse Steal; Gray vs. White Matter
- Autoregulation: Normal, Altered, and Abolished
- Pathophysiology of Ischemia/Hypoxia: Global vs. Focal, Glucose Effects, Effects of Brain Trauma or Tumors

d) Cerebrospinal Fluid

- Formation, Volume, Composition, Flow and Pressure
- Blood-Brain Barrier, Active and Passive Molecular Transport Across, Causes of Disruption
- Relation to Blood Chemistry and Acid-Base Balance

e) Cerebral Protection

- Hypothermia
- Anesthetic and Adjuvant Drugs

2) Spinal Cord

- General Organization
- Spinal Reflexes
- Spinal Cord Tracts
- Evoked Potentials

3) Neuromuscular and Synaptic Transmission

- Morphology; Receptors, Receptor Density
- Membrane Potential; Mechanism
- Action Potential; Characteristics, Ion Flux
- Synapse; Transmitters, Precursors, Ions, Termination of Action, Transmission Characteristics, Presynaptic and Postsynaptic Functions

4) Skeletal Muscle Contractions; Depolarization, Role of Calcium, Actin/Myosin; Energy Source and Release

5) Pain Mechanisms and Pathways

- Nociceptors and Nociceptive Afferent Neurons, Wind-Up Phenomenon
- Dorsal Horn Transmission and Modulation
- Spinal and Supraspinal Neurotransmission and Modulation; Opioid Receptors
- Autonomic Contributions to Pain; Visceral Pain Perception and Transmission
- Social, Vocational and Psychological Influences on Pain Perception
- Gender and Age Differences in Pain Perception

6) Autonomic Nervous System

- Sympathetic: Receptors; Transmitters, Synthesis; Storage; Release; Responses; Termination of Action
- Parasympathetic: Receptors; Transmitters; Synthesis; Release; Responses; Termination of Action
- Ganglionic Transmission
- Reflexes: Afferent and Efferent Limbs

7) Temperature Regulation

- Temperature Sensing; Central, Peripheral
- Temperature Regulating Centers; Concept of Set Point
- Heat Production and Conservation d) Heat Loss; Mechanisms e) Body Temperature Measurement; Sites; Gradients f) Effect of Drugs/Anesthesia on Temperature Regulation

b. Anatomy

1) Brain

Cerebral Cortex , Cerebellum, Basal Ganglia, Major Nuclei and Pathways

(2) Brain Stem

(a) Respiratory Centers

(b) Reticular Activating System

(3) Cerebral Circulation; Circle of Willis, Venous Sinuses and Drainage

2) Spinal Cord and Spine

a) Variations in Vertebral Configuration

b) Spinal Nerves (Level of Exit, Covering, Sensory Distribution)

c) Blood Supply

d) Sacral Nerves: Innervation of Pelvic Structures

3) Meninges: Epidural, Subdural and Subarachnoid Spaces

4) Parasympathetic Nervous System: Location of Ganglia, Vagal Reflex Pathways

5) Sympathetic Nervous System: Ganglia, Rami Communicantes, Sympathetic Chain

a) Cranial Nerves

b) Carotid and Aortic Bodies, Carotid Sinus

c) Ganglia, Rami Communicantes, Sympathetic Chain

d) Nociception

(1) Peripheral Nociceptors: Transduction

(2) Afferent Pathways: Neurons, Dorsal Horn, CNS Pathways

2. Respiratory System

a. Physiology: Lung Functions and Cellular Processes

1) Lung Volumes

a) Definitions; Methods of Measurement; Normal Values; Time Constants

b) Spirometry; Static and Dynamic Volumes; Deadspace; Nitrogen Washout, O2 Uptake, CO2 Production, Exercise Testing

2) Lung Mechanics

a) Static and Dynamic Compliance, Pleural Pressure Gradient, Flow-Volume Loops and Hysteresis, Surfactant, Laplace Law

b) Resistances; Principles of Gas Flow Measurement

c) Methods of Measurement

d) Work of Breathing

e) Regulation of Airway Caliber

3) Ventilation - Perfusion

a) Distribution of Ventilation

b) Distribution of Perfusion, Zones, Hypoxic Pulmonary Vasoconstriction

c) Alveolar Gas Equation

4) Diffusion

a) Definition, Pulmonary Diffusion Capacity

b) Apneic Oxygenation, Diffusion Hypoxia

5) Blood Gas

a) O2 Transport; O2 Physical Solubility; Oxyhemoglobin (Hb-O2) Saturation, Hb-O2 Dissociation Curve; 2,3-Diphosphoglycerate (2,3-DPG), P50, Respiratory Enzymes; Hemoglobin (Hb) As A Buffer

b) CO2 Transport; Blood CO2 Content; Carbonic Anhydrase; CO2 Dissociation Curve; Bohr Effect, Haldane Effect

c) Systemic Effects of Hypercarbia and Hypocarbia

d) Systemic Effects of Hyperoxia and Hypoxemia

e) Basic Interpretation of Arterial Blood Gas

6) Control of Ventilation

a) Respiratory Center

b) Central and Peripheral Chemoreceptors; Proprioceptive Receptors; Respiratory Muscles and Reflexes; Innervation

c) CO_2 and O_2 Response Curves

7) Non-Respiratory Functions of Lungs: Metabolic, Immune

8) Perioperative Smoking

a) Physiologic effects

b) Cessation of smoking

b. Anatomy

1) Nose

2) Pharynx: Subdivisions; Innervation

3) Larynx

- Innervation; Muscles; Blood Supply; Cartilages
- Vocal Cords, Positions with Paralysis c) Differences Between Infant and Adult

4)Trachea

- Structure and Relationships in Neck and Chest

5) Muscles of Respiration, Accessory Muscles

c. Pharmacology

1) Bronchodilators

a) β-agonists

b) Anticholinergics

2) Antiinflammatory medications

a) Steroids

b) Leukotriene modifier drugs

c) Mast cell stabilizers

d) Immunoglobulin E (IgE) blockers

3. Cardiovascular System

a. Physiology

1) Cardiac Cycle

a) Control of Heart Rate

b) Synchronicity of Pressure, Flow, ECG, Sounds, Valve Action

c) Impulse Propagation

d) Normal ECG

e) Electrophysiology; Ion Channels and Currents

2) Ventricular Function

a) Frank-Starling Law; Preload and Afterload, Intracardiac Pressures

b) Force, Velocity, Length, Rate of Shortening

c) Myocardial Contractility, Measurement Limitations

d) Cardiac Output: Determinants and Regulation

e) Myocardial Oxygen Utilization

f) Systolic and Diastolic Function

g) Cardiac Output: Fick Principle

3) Venous Return

a) Vascular Compliance/Venous Capacitance; Controlling Factors

b) Muscle Action; Intrathoracic Pressure; Body Position

c) Blood Volume and Distribution

4) Blood Pressure

a) Systolic, Diastolic, Mean, and Perfusion Pressures

b) Intracardiac, Pulmonary, Venous

c) Systemic and Pulmonary Vascular Resistance, Viscosity

d) Baroreceptor Function

5) Microcirculation

a) Capillary Diffusion; Osmotic Pressure, Starling's Law

b) Pre-Post Capillary Sphincter Control

c) Viscosity; Rheology

6) Regional Blood Flow and Its Regulation

a) Cerebral and Spinal Cord

b) Coronary

c) Pulmonary

d) Renal

e) Splanchnic – Hepatic

f) Muscle and Skin

g) Uterine and Placental

7) Regulation of Circulation and Blood Volume

a) Central: Vasomotor Center, Hypothalamic-Pituitary-Adrenal Axis

b) Peripheral: Receptors and Reflexes

c) Hormonal Control

d) Mixed Venous Oxygen Tension and Saturation

8) Basics of Cardiopulmonary Resuscitation; Medications, Defibrillators, Advanced Cardiac Life Support (ACLS) Algorithms

b. Anatomy

1) Normal Anatomy of Heart and Major Vessels

a) Coronary Circulation

b) Heart Conduction System

c. Pharmacology

1) Digitalis; Actions and Toxicity

2) Inotropes

3) Phosphodiesterase III Inhibitors (Inodilators): Milrinone, Others

4) Antiarrhythmics

5) Antianginal Drugs

6) Vasodilators: Nitroprusside, Nitroglycerin, Hydralazine, Nesiratide, Calcium Channel Blockers, Others

7) Angiotensin Converting Enzyme Inhibitors and Angiotensin Blockers

8) Electrolytes (Potassium, Magnesium, Phosphorus, Calcium):

Cardiovascular Effects

9) Non-Adrenergic Vasoconstrictors: Vasopressin and Congeners

4. Gastrointestinal / Hepatic Systems

a. Physiology: Hepatic Function

1) Dual Blood Supply and Its Regulation

2) Metabolic and Synthetic Functions

3) Excretory Functions

4) Mechanisms of Drug Metabolism and Excretion, Cytochrome P450

5. Renal and Urinary Systems/ Electrolyte Balance

a. Physiology

1) Blood Flow, Glomerular Filtration, Tubular Reabsorption and Secretion

2) Renal Function Tests

3) Hormonal Regulation of Extracellular Fluid

4) Hormonal Regulation of Osmolality

5) Regulation of Acid-Base Balance

6) Drug Excretion

7) Water and Electrolytes: Distribution and Balance; Compartments

8) Renin-Angiotensin-Aldosterone System

b. Pharmacology

1) Diuretics

a) Mechanism of Action

b) Comparison of Drugs

c) Effect on Electrolytes and Acid-Base Balance

d) Adverse Effects

2) Dopaminergic Drugs

6. Hematologic System

a. Pharmacology

1) Anticoagulants, Antithrombotics, and Anti-Platelet Drugs

a) Mechanism of Action

b) Comparison of Drugs

c) Drug Interaction

d) Monitoring of Effects

e) Side Effects and Toxicity

f) Alternatives to Transfusion: Hemodilution, Sequestration, Autotransfusion, Blood Substitutes, Erythropoietin

2) Immunosuppressive and Anti-Rejection Drugs

b. Transfusions

1) Indications

2) Blood Preservation, Storage

3) Blood Filters and Pumps

4) Effects of Cooling and Heating; Blood Warmers

5) Blood Components, Volume Expanders

6) Preparation for Transfusion: Type and Cross, Type and Screen, Uncrossmatched Blood, Autologous Blood, Designated Donors

7) Synthetic and Recombinant Hemoglobins

c. Reactions to Transfusions

1) Febrile

2) Allergic

3) Hemolytic: Acute and Delayed

d. Complications of Transfusions

1) Infections: Hepatitis, Human Immunodeficiency Virus (HIV), Cytomegalovirus (CMV), Others

2) Citrate Intoxication

3) Electrolyte and Acid Base Abnormalities

4) Massive Transfusion: Coagulopathies, Hypothermia

5) Pulmonary

a)Transfusion-Related Acute Lung Injury

b)Transfusion-Related Circulatory Overload

6) Immunosuppression

7. Endocrine and Metabolic Systems

a. Physiology

1) Hypothalamus, Pituitary; Thyroid; Parathyroid, Adrenal Medulla, Adrenal Cortex and Pancreas

b. Biochemistry of Normal Body Metabolism

1) Carbohydrates

a) Aerobic and Anaerobic Utilization; Chemical Processes, Enzymes

b) Relationship to Hormones; Insulin; Human Growth Hormone, Glucocorticoids; Glucagon, Epinephrine

c) Effect of Stress

2) Proteins

a) Functions, Hormones, Antibodies

b) Cyclic Adenosine Monophosphate (CAMP); Cyclic Guanosine Monophosphate (CGMP)

c) Lipids: Triglycerides, Lipoproteins, Cholesterol

- Specific Organ Metabolism (Brain, Heart, Liver, Muscle)
-

8. Neuromuscular Diseases and Disorders

a. Physiology of Neuromuscular Transmission

1) Prejunctional Events: Acetylcholine Synthesis and Release, Modulation By Nicotinic and Muscarinic Prejunctional Receptors

2) Postjunctional Events: Acetylcholine Binding to Acetylcholine Receptors, Ion Flow Through Acetylcholine Receptor

b. Anatomy of the Neuromuscular Junction

1) Prejunctional Components: Motor Neurons, Neuronal Transport System, Synaptic Vesicles

2) Postjunctional Components: Muscle Cell, Acetylcholine Receptor

3) Perijunctional voltage-gated channels

D. Special Problems Or Issues in Anesthesiology

1. Physician Impairment Or Disability: Substance Abuse, Fatigue, Aging, Visual and Auditory Impairment.

2. Ethics, Practice Management, and Medicolegal Issues

a. Professionalism and Licensure

b. Ethics, Advance Directives/Do Not Resuscitate (DNR) Orders; Suspended DNR, Patient Privacy Issues.

c. Informed consent (principles, components)

d. Patient Safety

1) Medication Errors: Assessment and Prevention

2) Disclosure of Errors to Patients

e. Core Competencies .

II. Advanced Topics in Anesthesiology

A. Basic Sciences

1. Physics, Monitoring, and Anesthesia Delivery Devices

a. Monitoring Methods

1) Vascular Pressures: Arterial (Invasive/Noninvasive Differences), Central Venous (CVP), Pulmonary Arterial (PAP), Pulmonary Artery Occlusion (PAOP), Left Atrial (LAP), Left Ventricular End-Diastolic (LVEDP)

2) Heart Function: Heart Tones, Electrocardiogram (ECG), Echocardiography, Doppler, Cardiac Output

3) Brain and Spinal Cord Function: Electroencephalogram (EEG) (Raw and Processed), Depth of Anesthesia Monitors (Bispectral, Other), Evoked Potentials, Wake-Up Test, Intracranial Pressure (ICP), Jugular Venous Oxygen Saturation, Near Infrared Spectroscopy (Cerebral Oximetry), Transcranial Doppler

4) Mixed Venous Oxygen Saturation (SvO2)

5) Awareness Monitors

B. Instruments:

1) Cardiac Output: Fick, Dye Dilution, Thermodilution, Doppler, Impedance, Pulse Wave Analysis, Stoke Volume Assessment

2) Echocardiography: Technical Aspects, Complications

3) Coagulation Monitors

4) Ultrasound-Guided Placement of Invasive Catheters (Arterial, Central Venous) and Nerve Blocks

c. Ventilators

1) Continuous Positive Airway Pressure (CPAP) and Positive End-Expiratory Pressure (PEEP); Nasal CPAP

2) Nebulizers, Humidifiers, Drug Delivery Systems (Nitric Oxide, Others)

D. Pacemakers

1) Temporary Transvenous; Permanent (Epicardial, Endocardial), Transcutaneous

2) Types: Fixed Rate, Biventricular Synchronized, Ventricular, Atrial, Atrio-Ventricular (A-V) Sequential

3) Standard Nomenclature

4) Reasons for Failure or Malfunction

E. Electrical; Fire and Explosion Hazards

1) Basic Electronics

2) Lasers, Laser Safety, Laser-Safe Endotracheal Tubes

f. Drug Delivery Devices:

Patient-Controlled Intravenous and Epidural Analgesia, Epidural and Subarachnoid Continuous Drug Delivery Devices

2. Pharmacology a. General Concepts

1) Pharmacokinetics

a) Malignant Hyperthermia (Including Diagnosis and Therapy)

b) Butyrylcholinesterase (Pseudocholinesterase) Deficiency

c) Prolonged Qt Syndrome

d) Genetic Factors in Drug Dose-Response Relationships

2) Addiction

a) Physiology and Pharmacology

b) Patient Addiction: Anesthetic Implications

c) Addiction vs. Tolerance

B. Clinical Sciences: Anesthesia Procedures, Methods, and Techniques

1. Regional Anesthesia

a. Peripheral and Autonomic Nerve Blocks: Indications, Contraindications, Techniques, Clinical Assessment, Complications, Use of Nerve Stimulators, Use of Ultrasound

1) Head and Neck

2) Upper Extremity/Brachial Plexus

3) Trunk and Perineum

4) Lower Extremity

2. Special Techniques

a. Controlled Hypotension; Choice of Drugs, Use of Posture, Ventilation

b. Controlled Hypothermia; Techniques, Systemic Effects, Shivering, Rewarming, Complications

c. Hyperbaric Oxygen and Anesthesia Care

d. High Altitude Anesthesia

C. Organ-Based Advanced Clinical Sciences

1. Central and Peripheral Nervous Systems

a. Physiology

1) Metabolism: Substrates, Aerobic and Anaerobic

2) Intracranial Pressure

a) Brain Volume, Elastance and Compliance

b) Increased ICP, Herniation

3) Electroencephalography (EEG)

a) Wave Patterns, Frequency and Amplitude, Raw and Processed, Spectral Edge

b) Sleep, Convulsions; O2 and CO2; Hypothermia; Brain Death

c) Depth of Anesthesia; Burst Suppression, Electrical Silence, Specific Anesthetic and Drug Effects

4) Evoked Responses

a) Morphology, Effects of Ischemia and Anesthetics

b) Sensory: Somatosensory, Visual, Brainstem Auditory

c) Motor

b. Anatomy

1) Regional Anesthesia; Main Nerve Blocks (Includes Techniques and Comparisons of Techniques)

a) Autonomic: Stellate, Celiac, Lumbar Sympathetic

b) Head and Neck: Retrobulbar/Peribulbar, Facial, Trigeminal Nerve and Branches, Cervical Plexus, Glossopharyngeal, Superior Laryngeal, Transtracheal, Occipital

c) Extremities: Brachial Plexus (Interscalene, Supraclavicular, Infraclavicular, Axillary), Ulnar, Radial, Median, Musculocutaneous, Sciatic, Femoral, Lateral Femoral Cutaneous, Obturator, Lumbar Plexus (PSOAS Block), Popliteal Fossa, Ankle Block

d) Trunk: Intercostal, Paravertebral Somatic, Ilio-Inguinal, Genito-Femoral

e) Spine: Epidural (Cervical, Thoracic, Lumbar, Caudal, Transforaminal), Spinal (Subarachnoid), Combined Spinal-Epidural, Facet

c. Pharmacology

1) CNS Drugs for Non-Anesthetic Use (Major Actions, Comparison of Drugs; Effect on Respiration; Circulation, Adverse Effects)

a) Pre- and Postanesthetic Medications

(1) Opioids

(2) Opioid Antagonists, Agonist-Antagonists

b) Alpha-2 Agonists: Clonidine, Dexmedetomidine

c) Tranquilizers: Butyrophenones; Benzodiazepines

d) Anticonvulsants: Phenytoin, Carbamazepine, Gabapentin, Barbiturates, Others

e) Antidepressants, Anti-Parkinson Drugs

f) Arousal Agents: Physostigmine, Benzodiazepine Antagonists

g) Antiemetics and Aspiration Prophylaxis: Phenothiazines; Butyrophenones; Metoclopramide; Anticholinergics; Serotonin Antagonists, Antihistamines (H1 Blockers, H2 Blockers, Mixed Blockers), Antacids, Proton Pump Inhibitors

h) Substance Abuse and Addiction; Dependence

(1) Chronic Opioid Dependence and Therapy

(2) Pharmacologically-Assisted Opioid withdrawal

2) Autonomic Drugs

a) Sympathetic

(1) Transmitters and Types of Receptors

(2) Target Organ Effects; Metabolic Effects

(3) Agonists: Peripheral and Central Actions, Direct and Indirect Actions, Alpha vs. Beta vs. Mixed Agonists, Alpha and Beta-Receptor Subtype- Selective Agonists

(4) Antagonists: Alpha and Beta Blockers, Selective Blockers, Ganglionic Blockers

(5) Tocolytic Applications

b) Parasympathetic

(1) Transmitters

(2) Muscarinic Effects

(3) Nicotinic Effects

(4) Agonists: Cholinergic and Anticholinesterases

(5) Antagonists

d. Clinical Science

1) Central Nervous System

a) Seizures

b) Coma: Traumatic, Infectious, Toxic-Metabolic, Cerebrovascular Accident (CVA), Cerebral Hypoxia

(1) Glasgow Coma Scale, Management of Traumatic Brain Injury

(2) Therapeutic Barbiturate Coma

c) Drug Intoxication (CNS Drugs, Carbon Monoxide, Insecticides, Nerve Gases)

d) Paraplegia, Quadriplegia, Spinal Shock, Autonomic Hyperreflexia

(1) Airway Management in the Patient with Cervical Spine Disease

e) Tetanus

f) Special Problems of Anesthesia for Neurosurgery

(1) Increased Intracranial Pressure: Tumors, Hematomas, Hydrocephalus

(2) Positioning: Prone, Sitting, Other, Head Stabilization in Tongs

(3) Air Embolism

(4) Cerebral Protection from Hypoxia, Ischemia, Glucose Effects

(5) Aneurysms and A-V Malformations, Cerebral Vasospasm

(6) Interventional Neuroradiology; Coils and Embolization

(7) Pituitary Adenomas, Trans-Sphenoidal Hypophysectomy

(8) Anesthetic and Ventilatory Effects on Cerebral Blood Flow and Metabolism

(9) Fluid Management: Hypertonic Vs Isotonic Saline vs. Balanced Salt Solutions

(10) Spinal Fluid Drainage

(11) Stereotactic and Gamma-Knife Techniques, Deep Brain Stimulator Placement, Intra-Operative Wake-Up Techniques

(12) Ventriculostomy

(13) Awake Craniotomy

2. Respiratory System

a. Physiology:

Lung Functions and Cellular Processes

1) Ventilation - Perfusion

a) Measurement of Ventilation/Perfusion (V/Q) Ratio, Implications of Alveolar-Arterial O2 Gradient (A-aDO2), Arterial-Alveolar CO2 Gradient (A-aDCO2), Dead Space to Tidal Volume Ratio (Vd/Vt), Shunt Fraction (Qs/Qt), Lung Scan

b. Anatomy

1) Lungs

a) Divisions and Bronchoscopic Anatomy

b) Bronchial and Pulmonary Circulations

c) Microscopic Anatomy

c. Biochemistry

1) Normal Acid-Base Regulation: Buffer Systems; Compensatory Mechanisms;

2) Effects of Imbalance on Electrolytes and Organ Perfusion;

3) Strong Ionic Difference (SID);

4) ABG Interpretation;

a) Anion Gap;

b) Temperature Effect on Blood Gases: Alpha-Stat vs. pH-Stat

d. Clinical Science

1) Respiratory System

a) Obstructive Disease

(1) Upper Airway: Congenital, Infectious, Neoplastic, Traumatic, Foreign Body, Obstructive Sleep Apnea

(2) Tracheobronchial: Congenital, Infectious, Neoplastic, Traumatic, Foreign Body

(3) Parenchymal: Asthma, Bronchitis, Emphysema, COPD, Lung Abscess, Bronchiectasis, Cystic Fibrosis, Mediastinal Masses

b) Restrictive Disease

(1) Neurologic: CNS Depression, Spinal Cord Dysfunction, Peripheral Nervous System

(2) Musculoskeletal: Muscular, Skeletal, Obesity, Chest Trauma

(3) Parenchymal: Atelectasis, Pneumonia, Interstitial Pneumonitis, Pulmonary Fibrosis, Respiratory Distress Syndrome (ARDS), Bronchopulmonary Dysplasia

(4) Pleural and Mediastinal: Pneumo-, Hemo-, and Chylothorax, Pleural Effusion, Empyema, Bronchopleural Fistula

(5) Other: Pain, Abdominal Distention

c) Management of the Patient with Respiratory Disease

(1) Evaluation: History and Physical Examination, Chest X-Ray, Arterial Blood Gases (ABGs), Pulmonary Function Tests (PFTs); Assessment of Perioperative Risk

(2) Anesthetic Management

(a) Preoperative Preparation: Respiratory Therapy, Drug Therapy (Antibiotics, Bronchodilators, Mucolytics, Steroids), Tobacco Smoking Cessation (Techniques to Assist Patients, Benefits)

(b) Intraoperative Management

(1) Monitoring

(2) Choice of Anesthesia

(3) Anesthetic Techniques: Nonpulmonary Surgery, Thoracic and Pulmonary Surgery, One-Lung Ventilation, Thoracoscopic Techniques, Lung Transplantation, Mediastinoscopy

(c) Postoperative Care: Pain Management, Respiratory Therapy, Ventilator Support, Extubation Criteria

(3) Management of Respiratory Failure

(a) Nonventilatory Respiratory Management: O2 Therapy and Toxicity, Tracheobronchial Toilet, Positive Airway Pressure, Respiratory Drugs

(b) Ventilatory Management

(1) Criteria for Ventilatory Commitment and Weaning

(2) Mode of Ventilation: Conventional Mechanical Ventilation, Peep, CPAP, IMV, SIMV, Pressure Support, Pressure Control, High Frequency Ventilation (Positive

Pressure, Jet, Oscillation), Prone Ventilation, BIPAP, Airway Pressure-Release Ventilation

(3) Complications and Side Effects of Mechanical Ventilation: Volutrauma, Barotrauma, Biotrauma

(4) Management of Bronchospasm: Bronchodilator Drugs, Anti- Inflammatory Drugs, Acute and Chronic Management, Perioperative Management

(c) Other Management Adjuncts: Nitric Oxide, Steroids

(d) Lung Transplantation: Anesthetic Implications

3. Cardiovascular System

a. Normal Anatomy of Heart and Major Vessels

1) Echocardiographic Heart Anatomy: Chambers, Valves, Great Vessels, Pericardium, Basic Transesophageal Echocardiography (TEE) Views

2) Radiographic: Roentgenograms, CT, MRI

3) Other

b. Clinical Sciences

1) Ischemic Heart Disease

a) Risk Factors; Predictors of Perioperative Risk, Modification of Perioperative Risk (e.g., Prophylactic Beta-Blockers)

b) Manifestations

c) Diagnosis of Myocardial Infarction and Acute Coronary Syndrome; Clinical, ECG, Enzymes, Echocardiography, Nuclear Techniques,

d) Classification of types of MI (STEMI vs. demand)

e) Pharmacological Treatment of Angina, Thoracic Epidural for Angina, Interventional Cardiologic Techniques

f) Determinants of Myocardial Oxygen Requirements and Delivery, Silent Ischemia, Postoperative Ischemia

g) Perioperative Diagnosis and Treatment of Ischemia; ECG, TEE

h) Coronary Artery Bypass Procedures; Cardiopulmonary Bypass; of F-Pump Techniques

2) Valvular Heart Disease

a) Classification

b) Diagnosis (Including Echocardiography), Natural History, Surgical

Management

c) Anesthetic Considerations

d) Subacute Bacterial Endocarditis Prophylaxis

3) Rhythm Disorders and Conduction Defects

a) Chronic Abnormalities: Etiology, Diagnosis, Therapy

(1) Automated Implantable Cardioverter/Defibrillator (AICD) Implantation

(2) Pacemakers: Permanent, Temporary, Transvenous, Transcutaneous; Ventricular Synchronization

(3) Ablations, Cryotherapy, Maze Procedure

b) Perioperative Dysrhythmia: Etiology, Diagnosis, Therapy

c) Perioperative Implications of Pacemaker and AICD

4) Heart Failure and Cardiomyopathy (Ischemic, Viral, Hypertrophic)

a) Definition and Functional Classification, Perioperative Diagnosis and Treatment
b) Compensatory Responses

c) Right or Left Ventricular Dysfunction

(1) Etiology

(2) Signs and Symptoms

(3) Diagnostic Tests

(4) Systolic vs. Diastolic Dysfunction

d) Treatment

(1) Pulmonary Edema

(2) Pulmonary Hypertension

(3) Cardiogenic Shock

e) Cardiac Transplantation

5) Cardiac Tamponade and Constrictive Pericarditis

a) Etiology

b) Diagnosis; TEE, PA Catheter

c) Anesthetic Management

6) Circulatory Assist

a) Cardiopulmonary Bypass

(1) Components (Pump, Oxygenator, Heat Exchanger, Filters)

(2)

b) Cardiopulmonary Bypass Techniques

(3) Mechanisms of Gas Exchange

(4) Priming Solutions, Hemodilution

(5) Anticoagulation and Antagonism; Activated Clotting Time (ACT) and Other Clotting Times, Heparin Assays, Antithrombin III, Protamine Reactions, Heparin and Protamine Alternatives

(6) Prophylaxis with Aminocaproic Acid, Tranexamic Acid

(7) Anesthetic Considerations During Bypass

(8) Extracorporeal Membrane Oxygenation (ECMO)

(9) Cooling and Warming, Deep Hypothermic Circulatory Arrest

(10) Monitoring, Blood Pressure Management

(11) Minimally Invasive Bypass Techniques

(12) Myocardial Preservation: Physiology, Techniques, Complications

(13) Preconditioning

b) Minimal Invasive Cardiac Surgery

(1) Off-pump coronary artery bypass (OPCAB)

(2) Minimally invasive direct coronary artery bypass (MIDCAB)

(3) Percutaneous valve repair/replacement

c) Intraaortic Balloon: Rationale, Indications, Limitations

d) Ventricular Assist Devices and Artificial Heart: Internal and External

7) Pulmonary Embolism

a) Etiology: Blood, Air, Fat, Amniotic Fluid

b) Diagnosis, TEE Findings

c) Treatment; Acute, Preventive

8) Hypertension

a) Etiology, Pathophysiology, Course of Disease

b) Drug Treatment, Interactions with Anesthetics, Risk of Anesthesia

c) Intra or Postoperative Hypertension; Differential Diagnosis and Treatment

9) Shock States: Anesthetic Management of Patient in Shock

10) Vascular Diseases

a) Cerebral Circulation; Luxury Perfusion, Steals, Infarcts, Intracranial Hemorrhage

b) Carotid Endarterectomy: Anesthetic Management, Monitoring of Cerebral Perfusion, Complications

c) Abdominal Aneurysm Resection: Anesthetic Management

d) Peripheral Arteriosclerotic Disease

e) Aneurysms of Ascending, Descending and Arch of Aorta, Thoracoabdominal Aneurysms, Including Endovascular Repair Techniques

11) Cardiopulmonary Resuscitation

a) Recognition

b) Management - Drugs, Defibrillators, Monitors, Advanced Cardiac Life Support (ACLS) Algorithms

c) Complications and Outcomes of Therapy

d) Pediatric/Adult Differences

4. Gastrointestinal / Hepatic Systems

a. Biochemistry: Nutrition

1) Parenteral: Peripheral Or Central Vein, Hyperalimentation, Solutions Used and Complications, Anesthetic Implications

2) Enteral: GI Elemental Diets, Routes of Delivery, Complications, Anesthetic Implications

b. Clinical Science

1) Morbid Obesity/Anesthesia for Bariatric Surgery

a) Pre-Anesthetic Evaluation and Management

b) Pharmacologic Considerations

c) Anesthetic Management (Airway, Ventilation, Monitoring, Venous Access)

d) Postoperative Management (Ventilation, Analgesia)

2) Hepatic Disease

a) Preoperative Laboratory Assessment

b) Anesthesia Choice (Hepatocellular Disease, Ascites, Portal Hypertension)

c) Postoperative Hepatic Dysfunction, Hepatic Failure, Hepatorenal Syndrome d) Hepatic Transplantation

3) Intestinal Obstruction

a) Causes; Paralytic Ileus; Mechanical; Vascular

b) Physiological Changes; Fluid and Electrolyte; Respiratory

c) Anesthesia Management: Full Stomach; Fluid Therapy; Nitrous Oxide

5. Renal and Urinary Systems/ Electrolyte Balance: Clinical Science

a. Renal Disease

1) Pathophysiology of Renal Disease; Risk Factors for Acute Renal Failure

2) Anesthetic Choice in Reduced Renal Function

3) Anesthetic Management in Renal Failure, Arteriovenous (A-V) Shunts

4) Anesthetic Management in Renal Transplantation

5) Perioperative Oliguria and Anuria

6) Dialysis and Hemofiltration: Hemodialysis, Peritoneal Dialysis, Continuous Hemofiltration (Arteriovenous, Venovenous)

7) Pharmacologic Prevention and Treatment of Renal Failure

b. Urologic Surgery - Lithotripsy, Transurethral Resection of Prostate (TURP)/Irrigating Fluids/Hyponatremia

c. Perioperative Electrolyte Abnormalities

6. Hematologic System

a. Clinical Science

1) Hematologic Disorders

a) Diseases of Blood

(1) Anemias; Compensatory Mechanisms

(2) Polycythemias; Primary vs. Secondary

(3) Clotting Disorders

(a) Thrombocytopenia and Thrombocytopathy

(b) Congenital and Acquired Factor Deficiencies

(c) Disseminated Intravascular Coagulation

(d) Fibrinolysis

(e) Pharmacologic: Anticoagulants and Antagonists

(f) Coagulopathy in Trauma Patients

(4) Hemoglobinopathies, Porphyrias

b) Massive Transfusion Protocol

7. Endocrine and Metabolic Systems:

Clinical Science

a. Pituitary Disease

1) Hypopituitarism, Pituitary Removal - Substitution Therapy

a) Panhypopituitarism

b) Diabetes Insipidus

2) Hyperpituitarism

a) Acromegaly, Including Airway Management

b) Inappropriate ADH Secretion

b. Thyroid Disease

1) Hyperthyroidism

a) Metabolic and Circulatory Effects

b) Anesthetic Management

c) Thyroid Storm

2) Hypothyroidism

a) Metabolic and Circulatory Effects, Myxedema Coma

b) Substitution Therapy

c) Anesthetic Implications

3) Complications of Surgery: Hypocalcemia, Recurrent Laryngeal Nerve Injury, Diagnosis and Treatment

c. Parathyroid Disease

1) Hyperparathyroidism; Physiological Effects

2) Hypoparathyroidism; Postoperative Manifestations and Treatment

d. Adrenal Disease

1) Cushing's Syndrome

2) Primary Aldosteronism

3) Addison's Disease

4) Pheochromocytoma

a) Circulatory and Metabolic Manifestations

b) Diagnosis

c) Anesthetic Management

e. Carcinoid Syndrome

f. Diabetes Mellitus

1) Pathophysiology

2) Control of Blood Glucose - Hypoglycemia; Hyperglycemia and Ketoacidosis

3) Elective Anesthesia - Perioperative Management

4) Emergency Anesthesia

5) Hyperosmolar Coma

6) Pancreas Transplantation

8. Neuromuscular Diseases and Disorders:

Clinical Science

a. Demyelinating Diseases

1) Multiple Sclerosis

2) Motor Neuron Diseases: Amyotrophic Lateral Sclerosis, Spinobulbar Muscular Atrophy, Hereditary Spastic Paraplegia

3) Guillain-Barre Syndrome

4) Charcot-Marie-Tooth Disease

b. Primary Muscle Diseases

1) Muscular Dystrophies: Duchenne's, Becker's, Limb-Girdle, Congenital, Myotonic

2) Mitochondrial Myopathies

c. Channelopathies

d. Myasthenic Syndromes

1) Myasthenia Gravis

2) Lambert-Eaton Myasthenic Syndrome

3) Congenital Myasthenic Syndromes

e. Ion Channel Myotonias

1) Acquired Neuromyotonia

2) Myotonia Congenita

3) Hyperkalemic Periodic Paralysis, Paramyotonia Congenita, Postassium-Aggravated Myotonia

4) Hypokalemic Periodic Paralysis

D. Clinical Subspecialties

1. Painful Disease States

a. Pathophysiology

1) Acute Pain

2) Cancer-Related Pain

3) Chronic Pain States

a) Acute and Chronic Neck and Low Back Pain

b) Neuropathic Pain States

(1) Complex Regional Pain Syndrome, Types I and II

(2) Postherpetic Neuralgia

(3) Phantom Limb, Post-Stroke

(4) Peripheral Neuropathies (e.g., Diabetic Neuropathy)

c) Somatic Pain Conditions:

Myofascial Pain, Facet Arthropathy, etc. b. Treatment

1) Acute Postoperative and Posttraumatic Pain

a) Postoperative Epidural Analgesia

b) Neuraxial Opioids

c) Peripheral Nerve Blockade and Catheters

d) Patient-Controlled Analgesia

e) Other Modalities, Multimodal Analgesia (Nonsteroidal Analgesics, Electrical Stimulation, Acupuncture, Ketamine, etc.)

2) Cancer-Related Pain

a) Systemic Medications, Tolerance and Addiction

b) Continuous Spinal and Epidural Analgesia

c) Neurolytic and Non-Neurolytic Blocks

d) World Health Organization Analgesic Ladder

3) Chronic Pain (Non-Cancer-Related)

a) Systemic Medications: Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), Opioid Analgesics, Anticonvulsants, Antidepressants

b) Spinal and Epidural Analgesia

c) Peripheral Nerve Blocks

d) Sympathetic Nerve Blocks

e) Other Techniques: TENS, Spinal Cord Stimulation, Neuroablation (Surgical and Chemical Neurolysis)

2. Pediatric Anesthesia

a. Apparatus: Breathing Circuits (Advantages/Disadvantages, Dead Space, Etc.), Humidity, Thermal Control

1) Endotracheal Tube Selection (Cuffed vs. Uncuffed) and Sizing

2) Warming Devices: Types, Efficacy, Complications

b. Premedication: Drugs; Dosage; Routes; Vehicles, Including Topical Anesthetics; Parental Presence

c. Agents and Techniques

1) Induction Techniques

2) Anesthetics: Actions Different From Adults

a) Drug Toxicities Preferentially Occurring in Children: e.g., Propofol

b) Opioid Dosing and Sensitivity

c) Neuromuscular Blockers (Sensitivity, Congenital Diseases, Complications of Succinylcholine, Age-Related and Drug-Related Pharmacodynamics and Pharmacokinetics)

d) Regional Anesthesia

d. Fluid Therapy and Blood Replacement, Physiologic Anemia, Glucose Requirements

e. Problems in Intubation and Extubation (Full Stomach, Diaphragmatic Hernia, Tracheo Esophageal (T-E) Fistula, Pierre-Robin, Treacher-Collins, Crouzon's, Goldenhar's, Hurler's, Awake/Fiberoptic Intubation, Dentition, Laryngospasm, Stridor)

f. Neonatal Physiology

1) Respiratory

a) Development, Anatomy, Surfactant

b) Pulmonary Oxygen Toxicity

c) Pulmonary Function

d) Lung Volumes vs. Adult

e) Airway Differences, Infant vs. Adult

2) Cardiovascular

a) Transition, Fetal to Adult

b) Persistent Fetal Circulation

3) Retinopathy of Prematurity: Anesthetic Implications

4) Metabolism, Fluid Distribution and Renal Function

5) Thermal Regulation (Neutral Temperature, Nonshivering Thermogenesis)

6) Fetal Hemoglobin

7) Prematurity, Apnea of Prematurity

8) Bronchopulmonary Dysplasia

g. Congenital Heart and Major Vascular Disease

1) Cyanotic Defects

2) Acyanotic Defects

3) Primary Pulmonary Hypertension

4) Major Vascular Malformations: Coarctation, Persistent Patent Ductus Arteriosus, Vascular Rings.

5) Altered Uptake/Distribution of IV and Inhalation Anesthetics

6) Anesthetic Considerations

a) Cardiac Surgery; Corrective and Palliative

b) Noncardiac Surgery

c) Chronic Congenital Heart Disease, Corrected, Uncorrected, and Palliated

(1) In Childhood Beyond the Newborn and Infant Periods

(2) In Adulthood

h. Emergencies in the Newborn

1) Diaphragmatic Hernia

2) Tracheoesophageal Fistula and Esophageal Atresia

3) Neonatal Lobar Emphysema

4) Pyloric Stenosis

5) Necrotizing Enterocolitis

6) Omphalocele/Gastroschisis

7) Respiratory Distress Syndrome: Etiology, Management, Ventilation Techniques

8) Myelomeningocele

i. Pediatric Medical Problems with Anesthetic Implications

1) Respiratory: Upper Respiratory Infections (Colds, Epiglottitis, Laryngotracheobronchitis), Bronchopulmonary Dysplasia, Cystic Fibrosis

2) Musculoskeletal: Muscular Dystrophies, Myotonias, Etc.

3) Developmental Delay, Cerebral Palsy, Autism

4) Childhood Obesity

5) Endocrine Diseases: Childhood Diabetes, Congenital Adrenal Hyperplasia, Etc.

6) Skeletal Abnormalities with Or without Systemic Implications: Klippel-Feil, Achondroplasia, Marfan's, Morquio's, Osteogenesis Imperfect

7) Trisomy 21 and Other Chromosomal Abnormalities

8) Juvenile Rheumatoid Arthritis

9) Anemias: Congenital and Acquired: Iron Deficiency, Physiologic Anemia, Sickle Cell, Thalassemia, Etc.

10) Malignant Hyperthermia in Children; Susceptibility, Associated Diseases, Anesthetic Management of MH Susceptibility, Intraoperative Diagnosis, Treatment

j. Anesthetic Implications for Common Non-Neonatal Pediatric Subspecialty Surgery

1) Otolaryngology: Cleft Lip and Palate, Tonsillectomy and Adenoidectomy, Common Ear Procedures, Peritonsillar Abscess, Flexible and Rigid Bronchoscopy, Diagnostic and Therapeutic Laryngoscopy Techniques (Jet Ventilation, Laser Implications), Airway Foreign Bodies

2) Neurosurgery: Craniotomies for Tumor Or Vascular Malformations, Hydrocephalus, Ventriculoperitoneal Shunts, Craniofacial Procedures, Tethered Spinal Cord, Halo Placement Implications

3) Thoracic Surgery: Anterior Mediastinal Mass, Lung Isolation Techniques, Pectus Excavatum and Carinatum

4) General and Urologic Surgery: Laparotomy vs Laparoscopy, Bowel Surgery, Urologic Surgery (Wilms Tumor, Ureteral Reimplantation, Bladder and Urethral Malformations, Neuroblastoma)

5) Orthopedic Surgery: Fractures and Dislocations, Congenital Hip Dysplasia, Foot and Hand Malformations; Scoliosis Implications and Repair

6) Ophthalmologic: Strabismus, Cataract, Glaucoma Procedures, Etc.

k. Outpatient Pediatric Anesthesia

1) Indications and Contraindications

2) Anesthetic Considerations: Premedication, Induction, Maintenance, Monitoring

3) Postoperative Considerations: Recovery Period, Discharge Criteria, Post-Discharge Monitoring/Follow-Up

l. Postoperative Analgesia

1) Systemic Medications and Routes of Administration, Multimodal Therapy

2) Regional Techniques: Caudal, Epidural, Nerve Blocks

m. Postoperative Nausea and Vomiting:

Risk Factors, Prophylaxis, Treatment

n. Pediatric Sedation:

Guidelines, Pharmacology, Credentialing, Indications, Monitoring, Complications

o. Pediatric Anesthesia Outside the Operating Rooms: Diagnostic and Interventional Radiologic Procedures, Gastroenterology Laboratory, MRIs, Radiation Therapy

3. Obstetric Anesthesia

a. Maternal Physiology

1) Effects of Pregnancy on Uptake and Distribution

2) Respiratory (Anatomy, Lung Volumes and Capacities, Oxygen Consumption, Ventilation, Blood Gases, Acid Base)

3) Cardiovascular (Aorto-Caval Compression, Regulation of Uterine Blood Flow)

4) Renal

5) Liver (Albumin/Globulin Ratio, Protein Binding of Drugs)

6) Gastrointestinal (Gastric Acid, Motility, Anatomic Position, Gastroesophageal Sphincter Function)

7) Hematology (Blood Volume, Plasma Proteins, Coagulation)

8) Placenta

a) Placental Exchange - O_2, CO_2

b) Placental Blood Flow

c) Barrier Function

b. Maternal-Fetal Considerations

1) Pharmacology

a) Anesthetic Drugs and Adjuvants

b) Oxytocic Drugs (Indications, Adverse Effects)

c) Tocolytic Drugs (Indications, Adverse Effects)

d) Antiseizure Drugs; Interactions (Magnesium Sulfate)

e) Mechanisms of Placental Transfer, Placental Transfer of Specific Drugs

f) Fetal Disposition of Drugs

g) Drug Effects on Newborn

2) Amniotic Fluid (Amniocentesis, Oligohydramnios, Polyhydramnios)

3) Antepartum Fetal Assessment and Therapy (Ultrasonography, FHR Monitoring, Nonstress Test, Stress Test, Biophysical Profile)

4) Anesthetic Techniques and Risks (Elective vs. Emergency, General vs. Regional)
a) Systemic Medications: Opioids, Sedatives, Inhalational Agents

b) Regional Techniques

(1) Epidural, Caudal, Spinal, Combined Spinal/Epidural

(2) Paracervical Block, Lumbar Sympathetic Block, Pudendal Block

c) Complications (Aspiration, Nerve Palsies)

5) Physiology of Labor (Metabolism, Respiration, Cardiovascular, Thermoregulation)

6) Influence of Anesthetic Technique on Labor

7) Cesarean Delivery: Indications, Urgent/Emergent, Anesthetic Techniques and Complications, Difficult Airway, Aspiration Prophylaxis

c. Pathophysiology of Complicated Pregnancy

1) Problems During Pregnancy and Delivery

a) Anesthesia for Cerclage or Non-Obstetric Surgery

b) Ectopic Pregnancy

c) Spontaneous Abortion

d) Gestational Trophoblastic Disease (Hydatid Mole)

e) Autoimmune Disorders (Lupus, Antiphospholipid Syndrome)

f) Endocrine (Thyroid, Diabetes, Pheochromocytoma)

g) Heart Disease (Valvular Disorders, Pulmonary Hypertension, Congenital Heart Disease, Arrhythmias, Cardiomyopathy)

h) Hematologic (Sickle Cell Anemia, Idiopathic Thrombocytopenic Purpura, Von Willebrand Disease, Disseminated Intravascular Coagulation (DIC), Anticoagulant Therapy, Rh and ABO Incompatibility)

i) Hypertension (Chronic, Pregnancy-Induced)

j) Neurologic (Seizures, Myasthenia, Spinal Cord Injury, Multiple Sclerosis, Subarachnoid Hemorrhage)

k) Respiratory (Asthma, Respiratory Failure)

l) Renal

m) Human Immunodeficiency Virus Infection

2) Problems of Term and Delivery

a) Intrapartum Fetal Assessment (Fetal Heart Rate Monitoring, Fetal Scalp Blood Gases, Fetal Pulse Oximetry)

b) Preeclampsia and Eclampsia

c) Supine Hypotensive Syndrome

d) Aspiration of Gastric Contents

e) Embolic Disorders (Amniotic Fluid Embolism, Pulmonary Thromboembolism)

f) Antepartum Hemorrhage (Placenta Previa, Abruptio Placenta, Uterine Rupture)
g) Postpartum Hemorrhage (Uterine Atony, Placenta Accreta)

h) Cord Prolapse

i) Retained Placenta

j) Dystocia, Malposition, and Malpresentation (Breech, Transverse Lie)

k) Maternal Cardiopulmonary Resuscitation

l) Fever and Infection

m) Preterm Labor

n) Vaginal Birth After Cesarean Section (VBAC)

o) Multiple Gestation

3) Resuscitation of Newborn

a) Apgar Scoring

b) Umbilical Cord Blood Gas Measurements

c) Techniques and Pharmacology of Resuscitation

d) Intrauterine Surgery (Maternal and Fetal Considerations, Intrauterine Fetal Resuscitation)

4. Otorhinolaryngology (ENT) Anesthesia:

Airway Endoscopy; Microlaryngeal Surgery; Laser Surgery, Hazards, Complications (Airway Fires, Etc.)

5. Anesthesia for Plastic Surgery, Liposuction

6. Anesthesia for Laparoscopic Surgery; Cholecystectomy; Gynecologic Surgery; Gastric Stapling; Hiatus Hernia Repair; Anesthetic Management; Complications

7. Ophthalmologic Anesthesia, Retrobulbar and Peribulbar Blocks; Open Eye Injuries

8. Orthopedic Anesthesia; Tourniquet Management, Complications, Regional Vs. General Anesthesia

9. Trauma Anesthesia

a. Massive Trauma

1) Evaluation of the Trauma Patient

2) Hemorrhagic Shock

b. Burn Management

c. Mass Casualty

1) Crisis Management and Teamwork

d. Biological Warfare

10. Anesthesia for Ambulatory Surgery

a. Patient Selection and Preoperative Management

b. Anesthetic Management

c. Discharge Criteria and Postoperative Follow-Up, Including Continuous Nerve Blocks

d. Office-Based Anesthesia: Equipment, Safety, Organization, Patient Management

11. Geriatric Anesthesia / Aging

a. Pharmacological Implications, MAC Changes

b. Physiological Implications: CNS, Circulatory, Respiratory, Renal, Hepatic

12. Critical Care

a. Shock States

1) Etiology, Classification, Pathophysiology

2) Septic Shock and Life-Threatening Infection

3) Systemic Inflammatory Response Syndrome

4) Multiple Organ Dysfunction Syndrome

b. Poisoning and Drug Overdose

c. Near-Drowning

d. Infection Control

1) General and Universal Precautions

2) Needle Stick Injury

3) Catheter Sepsis

4) Nosocomial Infections

5) Antibiotics: Antibacterial, Antifungal, Antiviral, Antiparasitic; Antimicrobial Resistance

e. Ventilator Management

1) Volume Controlled; Pressure Controlled; PEEP, Inspired Oxygen Concentration; Tidal Volume

2) Pressure Support; Weaning

E. Special Problems or Issues in Anesthesiology

1. Electroconvulsive Therapy

2. Organ Donors: Pathophysiology and Clinical Management

3. Radiologic Procedures; CT Scan; MRI-Anesthetic Implications/Management, Anesthesia in Locations Outside the Operating Rooms

4. Ethics, Practice Management, and Medicolegal Issues

a. Professionalism and Credentialing, Licensure

b. Ethics, Advance Directives/Do Not Resuscitate (DNR) Orders; Patient Privacy Issues

c. Malpractice: Definition, Legal Actions and Consequences, National Practitioner Database, Closed Claims Findings, Anesthetic Accidents, Professional Liability Insurance

d. Practice Management; Medicare/Medicaid Requirements

e. Primary Certification, Recertification, Maintenance of Certification and Related Issues (Professional Standing, Lifelong Learning, Cognitive Knowledge, Clinical Practice Assessment, Systems-Based Practice)

f. Costs of Medical/Anesthesia Care, Operating Room Management

g. Patient Safety

1) Definitions: Medical Error, Adverse Event, Sentinel Event

2) Medication Errors: Assessment and Prevention

3) Reporting: Mandatory and Voluntary Systems, Legal Requirements

4) Disclosure of Errors to Patients

5) Safety Practices: Process-Based, Evidence-Based

6) Root Cause Analysis

h. Quality Improvement

1) Quality Improvement Basics: Design, Analysis, Implementation of Quality Improvement Project

a) Anesthesia Quality Institute; Data Entry; Information

b) Lean Six Sigma; Assessing QI Methods; Approach

c) Physician Quality Reporting System: Significance and Role in Practice

d) Barriers to Quality Improvement.

Teaching Strategy:

- OR rooms teaching rounds and DOPS
- Seminars
- Small group discussions
- Problem based learning
- Didactic lectures
- Case Based Discussion (CBD)
- Self-directed learning
- Follow up clinics
- Skill teaching in ward settings
- Clinic pathological conferences

Assessment:

- OSCE
- MCQs
- SEQs
- Long case
- Short case

Evaluation/Feedback

- 360 degree evaluation to judge the professionalism, ethics.
- A formal evaluation and verbal discussion with the PGT is to be done at the end of the rotation / PGTs are encouraged to discuss with the supervisor, co- supervisor and program director/Dean their learning experiences, difficulties or conflicts.

- Evaluation of training program by trainees pertinent to effectiveness and efficiency of program to equip trainees with necessary skills.

Attributes required other than knowledge

Patient Care	**Evaluation of Patient Care**	**Professionalism**	**Interpersonal and Communication Skills**	**Practice Based Learning Improvement**	**Evaluation of Medical Knowledge**
Obtain a complete history and recognize common abnormal physical findings. Construct a master problem list, a working diagnosis, and a group of differential diagnoses. Be familiar with different diagnostic tools such as the electronic thermometer, sphygmomanometer, ophthalmoscope, EKG machine, pulse oximetry, and defibrillator. Become familiar with the concept of pre-test and post-test probabilities of disease. Be able to perform various clinical procedures such as venipuncture, thoracentesis, paracentesis, lumbar puncture, arthrocentesis, skin punch-biopsy, endotracheal intubation, and central line placement. Residents should know indications of potential complications of each of these procedures. Understand how to improve patient/physician relationships in a professional way. Residents should be compassionate, but humble and honest, not only with their patients, but also with their co-workers. Residents are encouraged to develop leadership in teaching and supervising interns and medical students. Actively participate in all phases of patient care. Residents are encouraged to read on	Completeness and accuracy of medical interviews and physical examinations. Thoroughness of the review of the available medical data on each patient. Performance of appropriate maneuvers and procedures on patients. Accuracy and thoroughness of patient assessments Appropriateness of diagnostic and therapeutic decisions. Soundness of medical judgment. Consideration of patient preferences in making therapeutic decisions. Completeness of medical charting.	The resident should continue to develop his/her ethical behavior, and must show the humanistic qualities of respect, compassion, integrity and honesty. The resident must be willing to acknowledge errors and determine how to avoid future similar mistakes. The resident must be responsible and reliable at all times. The resident must always consider the needs of patients, families, colleagues, and support staff. The resident must maintain a professional appearance at all times.	The resident should learn when to call a sub-specialist for evaluation and management of a patient. The resident should be able to clearly present a case to the attending staff in an organized and thorough manner. The resident must be able to establish rapport with a patient and listen to the patient's complaints to promote the patient's welfare. The resident should provide effective education and counseling for patients. The resident must write organized legible notes. The resident must communicate any patient problems to the attending staff in a timely fashion.	The resident should use feedback and self-evaluation in order to improve performance. The resident should read pertinent required material and articles provided to enhance learning. The resident should use the medical literature search tools in the library to find appropriate articles related to interesting cases. The resident should use information provided by senior residents and attendings from rounds and consultations to improve performance and enhance learning	The resident's ability to answer directed questions and to participate in attending rounds. The resident's presentation of patient history and physical exam, where attention is given to differential diagnosis and pathophysiology. When time permits, residents may be assigned short topics to present at attending grounds. These will be examined for completeness, accuracy, organization and the residents understanding of the topic. The resident's ability to apply the information learned from attending round sessions to the patient care setting. The residents interest level in learning.

related topics,to share new learning with their colleagues and to keep their fund of knowledge up-to-date. Learn to use the computer for literature searches, to read and analyze scientific articles.					

RECOMMENDED BOOKS

1. Aithenhead A. R., Smith G., Rowbotham D. J. Textbook of Anaesthesia. 5th ed. Churchill Livingstone

2. Morgan G. E., Mikail M. S., Murray M. J. Clinical Anaesthesiology. 4th ed. Lange

3. Yao and Artusio's. Anaesthesiology:Problem oriented Patient Management 5th ed. Lippincott Williams and Wilking

4. David P. D. and Kenny G. N. C. Basic Physics and Measurement in Anaesthesia. 5th ed. Butterworth Heinmann

5. Fathalla M. F. and Fathalla M. M. F. A Practical Guide for Health

Researcher. Cairo: World Health Organization; 2004.

RECOMMENDED JOURNALS

1. British Journal of Anaesthesiology
2. Anaesthesia (British Journal)
3. Anaesthesia and Analgesia (American Journal)
4. Anaesthesia and Critical Care (British Journal)

ROTATIONS

Anesthesia training in Year 1 & 2 will focus on the basic principles and skills, followed by Year 3&4 with subspecialty training and Year 5 will offer further subspecialty training. The training in basic principles of Surgery and Medicine related to Anaesthesia will be carried out in the Department of Anaesthesia by the faculty of Anaesthesia.

Core training in Anesthesia and Basic Principles of Surgery and Medicine :(First 2 years)

A. Introduction to Anesthesia (6 months):

1 Preoperative assessment

2. Premedication

3. Post-operative and recovery room care

4. Perioperative management of emergency patients

5. Induction of general anaesthesia

6. Intraoperative care

7. Infection control

8. Management of cardiac arrest in adults and children.

9. Mandatory workshops

10. Synopsis preparation.

B. Core Anaesthesia (18 months):

Basics of Surgery:

1. Basic Airway management & Critical incident management- 2week

2. Day surgery - 2 weeks

3. General Surgery & Trauma - 6 months

4. Urological Surgery- 1 month

5. Gynaecological surgery- 1 month

6. Head, neck, maxillo-facial and dental surgery - 2 weeks

7. Orthopaedic surgery -1 month

Basics of Medicine

1. Intensive care medicine - 2 months

2. Outside theatre - 2 weeks

3. Obstetrics - 3 months

4. Paediatrics- 2 months

Specialty training (Year 3 & 4) - Focus on Subspecialty training (24 months)

Essential units:

1. Anaesthesia for neurosurgery, neuroradiology and neurocritical care - 1 month

2. Cardiothoracic, Vascular & Thoracic Anaesthesia - 2 months

3. Intensive care medicine - 2 months

4. Day surgery- 2 weeks

5. General Surgery & Trauma and stabilisation - 5 months

6. Urological Surgery - 1 month

7. Gynaecological surgery - 1 month

8. Head, neck, maxillo-facial and dental surgery- 2 weeks

9. Outside theatre - 2week

10. Orthopaedic surgery - 1 month

11. Regional - 1 month

12. Sedation - 2 weeks

13. Obstetrics - 3 months

14. Paediatric - 3 months

15. Pain medicine - 1 month

Minor Rotations:

16. Ophthalmic - 2 weeks

17. Plastics/burns - 2 weeks

Year 5 - Focused Advanced training

May elect to do up to 6 months in two of the following subspecialties:

1. Anaesthesia for Neurosurgery, Neuroradiology and Neurocritical care

2. Cardiothoracic anaesthesia and cardiothoracic critical care

3. Regional

4. Intensive care medicine

5. Obstetrics

6. Paediatric

7. Pain medicine

8. Plastics/burns.

(INTENSIVE CARE UNIT – ICU)

Educational Purpose:

- The goal of the Critical Care faculty is to train the trainee to evaluate and treat critically ill patients, use consultants and paramedical personnel effectively, and stress sensitive, compassionate management of patients and their families.
- Training in critical care is crucial for the anesthetist.
- Recognition/prioritization medical emergencies is the basic knowledge that should be acquired by the trainee.
- Important aspects of this training include: identifying patients who are candidates for intensive care, the bedside approach to the critically-ill patient, knowledge of algorithms for diagnosis and management of common problems in the ICU, death and resuscitation issues, interaction with families.

Content of required knowledge:

1. Understand blood gas results and respond appropriately.
2. Understand cardiovascular hemodynamics in a wide range of disease states.
3. Management of congestive heart failure and cardiogenic shock.
4. Basics of conventional mechanical ventilation.
5. Nutritional support of the critically ill.
6. Management of acute myocardial ischemia.
7. Acute renal failure - diagnosis and treatment.
8. Acute lung injury.
9. Sepsis and the sepsis syndrome.
10. Acute treatment of cardiac arrhythmias.

11. Management of common neurologic emergencies.

Skills and Procedures:

- Asthma management
- Evaluation of chest pain
- Evaluation of shortness of breath
- Airway management/tracheostomy Barotrauma
- Mechanical ventilation: indications, initial set-up, trouble shooting, weaning
- Critical care nutrition: indications, disease-specific nutrition, writing TPN orders
- Management of Ob/Gynae emergencies
- Oxygen transport: physiology, alterations in the critically-ill
- Arterial blood gases: approach to analysis, common alterations
- Hemodynamics: physiology, PA catheter, hemodynamic waveforms, trouble-shooting
- Critical care pharmacology: pressors / inotropes, antibiotic dosing, drug dosing in ARF
- Shock: pathophysiology, approach to resuscitation
- Fluid and electrolyte disturbances: sodium, potassium, magnesium, calcium
- Acute renal failure: approach differential diagnosis, management
- Coma: pathophysiology, neurological exam, differential diagnosis
- Wound care
- Splinting techniques
- Multiple organ dysfunction syndrome
- Acute CHF
- Ethical issues in the ICU
- Sepsis prevention in the ICU
- Arterial line insertion
- Central venous catheterization
- Pulmonary artery catheterization
- endotracheal intubation
- Cardiopulmonary resuscitation
- Ordering and rapid interpretation of laboratory tests

Attributes required other than knowledge

Patient Care	**Practice Based Learning Improvement**	**Professionalism**
Trainees will learn to obtain a logical, chronological history from critically ill patients and their families and to do an effective physical examination in this challenging milieu. Use of information from old charts and private physicians is stressed. Residents will learn to integrate physiological parameters and laboratory data with the clinical history and physical exam to make clinical diagnostic and management decisions. Residents will learn the appropriate use of daily progress notes in patient follow-up, and the need for frequent reevaluation of the unstable patient.	The resident should use feedback and self-evaluation in order to improve performance. The resident should read the required material and articles provided to enhance learning. The resident should use the medical literature search tools in the library to find appropriate articles related to interesting cases.	The resident should continue to develop his/her ethical behavior and the humanistic qualities of respect, compassion, integrity, and honesty. In the ICU, these goals are met in several ways: Sensitive handling of a do-not resuscitate order. Respect and compassion for the depersonalized, intubated, non-communicative patient. Appropriate use of consultants and paramedical personnel. Compassionate handling of families and development of rapport with them. The resident must be willing to acknowledge errors and determine how to avoid future similar mistakes. The resident must be responsible and reliable at all times. The resident must always consider the needs of patients, families, colleagues, and support staff. The resident must maintain a professional appearance at all times.

Teaching Strategies

A. Formal presentation of the new admissions.
B. ICU Rounds
C. Diagnostic and treatment strategies are discussed at the bedside.

D. Didactic Lectures
E. Reading assignments
F. literature searches
G. Noon conferences
H. Skill teaching in ICU & emergency settings
I. Skill teaching in skill laboratory

Evaluation/Feedback

- At the midway point of the rotation, residents are given feedback (informally) on their performance to date. Areas and methods of improvement are suggested. A formal evaluation and verbal discussion with the resident is to be done at the end of the rotation.
- 360 degree evaluation to judge the professionalism, ethics
- A formal evaluation and verbal discussion with the PGT is to be done at the end of the rotation / PGTs are encouraged to discuss with the supervisor, co- supervisor and program director/Dean their learning experiences, difficulties or conflicts.
- Evaluation of training program by trainees pertinent to effectiveness and efficiency of program to equip trainees with necessary skills

Suggested Readings:

Paul L. Marino, The ICU Book, 3rd edition.

RESEARCH/ THESIS WRITING

Total of one year will be allocated for work on a research project with thesis writing.

Project must be completed and thesis be submitted before the end of training.

Research can be done as one block in 5th year of training or it can be stretched over five years of training in the form of regular periodic rotations during the course as long as total research time is equivalent to one calendar year.

Research Experience

The active research component program must ensure meaningful, supervised research experience with appropriate protected time for each resident while maintaining the essential clinical experience. Recent productivity by the program faculty and by the residents will be required, including publications in peer reviewed journals. Residents must learn the design and interpretation of research studies, responsible use of informed consent, and research methodology and interpretation of data. The program must provide instruction in the critical assessment of new therapies and of the surgical literature. Residents should be advised and supervised by qualified staff members in the conduct of research.

Clinical Research

Each resident will participate in at least one clinical research study to become familiar with:

1. Research design

2. Research involving human subjects including informed consent and operations of the Institutional Review Board and ethics of human experimentation

3. Data collection and data analysis

4. Research ethics and honesty

5. Peer review process

This usually is done during the consultation and outpatient clinic rotations.

Case Studies or Literature Reviews

Each resident will write, and submit for publication in a peer-reviewed journal, a case study or literature review on a topic of his/her choice.

Laboratory Research

Bench Research

Participation in laboratory research is at the option of the resident and may be arranged through any faculty member of the Division. When appropriate, the research may be done at other institutions.

Research involving animals

Each resident participating in research involving animals is required to:

1. Become familiar with the pertinent Rules and Regulations of the University of Health Sciences Lahore i.e. those relating to "Health and Medical Surveillance Program for Laboratory Animal Care Personnel" and "Care and Use of Vertebrate Animals as Subjects in Research and Teaching"

2. Read the "Guide for the Care and Use of Laboratory Animals"

3. View the videotape of the symposium on Humane Animal Care

Research involving Radioactivity

Each resident participating in research involving radioactive materials is required to

1. Attend a Radiation Review session

2. Work with an Authorized User and receive appropriate instruction from him/her.

MANDATORY WORKSHOPS

S.NO	NAME OF THE WORKSHOP	LEARNING OBJECTIVES	TOPICS TO BE COVERED
1.	**Biostatistics & Research Methodology (4 days)**	To understand the basics of Bio-Statistics To critique why research is important? To discuss the importance of Selecting a Field for Research To prepare oneself for Participation in National and International Research To prepare oneself for Participation in Pharmaceutical Company Research To interpret the importance of research ideas & Criteria for a good research topic To discuss Ethics in Health Research To learn to write a Scientific Paper To learn to make a Scientific Presentation To learn to make a purposeful literature search	1. Introduction to Bio-Statistics 2. Introduction to Bio- Medical Research Why research is important? 3. What research to do? i. Selecting a Field for Research ii. Drivers for Health Research iii. Participation in National and International Research iv. Participation in Pharmaceutical Company Research v. Where do research ideas come from vi. Criteria for a good research topic Ethics in Health Research 4. Writing a Scientific Paper 5. Making a Scientific Presentation & Searching the Literature
2.	**Introduction to computer/Information Technology & Software (5 days)**	By the end of this workshop student should be able to: • Appropriately start up and shut down your computer. • Navigate the operating system and start applications. • Perform basic functions of file management. • Perform basic functions in a word processor and spreadsheet. • Manage print settings and print documents.	1.Hardware and Software • Understand the main components of a computer, including input and output devices. • Understand the function of communication devices such as smartphones and tablets. • Understand the role of Operating Systems, programs and apps. 2.Windows • Turning on the computer and logging on. • The Windows screen. • Running programs from the Start Menu. • Minimising, maximising, moving, resizing and closing windows. • Logging off and shutting down your computer. 3.Working with Programs • Running multiple programs. • Desktop icons and creating a desktop shortcut. • Managing programs from the taskbar. • Closing programs. 4.File Management

		• Receive and send email. • Use a web browser to navigate the Internet. • work with windows, toolbars, and command menus • perform basic word processing and graphic tasks • make a Power Point presentation • explore Web browsing basics • back up files • save, copy, and organize your work • to enter data accurately in software of Statistical Package for Social Sciences	• Managing Windows Explorer. • Creating, moving, renaming and deleting folders and files. • Understandings file extensions. • Viewing storage devices and network connections. • Managing USB flash drives. 5.Word Processing • Creating documents in Microsoft Word. • Typing text, numbers and dates into a document. • Easy formatting. • Checking the spelling in your document. • Making and saving changes to your document. • 6.Power Point Making Power Point presentation 7.Spreadsheets • Understanding spreadsheet functionality. • Creating spreadsheets in Microsoft Excel. • Typing text numbers and dates into a worksheet. • Easy formulas. • Easy formatting. • Charting your data. • Making and saving changes to your workbook. • Printing a worksheet. 8.Printing • Print preview. • Print settings. • Managing the print queue. 9.Using Email • The Outlook mail screen elements. • Composing and sending an email message. • Managing the Inbox. 10.Accessing the Internet • Going to a specific website and bookmarking. • Understanding how to search/Google effectively. • Copy and paste Internet content into your documents and emails. • Stopping and refreshing pages. • Demystifying the Cloud. • Understanding social media platforms such as Facebook and Twitter. • Computer security best practices. 11.Statistical Package for Social Sciences • general understanding for data entry •
3.	**communication skills (3 days)**	• To learn to use Non-medicinal Interventions in Communication Skills of Clinical Practice • To discuss the importance of counseling • To role play as a counselor • To learn to manage a conflict resolution • To learn to break a bad news • To discuss the importance of Medical Ethics, Professionalism and Doctor-Patient	1. Use of Non-medicinal Interventions in Clinical Practice Communication Skills 2. Counseling 3. Informational Skills 4. Crisis Intervention/Disaster 5. Management Conflict Resolution 6. Breaking Bad News 7. Medical Ethics, Professionalism and Doctor-Patient Relationship Hippocratic Oath 8. Four Pillars of Medical Ethics (Autonomy, Beneficence, Non-malficence and Justice) 9. Informed Consent and Confidentiality 10. Ethical Dilemmas in a Doctor's Life

		Relationship Hippocratic Oath • To learn to take an informed consent • To illustrate the importance of confidentiality • To summarize Ethical Dilemmas in a Doctor's Life	
4.	**Advanced Cardiac Life Support (4 days)**	Upon successful completion of the workshop, the student will be able to: • Recognize and initiate early management of pre-arrest conditions that may result in cardiac arrest or complicate resuscitation outcome • Demonstrate proficiency in providing BLS care, including prioritizing chest compressions and integrating automated external defibrillator (AED) use • Recognize and manage respiratory arrest • Recognize and manage cardiac arrest until termination of resuscitation or transfer of care, including immediate post-cardiac arrest care • Recognize and initiate early management of ACS, including appropriate disposition • Recognize and initiate early management of stroke, including appropriate disposition • Demonstrate effective communication as a member or leader of a resuscitation team and recognize the impact of team	The workshop is designed to give students the opportunity to practice and demonstrate proficiency in the following skills used in resuscitation: 1. Systematic approach 2. High-quality BLS 3. Airway management 4. Rhythm recognition 5. Defibrillation 6. Intravenous (IV)/intraosseous (IO) access (information only) 7. Use of medications 8. Cardioversion 9. Transcutaneous pacing 10. Team dynamics 11. Reading and interpreting electrocardiograms (ECGs) - Be able to identify—on a monitor and paper tracing—rhythms associated with bradycardia, tachycardia with adequate perfusion, tachycardia with poor perfusion, and pulseless arrest. These rhythms include but are not limited to: ○ Normal sinus rhythm ○ Sinus bradycardia ○ Type I second-degree AV block ○ Type II second-degree AV block ○ Third-degree AV block ○ Sinus tachycardia ○ Supraventricular tachycardias ○ Ventricular tachycardia ○ Asystole ○ Ventricular fibrillation ○ Organized rhythm without a pulse 12. Basic understanding of the essential drugs used in: ○ Cardiac arrest ○ Bradycardia ○ Tachycardia with adequate perfusion ○ Tachycardia with poor perfusion ○ Immediate post–cardiac arrest care

		dynamics on overall team performance	

SECTION –VI

EVALUATION & ASSESSMENT STRATEGIES

The purpose of the Assessment system:

The purpose of the assessment system is to:

- enhance learning by providing formative assessment, enabling trainees to receive immediate feedback, measure their own performance and identify areas for development;
- drive learning and enhance the training process by making it clear what is required of trainees and motivating them to ensure they receive suitable training and experience;
- provide robust, summative evidence that trainees are meeting the curriculum standards during the training programme;
- ensure trainees are acquiring competencies within the domains of Good Medical Practice*;*
- assess trainees' actual performance in the workplace;
- ensure that trainees possess the essential underlying knowledge required for their specialty;
- inform the Annual Review of Competence Progression (ARCP), identifying any requirements for targeted or additional training where necessary and facilitating decisions regarding progression through the training programme;
- Identify trainees who should be advised to consider changes of career direction.

The integrated assessment system

The integrated assessment system comprises a mixture of workplace-based assessments and knowledge-based assessments. Individual assessment methods are described in more detail below.The assessments will be supported by structured feedback for trainees within the training programme of General Internal Medicine. Assessment tools will be both formative and summative and will be selected on the basis of their fitness for purpose. Workplace-based assessments will take place throughout the training programme to allow trainees to continually gather evidence of learning and to provide formative feedback. They are not individually summative but overall outcomes from a number of such assessments provide evidence for summative decision making. The number and range of these will ensure a reliable assessment of the training relevant to their stage of training and achieve coverage of the curriculum.

Assessment methods

The following methods are used in the integrated assessment system:

A. **Examinations**

- Intermediate Examination (at the end of second calendar year)
- Final Examination (at the end of fourth calendar year)

B. **Workplace-based assessments**

- mini-Clinical Evaluation Exercise (mini-CEX)
- Direct Observation of Procedural Skills (DOPS)
- Multi-Source Feedback (MSF)
- Case-Based Discussions (CbD)
- Patient Survey (PS)
- Acute Care Assessment Tool (ACAT)
- Audit Assessment (AA)
- Teaching Observation (TO)
- Many others as described earlier in the section of modern assessment tools