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FACULTY OF POSTGRADUATE MEDICINE

DOCTOR OF MEDICINE (MD)
CURRICULUM
ANESTHESIOLOGY (2018)



Khesar Gyalpo University of Medical Sciences of Bhutan

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BACKGROUND

Health care has improved considerably in Bhutan during the last 15 years. But there is a considerable shortage of health care providers in many specialties throughout Bhutan. To improve access to surgical services and critical care additional anesthesiologists are needed. Anesthesia care services are required to expand surgical and obstetric services not only in Thimphu but in many of the regional hospitals in Bhutan. Increased complexity of patient problems requiring surgery and high acuity of surgical patients requires the depth of knowledge that is obtained from postgraduate education in anesthesiology.

RATIONALE

Despite the considerable improvement in the country's health care in the last few decades, the shortage of the specialized health care human resource still remains a challenge for the country. Bhutan heavily depends on the regional countries not only for training of its undergraduate and post graduate students, but is also heavily dependent on expatriate anesthesiologists. The demand for anesthesia service has been increasing with the country health care improvement and expansion of more and more specialized service, there is need for the training of our own anesthesiologist to fill up the requirement of the country.

GOAL

The goal of MD in Anesthesiology is to produce competent, compassionate and professional Specialists who are capable of providing all types of Anesthesia services including management of critically ill patients.

Mission of Training / Curriculum

“To create graduates of high quality with ethical excellence”

The anesthesiology training course provides the graduates with knowledge and skills in anesthesiology and the ability to learn continuously. They will be equipped with research capabilities to create knowledge, communication skills and ability to interact as a team while understanding the health system and quality and safety processes for continuous improvement. They are expected to have ethical responsibilities and positive attitudes towards patients, colleagues, and organizations to maximize the benefits of anesthesia services.

Therefore, only theoretical study is not enough to be an anesthesiologist. The trainee needs to integrate knowledge and skills so that (during the course of the illness) complications or crises may be managed.

The department uses the principle of the trainee as the center. To motivate, prepare and encourage trainees to show responsibility for their learning process and reflect on their learning. Self-reflection and instructor guidance is based on the principles of supervision. It is a systematic process of monitoring, appraisal, and systematic feedback.

OBJECTIVES

To impart knowledge on the principles and practices of Anesthesiology and critically ill care;

- i. To impart in-depth knowledge on the pharmacology, physiology, anatomy and physics relevant to anesthesia.
- ii. To inculcate skills necessary for the competent provision of various anesthetic procedures.
- iii. To impart clinical decision making and problem-solving skills.
- iv. To provide knowledge on the pre-intra-and post-operative evaluation, monitoring and management of patients.

LEARNING OUTCOMES

By the end of the curriculum the postgraduate physician in training in the anesthesiology program will be able to:

- i. Demonstrate comprehensive knowledge on the principles and techniques of anesthesiology including care of the critically ill-patients.
- ii. Demonstrate clinical decision-making skills using problem solving skills including differential diagnosis.
- iii. Identify essential components of the preoperative evaluation to effectively provide anesthesia care.
- iv. Understand the impact of co-existing disease in patients during the pre anesthetic period.
- v. Understand the pharmacokinetics and pharmacodynamics of medications used in anesthesia and also other medications taken by patients undergoing anesthesia.
- vi. Administer all types of anesthesia in a variety of clinical settings.
- vii. Manage acute pain and chronic pain syndromes.
- viii. Carry out competently all types of procedures related to the practice of Anesthesiology including those related to critical care.

AN OVERVIEW OF ROTATIONAL SCHEDULE

Sl. No	Activity	PG 1		PG 2		PG 3		PG 4	
		1	2	3	4	5	6	7	8
1	Generic Curriculum								
2	OR/placement								
3	Lecture class								
4	ICU			Nov/Dec (4 weeks)				July-Aug (8 Weeks)	
5	Radio-diagnosis rotation		2 Weeks						
6	Medicine						January (2 Weeks)		
7	Emergency Medicine						4 weeks		
8	District posting					November		December	
9	Overseas posting 4 weeks/year			February			March (4 weeks)		
10	Assessment Schedule	2 nd week December		3 rd Week of May			1 st week of June		3 rd &4 th Week, May
11	Continuous assessment								

Term: July to December and January to June (6 months), 4 years is divided into 8 terms.

***: refer the section on assessment system for further details

CORE COMPETENCIES

The Core Competency shall comprise of the following:

- i. The physician who completes the training is a specialist in anesthesiology and will gain knowledge and ability according to the core competencies in six areas.
- ii. Patient care
- iii. Applied Professional Knowledge and Skill
- iv. Practice-based learning and improvement
- v. Interpersonal and communication skills
- vi. Professionalism
- vii. Systems-based practice

EDUCATIONAL STRATEGIES

Teaching and learning methods

The Curriculum is based on the following principles of learning:

Competency –based Education

Competency based education is defined by identifying the outcomes, defining performance levels, framework for accessing competencies and continuous evaluation process. The training of Anesthesiologist needs to be focused on skill development, integrated with knowledge.

The Practice- based, learner centered and experiential learning Education

The training of Anesthesiology residents will take place in a supervised clinical setting. During the rotational postings, the residents will work once in a week on emergency on call and attend the general rounds in the respective ward, and twice a week with supervisor for assessment. Regular assessments and feedback by the supervisor will be performed. The residents learn from the following methods but not limited to these:

- i. Case presentations and discussion
- ii. Case managements and discussion
- iii. Performing procedural skills under supervision, feedback and reflections
- iv. Learning & practicing communication skills through role plays and
- v. De-briefing
- vi. Working professionally and ethically as a role model.
- vii. As teachers, learners and leaders

The residents need to develop educational and leadership skills as an integral part of their professional career. This curriculum aims to incorporate teaching, mentoring and leadership at all levels of professional life. The residents will be learning assessment and evaluation skills, adult learning principles, instructional and supervision skills, and

providing feedback and develop skills on how to learn and educate. The following methods allow residents to acquire the above skills.

- i. Paper presentations and question answer sessions.
- ii. Journal clubs and discussions.
- iii. Case presentation and discussions.
- iv. Bedside teaching followed by demonstration and practice¹.
- v. Grand rounds and question answer session.
- vi. Seminars, Workshops, Conferences, PBL, Research writing (thesis).
- vii. Teaching interns and allied health staff.

Independent Self-Directed Learning:

- i. Reading journals and articles, including web-based material
- ii. Maintenance of portfolio
- iii. Audit and research projects

Assessment methods

Assessment is a strong driving force behind learning and therefore is a main focus in the curriculum design.^{2,3} Since it addresses complex competencies, it requires both quantitative and qualitative information from different sources as well as professional judgment. No single assessment method is inferior or superior and all methods have their strengths and weaknesses. A complete assessment programme tries to balance these out. A further important issue to consider is the problem of domain specificity. Any assessment or test is factually a sample of questions (or assignments or observation) out of huge domain of possible questions, and how a candidate performs on one question is a poor predictor of their performance on any other question. This – slightly counter intuitive – notion of domain specificity^{4,5} requires examinations to be sufficiently long and sufficiently diverse. Assessment programmes can be described using the categorization of Miller's Pyramid (fig. 1). This illustrates a helpful framework for assessment. The base of the pyramid represents knowledge (Knows), followed by competence (Knows how), performance (shows how) and action in the work place (does)⁶. No single method is able to assess all the layers and therefore multiple methods need to be employed.⁷ The following methods will be utilized for both formative and summative assessments.

¹Peters M, ten Cate O. Bedside teaching in medical education: a literature review. *Perspect Med Educ*. 2013;3(2):76-88.

²Frederiksen N. The real test bias: Influences of testing on teaching and learning. *American Psychologist* 1984;39:193-202.

³Cilliers FJ, Schuwirth LWT, Adendorff HJ, Herman N, Van der Vleuten CPM. The mechanisms of impact of summative assessment on medical students' learning. *advances in health sciences education* 2010;15:695-715.

⁴Eva K. On the generality of specificity. *Medical Education* 2003;37:587-8.

⁵Eva KW, Neville AJ, G.R. N. Exploring the etiology of content specificity: Factors influencing analogic transfer and problem solving. *Academic Medicine* 1998;73:s1-5.

⁶Miller G E. The Assessment of Clinical Skills/Competence/Performance. September supplement 1990, Volume 65, Number 9.

⁷Kern D. Curriculum development for medical education. Baltimore: Johns Hopkins University Press; 1998.

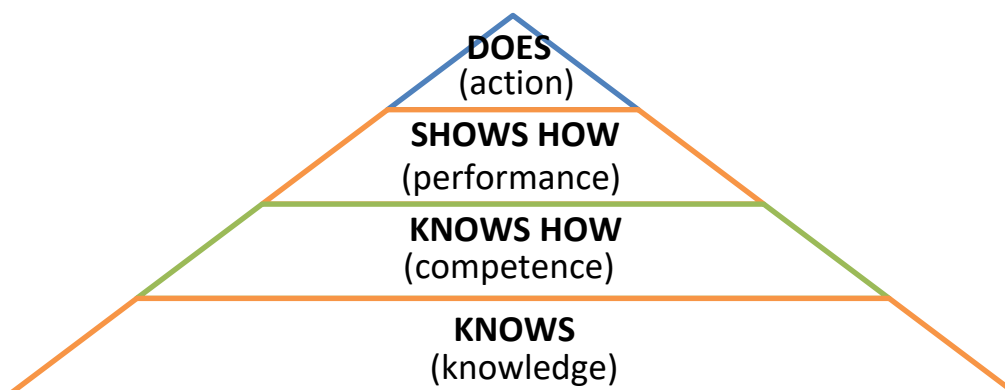


Figure 1: Miller's Pyramid, framework for clinical assessment

360 degree feedback

360-Degree Evaluation/Multisource Assessment consists of measurement tools completed by multiple individuals in a person's sphere of influence. Assessment by peers, other members of the clinical team, and patients can provide insight into trainees' work habits, capacity for team work, and interpersonal sensitivity.⁸

Mini-CEX

The Mini-CEX is a 10 to 20 minute direct observation assessment or "snapshot" of a trainee-patient interaction. The competencies that can be assessed by this method are: patient's history taking, physical examination, counseling skills, Clinical Judgment/reasoning and overall clinical competence⁹.

Objective Structured Clinical examination (OSCE)

This consists of multiple stations in each of which the candidate is asked to perform a different defined task such as taking a focused history or performing a focused clinical examination of a particular system. A standardized marking scheme specific for each case is used¹⁰.

⁸Tabish S. Assessment methods in medical education. International Journal of health Science. 2008;Volume 2(2); 2008 (PMC3068728).

⁹ Assessment tools [Internet]. American Board of Internal Medicine. 2016 [cited 28 May 2016]. Available from: <http://www.abim.org/program-directors-administrators/assessment-tools/mini-cex.aspx>

¹⁰ Tabish, S. A. Assessment methods in medical education. Int J Health Sci (Qassim). 2008 Jul; 2(2): 3–7.

The Short Answer Question (SAQ)

This is an open ended, semi-structured question format²⁵. They take more time to answer than for example multiple choice questions and therefore their reliability per hour of testing time is lower. Generally, it is recommended that they should be used mainly when testing aspects which cannot be tested by closed questions format.¹¹ A structured predetermined marking scheme improves reliability.

Direct Observation of Procedural Skills (DOPS)^{12,25}

This is a structured rating scale for assessing and providing feedback on practical procedures. The competencies that are commonly assessed include general knowledge about the procedure, informed consent, pre-procedure preparation, analgesia, technical ability, aseptic technique, post-procedure management, and counseling and communication.

Multiple Choice Questions (MCQ)

MCQ tests can be useful for formative and summative assessments and good quality MCQ can be set through peer review process and efficient feedback system¹³. Although time consuming to set, these tests typically have a high reliability per hour of testing time (than open ended questions), because they can easily mitigate the impact of context specificity, i.e. a large number of items can be tested and marked within a relatively short time frame¹⁴.

Key Feature Questions (KFQ)

This is a clinical scenario-based question. A description of the cases is followed by a limited number of questions that focus on critical, challenging actions or decisions²⁵.

¹¹Schuwirth W T Lambert, Vleuten P M Cees. ABC of learning and teaching in medicine.

¹²Norcini J, McKinley D. Assessment methods in medical education. *Teaching and Teacher Education*. 2007;23(3):239-250.

¹³Bunmi S. Malau-Aduli, Dwight Assenheimer, Derek Choi-Lundberg & Craig Zimitat (2014) Using computer-based technology to improve feedback to staff and students on MCQ assessments, *Innovations in Education and Teaching International*, 51:5, 510-522, DOI: 10.1080/14703297.2013.796711

¹⁴Wass V, Bowden R, Jackson N. ResearchGate. (2014). Principles of Assessment Design. [online] Available at: https://www.researchgate.net/publication/253681539_The_principles_of_assessment_design [Accessed 17 Jun. 2016].

Simulation with standardized patients.²⁷

A standardized patient is a person trained to accurately and consistently portray a patient with a particular medical condition. Based on an encounter between the standardized patient and a student, both the standardized patient and medical professionals can make judgments about the quality of the performance along a number of dimensions (e.g., history-taking, physical examination, interpersonal, and communication skills)

Logbook

In the Logbook students keep a record of the patients seen or procedures performed either in a book or in a computer. It documents the range of patient care and learning experience of students. Logbook is very useful in focusing students on important objectives that must be fulfilled within a specified period of time.¹⁵

Case-based Discussion (CbD)

This is a valuable workplace formative assessment tool and is used to assess the resident's professional judgments in clinical areas. In this method, a comprehensive review of a clinical case is conducted between a resident and an assessor. After the discussion, the assessor provides feedback to help the resident improve and structure their future learning. The clinical areas that can be assessed by this methods are record keeping, history taking, clinical findings and interpretation, management plan, follow up and future planning.¹⁶

Portfolio assessment^{17,18}

This method is the most important process that will be utilized to assess residents. They are required to collect every bit of learning experience and data like a logbook, reflections and all records of learning activity and assessments reflecting five domains of Anesthesiology, throughout the training period. It will be seen as both the process and the outcome of the residency programme. As a process, it will enable the residents to monitor their own learning systematically, reflecting on their learning using the five domains of Anesthesiology leading to learning goals. As a product, it holds the work records and documents the resident has produced representing their achievements. The portfolio will be assessed (fig. 2 and appendix 1 - 6) regularly by the residents, supervisor and the specialist supervisor. It will be further assessed by internal and external examiner

¹⁵ Tabish, S. A. Assessment methods in medical education. *Int J Health Sci (Qassim)*. 2008 Jul; 2(2): 3–7

¹⁶ Case-based Discussion [Internet]. RACP. [cited 29 May 2016]. Available from: <https://www.racp.edu.au/trainees/assessments/work-based-assessments/case-based-discussion>

¹⁷17. Zaidi S Nasir M. Teaching and learning methods in medicine.

¹⁸ Assessing by portfolio [Internet]. UNSW, Australia. [cited 29 May 2016]. Available from: <https://teaching.unsw.edu.au/assessing-portfolio>

at two low stakes examinations (institute examination I and II – IE 1, IE 2) and finally at high stake examination (University examination - UE), after completion of the residency programme. A good documentation process will be followed to ensure credibility. The following figure (figure 2) illustrates the assessment process of the portfolio. The concept for the flow chart is adapted from the Journal article - Assessing tomorrow's learners: In competency-based education only a radically different holistic method of assessment will work by Lambert Schuwirth and Julie Ash .¹⁹

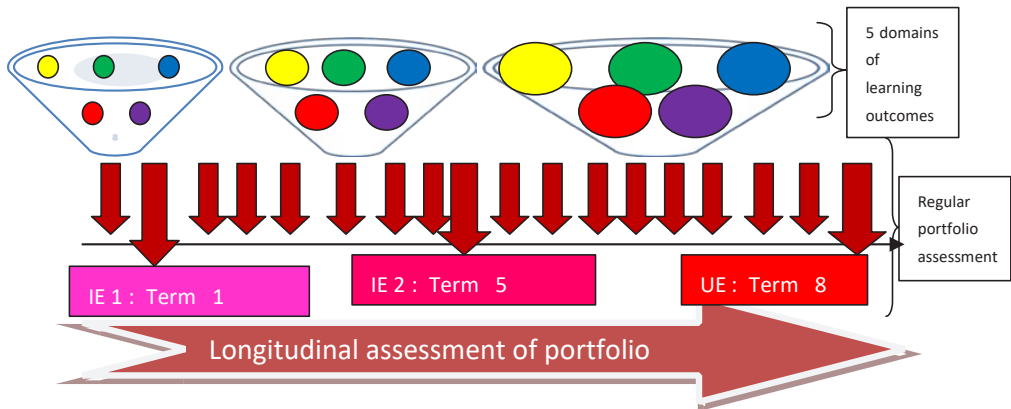


Figure 2: Utility of portfolio as an assessment method

¹⁹ Schuwirth L, Ash J. Assessing tomorrow's learners: In competency-based education only a radically different holistic method of assessment will work. Six things we could forget. Medical Teacher. 2013;35(7):555-559.

DETAILS OF CORE COMPETENCIES WITH LEARNING METHODS AND TOOLS OF ASSESSMENT**Patient Care**

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

Specific Learning Outcome	Teaching/learning activity	Assessment methods
1.1 Demonstrate Skill in anesthesia care during preoperative, intra operative and postoperative period.	Lectures, learning by doing, and guidance by supervisors	Standardized Patients-OSCE
1.2 Demonstrate skill in general anesthesia and monitoring during anesthesia in patients undergoing surgeries with various comorbidities	Interviewing Patients and debriefing Self-reflection on experience Simulations and workshops	Mini-CEX 360-degree feedback Observation of actual work situation EPA
1.3 Demonstrate skills in airway management	Seminars	DoPs
1.4 Demonstrate skills in resuscitating patients. (cardiopulmonary-cerebral resuscitation)	Rotation posting	Portfolio assessment Log book
1.5 Demonstrate skills in care and treatment of critically ill patients and respiratory care.		
1.6 Demonstrate in pain management and treatment.		

Applied Professional Knowledge and Skill

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care. Residents are expected to:

Specific Learning Outcome	Teaching/learning Activity	Assessment methods
2.1. Demonstrate understanding of basic medical science of human body related to anesthesiology	Classroom lectures Case presentations	OSCE Mini CEX
2.2 Demonstrate relevant diagnosis and managerial skills in anesthesia	Journal clubs Scientific seminars	MCQ SAQ, KFQ
2.3 Able to remain informed and innovative Evidence-based resources & practice Up-to- date prescribing knowledge Innovate approach to patient with multiple problems Different models of care- cure, care, rehabilitations etc.	National and international conferences Literature review, critique reflection Poster presentation Clinics	DOPS 360 degree feed back Case based Discussion (CbD) Portfolio assessment
2.4 Understand management of acute and chronic pain		
2.5 Understand and manage critically ill patients	Interdepartmental postings	
2.6 Able to collaborate and coordinate care		

Practice-based Learning and Improvement

Residents must be able to investigate and evaluate their patient care practices, appraise and simulate scientific evidence, and improve their patient care practices. Residents are expected to:

Specific Learning Outcome	Teaching/learning Activity	Assessment methods
3.1 Analyze practice experience and perform practice-based improvement activities using a systematic methodology;	Journal clubs	360 degree feed back Case based Discussion (CbD) Thesis assessment as per university mandate
3.2 Locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;	Scientific seminars	
3.3 Obtain and use information about their own population of patients and the larger population from which their patients are drawn;	National and international conferences	
3.4 Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness;	Literature review, critique reflection	
3.5 Use information technology to manage information, access on-line medical information; and support their own education; and	Provide training on basic research methods. Provide patient information and discuss academic issues such as journal club topic review	
3.6 Facilitate the learning of students and other health care professionals.		

Interpersonal and Communication Skills

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, patient’s families, and professional associates. Residents are expected to:

Specific Learning Outcome	Teaching/learning activity	Assessment methods
1. Communication is clear, respectful, empathetic and appropriate to the person and socio-cultural context	Role play and de-contextualizations relating the experiences to first principles.	Standardized Patients-OSCE Mini-CEX
2. Effective communication is used in challenging situations like: Breaking bad news Agitated family or patients Discuss poor prognosis of diseases Managing patients experiencing current or consequences of trauma	Interviewing Patients and debriefing Self reflection on experience	360 degree feedback Real patient observation Portfolio assessment
3. Communication with family, caregivers and others involved in the care of the patient is appropriate and clear Involvement of family member & caregiver in patient management Impacts of patient care burden on caregivers	Role play and de-contextualizations relating the experiences to first principles.	Standardized Patients-OSCE Mini-CEX
4. Complaints and concerns are managed effectively Approaches to address patient complaints Plans to reduce risk of arising complaints in future	Interviewing Patients and debriefing Self reflection on experience	360 degree feedback Real patient observation Portfolio assessment

Professionalism

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to adverse patient population. Residents are expected to:

Specific Learning Outcome	Teaching/learning Activity	Assessment methods
5.1 Demonstrate moral, ethical, and positive attitudes toward patients, relatives, colleagues, and the community	Role play Team work Small group discussion Large group teaching	Mini CEX 360 degree feed back Case based Discussion (CbD)
5.2 Demonstrate accountability to patients, society, and the profession;	Foundation course	
5.3 Demonstrate commitment to excellence and on-going professional development;		
5.4 Be committed to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information and informed consent.		
5.5 Demonstrate sensitivity and responsiveness to patients' culture, age,gender, and disabilities.		

Professional attitudes and conduct require that Resident must also have developed a style of care which is:

- i. Humane (reflecting compassion in providing bad news, if necessary; the management of the visually impaired; and recognition of the impact of visual impairment on the patient and society);
- ii. Reflective (including recognition of the limits of his/her knowledge, skills and understanding);
- iii. Ethical;
- iv. Integrative (including involvement in an inter-disciplinary team for the care of children, the handicapped, the systemically ill, and the elderly); and
- v. Scientific (including critical appraisal of the scientific literature, evidence-based practice and use of information technology and statistics).

Systems-based Practice

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Residents are expected to:

Specific Learning Outcome	Teaching/learning Activity	Assessment methods
6.1 Demonstrate knowledge of the health system of the country.	Small group discussion Large group teaching Case discussion	360 degree feed back Case based Discussion (CbD)
6.2 Demonstrate knowledge and involvement in quality improvement system for patient care 6.3 Practice cost-effective health care and resource allocation that do not compromise quality of care;	Workshop	Presentation following postings
6.4 Adhere to system operating procedures and standard operating procedures		
6.5 Able to partner with healthcare managers and providers to assess, coordinate, and improve health care and know how these activities can affect system performance		

INTRODUCTION TO CONTENTS

GENERIC CURRICULUM

The Generic Curriculum or basic science for the first 6 months is designed to help resident doctors to develop competency in a number of areas including communication and consultation skills, patient safety and team work as well as the general principles and techniques of basic sciences including diagnostic and imaging and investigative medicine. The resident doctors are also expected to develop and demonstrate a range of essential interpersonal and clinical skills for managing both acute and long-term conditions, regardless of the specialty. The concepts defined in the Generic Curriculum should continue to be revisited, reflected upon, and honed throughout the residency training programme and lifelong professional carrier.

Learning outcomes

At the end of this curriculum, the residents are expected to be able to:

- I. Identify the general and specific learning needs and outcome of the whole residency programme.
- II. Apply the principles and techniques in basic sciences to clinical setting in the respective Specialty discipline.
- III. Synthesize the process of history taking, clinical observations, investigations, diagnosis and treatment plans for proper and effective management of the patients.
- IV. Illustrate a range of essential interpersonal and clinical skills for managing patients with both acute and long-term conditions, regardless of the specialty.
- V. Demonstrate different aspects of medical ethics and etiquettes for strengthening professionalism and patient care.
- VI. Identify and address the legal and ethical issues as applicable to clinical practice and healthcare.
- VII. Provide leadership and management oversight in patient management with emphasis on intra-and inter-disciplinary team work.
- VIII. Make independent clinical decisions with appropriate support.
- IX. Understand the principles and techniques in epidemiology, biostatistics and research and apply research in clinical practice to promote and strengthen evidence-based care.

TEACHING METHODS MODULE

MEDICAL HUMANITIES MODULE

Note: Above two modules will be delivered from term 2 to term 7 residency with compulsory attendance requirement of 90% to qualify for institute examination III.

QUALITY IMPROVEMENT PROJECT

CLINICAL SCIENCE COURSE CONTENTS

First Year Resident

TERM 1

Basic sciences: Basic science contents are divided according to TERM-wise

Gas Sources (TERM 1)

- I. Medical Gas Cylinder and Containers
- II. Pipeline System

Anesthesia Work Station/Anesthetic Machine (TERM 1)

- I. Function of the modern workstation
- II. Development of the anesthesia workstation
- III. The anesthesia delivery system
- IV. Ventilators

- V. Ergonomics
- VI. Standards
- VII. Pre-use check
- VIII. Specific machines

Anesthesia Breathing System (TERM 1)

- I. Classification
- II. Components
- III. Working principles
- IV. Non-rebreathing systems utilizing carbon dioxide absorption and recirculation of gases

Airways Management Equipment (TERM 1)

- I. Fundamentals
- II. Materials used in airway devices
- III. Artificial airways
- IV. Simple airway adjuncts
- V. Facemasks
- VI. Supraglottic airways
- VII. Tracheal tubes
- VIII. Subglottic devices
- IX. Laryngoscopes
- X. Aids for intubation/tube exchange
- XI. Magill's forceps
- XII. Airway drug delivery systems

Equipment for Inhalation of O₂ and Other Gases, Manual resuscitators (TERM1)

- I. Normobaric oxygen therapy
- II. Administration of oxygen in a mixture of gases
- III. Oxygen delivery at high or low atmospheric pressure
- IV. Manual resuscitators: components and safety features

Basic Principles of Pharmacology (TERM 1)

- I. Pharmacokinetics and Pharmacodynamics
 - a. Protein Binding
 - b. Partition coefficients
 - c. PKA
 - d. Ionization
 - e. Tissue Uptake
 - f. Compartmentalization and Exponential Models
- II. Pharmacokinetics of Neuraxial Drug Administration: Epidural and Subarachnoid
- III. Tolerance and Tachyphylaxis
- IV. Termination of Action

DOCTOR OF MEDICINE (MD) CURRICULUM

- a. Elimination: Biotransformation, Context-Sensitivity Half-life
- b. Impact of Renal Disease
- c. Impact of Hepatic Disease
- V. Drug Interactions
 - a. Enzyme Induction and Inhibition
 - b. Hepatic Blood Flow
 - c. Drug-Drug Binding

Clinical Sciences: Anesthesia procedures, methods and techniques

Historical Perspective on Anesthesia Practice (TERM 1)

Evaluation of the Patient and Preoperative Preparation (TERM 1)

- I. Physical Examination including Airway Evaluation
- II. Laboratory Evaluation
- III. ASA Physical Status Classification
- IV. Preparation for Anesthesia/Premedication
- V. Interaction with Chronic Drug Therapy
- VI. Specific Problems in Disease States: Hyperthyroidism and Hypothyroidism, Drug Abuse, Glaucoma, Uremia, Increased CSF Pressure, Chronic Steroid Ingestion, Obesity, Obstructive Sleep Apnea, COPD and Hypertension
- VII. Patients with Allergies
- VIII. Practice Guidelines for Preoperative Fasting
- IX. Continuation versus Discontinuation of Chronic Medication: Antihypertensive, Hypoglycemic Agents, Antidepressants, and Platelet Inhibitors etc.
- X. Prophylactic Cardiac Risk Reduction
- XI. Premedication

Regional Anesthesia (TERM 1)

- I. Indications and Contraindications
- II. Mechanisms and Site of Action
- III. Factors Influencing Onset, Duration and Termination of Action
- IV. Systemic toxicity, Test Dose
- V. Physiological Effects
- VI. Agents and Techniques
- VII. Complications: Precipitating Factors, Prevention, Therapy, Implications of Anticoagulants and Platelet Inhibitors
 - a. Spinal Anesthesia
 - b. Epidural Anesthesia
 - c. Combined Spinal and Epidural Anesthesia
 - d. Caudal Anesthesia
 - e. IV Regional

General Anesthesia (TERM 1)

- I. Stages and Signs of Anesthesia: Awareness Under Anesthesia
- II. Techniques: Inhalation, Total Intravenous, and Combined Inhalation/ Intravenous
- III. Airway Management
 - a. Assessment and Identification of The Difficult Airway: Anatomic Correlates, Mallampati Classification, and Range of Motion
 - b. Techniques for Managing Airway: Awake vs Asleep, Use vs Avoidance of Muscle Relaxants, Drugs Selection, Retrograde Intubation Techniques, ASA Difficult Airway Algorithm
 - c. Devices: Flexible Fiber Optics, Trans-illumination, Laryngoscope Blades, Alternative Intubating Devices, And Video Laryngoscope
 - d. Alternatives and Adjuncts: Laryngeal Mask Airway (Traditional and Modified), Esophageal Obturator Airway, And Occlusive Pharyngeal Airways
 - e. Transcutaneous or Surgical Airways: Tracheostomy, Crico-thyroidotomy, Trans-laryngeal or Tracheal Jet Ventilation
 - f. Endo-bronchial Intubation: Double Lumen Endo-bronchial Tubes, Bronchial Blockers, Placement and Positioning Consideration, Postoperative Considerations
 - g. Intubation and Tube Change Adjuncts: Bougies, Jet Stylet, Soft and Rigid Tube Change Devices; Complications
 - h. Endotracheal Tube Types: Tube Materials: Polyvinyl Chloride, Silicone etc.
 - a. Tube Tip Design: Murphy Eyes, Flexible Tips etc.
 - b. Cuff Design: High vs low Volume/ Pressure, Cuffed or uncuffed, Cuff Pressure
- IV. ASA Monitoring Standards
- V. Patient positioning

TERM 2:**Basic sciences****Physics Principles (TERM 2)**

- I. Mechanics
 - a. Force, pressure and flow
 - b. Atmospheric pressure and partial pressure
 - c. Absolute, differential and gauge pressure
 - d. Methods of measuring pressure
 - e. Measurement of gas flow
- II. Properties of Liquids, Gases and Vapors
 - a. Diffusion of Gases
 - b. Solubility Coefficients
 - c. Relative and Absolute Humidity
- III. Principles of Ultrasound

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- a. Obtaining an Image
- b. Resolution
- c. Depth
- d. Frequency
- e. Resonance
- IV. Principles of Doppler Ultrasound

Vaporizers (TERM 2)

- I. Vapor Pressure and Calculation of Anesthetic Concentrations
- II. Vaporizer Types and Safety Features
- III. Uptake and Distribution of Inhalation Agents
 - a. Uptake and Elimination Curves; Effect of Ventilation, Circulation and Anesthetic systems
 - b. Concentration Effect
 - c. Second Gas Effect

Pharmacology

Anesthetic Gas and Vapors (TERM 2)

- I. Physical Properties
- II. Mechanism of Action
- III. Effects on Central Nervous System
- IV. Effects on Respiration
- V. Effects on Neuromuscular Function
- VI. Effects on Renal Function
- VII. Effects on Hepatic Function
- VIII. Effects on Hematologic and Immune Systems
- IX. Biotransformation and Toxicity
- X. Effects on Cardiovascular Systems
- XI. Minimum Alveolar Concentration (MAC): Factors effecting on MAC
- XII. Trace Concentration

Intravenous Anesthetics (TERM 2)

Opioid and Non Opioid Induction and Anesthetic Agents

- I. Mechanism of Action
- II. Pharmacokinetic and Pharmacodynamics
- III. Metabolism and Excretion
- IV. Effects on Circulations
- V. Effects on Respiration
- VI. Effects on other Organs
- VII. Side Effects and Toxicity
- VIII. Indications and Contraindications
 - a. Opioids: Intravenous, Intrathecal and Epidural; Opioid Antagonists
 - b. Barbiturates

- c. Propofol
- d. Etomidate
- e. Benzodiazepines: Antagonist
- f. Ketamine
- g. Dexmedetomidine

Neuromuscular and Synaptic Transmission (TERM 2)

- I. Morphology, Receptors and Receptor Density
- II. Membrane Potential: Mechanism
- III. Action Potential: Characteristics, Ion Flux
- IV. Synapse: Transmitters, Precursors, Ions, Termination of Action, Transmission Characteristics

Skeletal Muscle Contraction (TERM 2)

- I. Depolarization
- II. Role of Calcium, Actin/Myosin
- III. Energy Source and Release

Muscle Relaxants (TERM 2)

Depolarizing and None-Depolarizing

- I. Mechanism of Action
- II. Pharmacokinetic and Pharmacodynamics
- III. Metabolism and Excretion
- IV. Side Effects and Toxicity
- V. Indications and contraindications
- VI. Antagonism of Blockade

Local Anesthetics (TERM 2)

- I. Uptake and Mechanism of Action
- II. Biotransformation and Excretion
- III. Comparisons of Drugs and Chemical Groups
- IV. Prolongation of Action
- V. Local Anesthetics Side Effects:
 - a. CNS: Seizures, Transient Neurological Symptoms etc.
 - b. Cardiac:
 - c. Allergy
 - d. Preservatives/ Additive
 - e. Methemoglobinaemia

Intravenous Fluid Therapy during Anesthesia (TERM 2)

- I. Water, Electrolyte, Glucose Requirement and Disposition
- II. Crystalloid vs Colloids
- III. Fluid requirement and Fluid deficit Calculation

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- IV. Normal Saline vs Ringer Lactate vs Plasmalyte vs D5W
- V. Enhanced Recovery After Surgery: Protocol for Fluid Therapy

Post-Operative Period (TERM 2)

- I. Pain Relief- Pharmacology: Drugs, Routes and other Techniques
- II. Respiratory Consequences of Anesthesia and of Surgical Incisions
- III. Cardiovascular Consequences of General and Regional Anesthesia-Treatment of Postoperative Hypertension and Hypotension
- IV. Nausea and Vomiting - Physiology, Etiology, Risk Factors and Preventive Strategies- Use of Antacids and Histamine-2 Blockers, Metoclopramide, Transdermal Scopolamine, Droperidol, Serotonin Antagonists, Proton Pump Inhibitors, Dexamethasone, Multimodal Therapy, Acupressure/Acupuncture
- V. Neuromuscular Consequences- Residual Paralysis, Muscle Soreness, Recovery of Airway

CNS Anatomy (TERM 2)

- I. Brain
 - a. Cerebral Cortex
 - b. Cerebellum: Basal Ganglia, Major Nuclei and pathways
 - c. Brain Stem: Respiratory Center and Reticular Activating System
 - d. Cerebral Circulation: Circle of Willis, Venous Sinuses and Drainage
- II. Spinal Cords and Spine
 - a. Variations in Vertebral Configuration
 - b. Structure of the cord
 - c. Blood supply
 - d. Spinal Nerves: Level of Exit, Covering and Sensory Distribution
 - e. Sacral Nerves: Innervation of pelvic Structures
- III. Meninges
 - a. Compartments relates to the spinal meninges
 - b. Cerebrospinal fluid
- IV. Parasympathetic Nervous Systems
 - a. Location of ganglia
 - b. Vagal Reflex Pathway
- V. Sympathetic Nervous System
 - a. Ganglia
 - b. Rami Communicates
 - c. Sympathetic Chain

Respiratory System (TERM 2)

- I. Physiology:
 - a. Lung Function and Cellular processes
 - b. Lung Volumes: Definitions, Methods of Measurement, Normal Values, Time Constants

- c. Spirometry: Static and Dynamic Volumes, Dead spaces, Nitrogen Washout, O₂ uptake, CO₂ production, Exercise Testing
- II. Lung Mechanics:
 - a. Static and Dynamic Compliance, Pleural Pressure Gradient, Flow-Volume Loops and Hysteresis, Surfactant, Laplace law
 - b. Resistances: Principles of Gas Flow Management
 - c. Methods of Measurement
 - d. Work of Breathing
 - e. Regulation of Airway Caliber
- III. Ventilation- Perfusion:
 - a. Distribution of Ventilation
 - b. Distribution of Perfusion, Zones, Hypoxic pulmonary vasoconstriction
- IV. Diffusion:
 - a. Definition, Pulmonary Diffusion Capacity
 - b. Apneic Oxygenation, Diffusion Hypoxia
- V. Blood Gas:
 - a. O₂ Transport: O₂ Physical Solubility, Oxyhaemoglobin saturation, Hb- O₂ Dissociation Curve
 - b. Respiratory Enzymes: P₅₀, Hb as a Buffer
 - c. CO₂ Transport: Blood CO₂ Content: Carbonic Anhydrase, CO₂ Dissociation Curve, Bohr Effect, Haldane Effect
 - d. Systemic Effect of Hypercarbia and Hypocarbia
 - e. Systemic Effect of Hyperoxia and Hypoxaemia
 - f. Basic Interpretation of Arterial Blood Gas
- VI. Control of Ventilation
 - a. Respiratory Center
 - b. Central and peripheral Chemoreceptors
 - c. Proprioceptive Receptors, Respiratory Muscles
 - d. Reflexes: Innervations

Anatomy of Respiratory System (TERM 2)

- I. Nose
- II. Pharynx
 - a. Subdivisions and Innervations
- III. Larynx
 - a. Innervations: Muscles, Blood supply, Cartilage
 - b. Vocal Cords, Positions with Paralysis
 - c. Difference between Adults and Infants
- IV. Trachea
 - a. Structures and Relationships in Neck and Chest
- V. Muscles of respiration
 - a. Accessory Muscles

Cardiovascular System: Anatomy (TERM 2)

- I. Normal Anatomy of Heart and Major Vessels
- II. Coronary Circulation
- III. Heart Conduction System

Cardiovascular System: Physiology (TERM 2)

- I. Physiology:
 - a. Control of Heart Rate
 - b. Synchronicity of Pressure, Flow, ECG, Sounds, Valve Actions
 - c. Impulse Propagation
 - d. Normal ECG
 - e. Electrophysiology: Ion Channels and Currents
- II. Ventricular Function
 - a. Frank- Starling Law
 - b. Preload and Afterload
 - c. Intra-cardiac Pressures
 - d. Force, Velocity, Length, Rate of Shortening
 - e. Myocardial Contractility and Measurement Limitation
 - f. Cardiac Output: Determinants and Regulations, Fick Principle
 - g. Myocardial Oxygen Utilization
 - h. Systolic and Diastolic Function
- III. Venous Return
 - a. Vascular Compliance/ Venous Capacitance: Controlling Factors
 - b. Muscle Actions, Intrathoracic Pressure, Body position
 - c. Blood Volume and Distribution
- IV. Blood Pressure
 - a. Systolic, Diastolic, Mean, and Perfusion pressures: Intra cardiac, Pulmonary and Venous
 - b. Systemic and Pulmonary Vascular Resistance, Viscosity
 - c. Baroreceptor Function
- V. Microcirculation
 - a. Capillary Diffusion: Osmotic Pressure, Starling's law
 - b. Pre and Post Capillary Sphincter Control
 - c. Viscosity: Rheology
- VI. Regional Blood Flow and Its Regulation
 - a. Cerebral and Spinal Cord
 - b. Coronary
 - c. Pulmonary

Cardiovascular System: Pharmacology (TERM 2)

- I. Digitalis: Action and Toxicity
- II. Inotropes
- III. Phosphodiesterase III Inhibitors: Milrinone and Others

- IV. Antiarrhythmics
- V. Antianginal Drugs
- VI. Vasodilators
- VII. ACEI and Angiotensin Blockers
- VIII. Electrolytes (Potassium, Magnesium, Phosphorus, Calcium); Cardiovascular Effects
- IX. Non- adrenergic Vasoconstrictors: Vasopressin and Congeners

Hypertension

- I. Etiology, Pathophysiology and Course of Disease
- II. Drug Treatment, Interaction with anesthetics, Risk of Anesthesia
- III. Intra or Post-operative Hypertension: Differential Diagnosis and Treatment

Ischemic Heart Disease

- I. Risk Factors: Predictors of perioperative risk
- II. Modification of perioperative risk
- III. Manifestations: Diagnosis of Myocardial Infarction and Acute Coronary Syndrome: Clinical, ECG, Enzymes and Echocardiography etc.
- IV. Classifications of Type of MI
- V. Pharmacological Treatment of Angina
- VI. Determinants of Myocardial Oxygen Requirement and Delivery, Silent Ischemia, Postoperative Ischemia
- VII. Perioperative Diagnosis and Treatment of Ischemia
- VIII. *Coronary Artery Bypass procedure: Cardiopulmonary
- IX. Bypass Procedure, off-pump techniques

Valvular Heart Disease

- I. Classifications
- II. Diagnosis
- III. Anesthetic Consideration
- IV. Subacute Bacterial endocarditis Prophylaxis

Rhythm Disorders and Conduction Defect *

- I. Chronic Abnormalities: Etiology, Diagnosis and Treatment
 - a. ACID implantation
 - b. Pacemakers
 - c. Ablation
- II. Perioperative dysrhythmia: Etiology, Diagnosis and Treatment
- III. Perioperative Implication of ACID and Pacemaker

CPR and Rhythm Recognition (TERM 1)*

- I. Rhythm Recognition
- II. Management: BCLS, ACLS Algorithm, Drugs, Defibrillation

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- III. Complications and outcomes of Therapy
- IV. Adults and Pediatric Differences

Gastrointestinal/Hepatic System Clinical Sciences (TERM 2)

- I. Intestinal Obstruction:
 - a. Causes: Paralytic Ileus, Mechanical, Vascular
 - b. Physiological Changes: Fluid and Electrolytes, Respiratory
 - c. Anesthetic Management: Full stomach, Fluid Therapy, Nitrous Oxide

Endocrine and Metabolic System Clinical Sciences (TERM 2)* 3 and 4

- I. Diabetes Mellitus
 - a. Pathophysiology
 - b. Control of Blood Glucose
 - c. Elective Anesthesia: Perioperative Management
 - d. Emergency Anesthesia
 - e. Hyperosmolar Coma
 - f. Pancreas Transplantation*

Pediatric Anesthesia (TERM 2)* 3 and 4

- I. Apparatus:
 - a. Breathing Circuits (Advantages, Disadvantages etc.)
 - b. Humidity
 - c. Thermal Control
 - d. Endotracheal tube Selection
 - e. Warming Devices

Obstetric Anesthesia (TERM 2)

- I. Maternal Physiology:
 - a. Effects of pregnancy on Uptake and Distribution
 - b. Respiratory (Anatomy, Lung Volume and Capacities, Oxygen consumption, Ventilation, Blood gas, Acid- Base)
 - c. Cardiovascular (Aorto-Caval Compression, Regulation of Uterine Blood Flow)
 - d. Renal
 - e. Gastrointestinal
 - f. Hematology
 - g. Placental Exchange
 - h. Barrier Function
- II. Maternal-Fetal Consideration
 - a. Pharmacology:
 - * Drugs effect on Newborn
 - * Anesthetic Drugs and Adjuncts
 - * Oxytocic Drugs
 - * Tocolytic Drugs

- * Antiseizure Drugs
- * Mechanism of Placental Transfer
- * Fetal Disposition of Drugs
- b. Amniotic Fluids
 - * Amniocentesis
 - * Oligohydramnios
 - * Polyhydramnios
- III. Antepartum Fetal Assessment and Therapy
 - a. Ultrasonography
 - b. FHR Monitoring
 - c. Non stress test
 - d. Stress Test
 - e. Biophysical Profile
- IV. Anesthetic Techniques and Risk
 - a. Systemic medications, Inhalational agents, Opioid and sedatives
 - b. Regional Techniques
 - c. Elective vs Emergency, General vs Regional
- V. Physiology of Labor
- VI. Influences of Anesthetic Technique on Labor
- VII. Caesarean Delivery

Orthopedic Anesthesia (TERM 2)

- I. Tourniquet Management
- II. Complications
- III. Regional vs General Anesthesia

Second Year Resident

Organ Based Basic and Clinical Sciences

TERM 3

Monitoring Devices (TERM 3)

- I. Neuromuscular Function: Nerve Stimulators, Electromyography
- II. Ventilation: Spirometer, Inspiratory Forces, Spirometry, Flow-Volume Loops
- III. Gas Concentrations: O₂, CO₂, Nitrogen, Anesthetic Gas and Vapors
- IV. Temperature
- V. Oxygen: Oximetry, Co-oximetry, Pulse Oximetry
- VI. Blood Pressure: Invasive and Noninvasive
- VII. Heart Function: Heart tones, ECG

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OR Hazards and Safety (TERM 3)

- I. Electrical Safety in Operating Room
- II. Environmental Safety including Chemical Dependency
- III. Electrical, Fire and Explosion Hazards:
 - a. Basic Electronics
 - b. Laser, laser- Safety and Laser- Safe Endotracheal Tube

Ventilators (TERM 3)

- I. Classifications: Flow Generation vs Pressure Generation
- II. Principles of Action: Assistors, Controllers, Assist- Control, Pressure Limited, Volume- Limited, FiO₂ Control, Periodic Sigh, High Frequency Ventilation, Intermittent Mandatory Ventilation (IMV), Synchronized IMV, Pressure Support, Airway Pressure Release Ventilation (APRV), Pediatric Adaptation, Non-Invasive Techniques: Biphase positive Airway Pressure (BIPAP), Others
- III. Monitors: Pressure (Plateau, Peak), Oxygen, Apnea, I:E ratio, Dynamic and Static Compliance

Monitored Anesthesia Care and Sedation (TERM 3)

- I. Techniques
- II. Risks and Complications
- III. ASA Guidelines for Sedation and Sedation Guideline for Non- Anesthesiologists

Complications (TERM 3)*4

Etiology, Prevention, Treatment

- I. Trauma
 - a. Upper Airway: Epistaxis
 - b. Larynx, Trachea and Esophagus
 - c. Eyes: Corneal Abrasion, Blindness and post-op visual loss
 - d. Vascular: Arterial and Venous Thrombosis: Thrombophlebitis, Sheared Catheter, Intra-arterial Injection, Air Embolism, Cardiac/ Vascular Perforation, Pulmonary Artery Rupture
 - e. Neurological: Pressure Injury of Mask, Tourniquet Injury, Body Position, Intraneural Injection, Retractors, peripheral neuropathy
 - f. Burns
- II. Chronic Environmental Exposure
 - a. Fertility
 - b. Teratogenicity
 - c. Carcinogenicity
 - d. Scavenging

Pain Mechanism and Pathway (TERM 3)

- I. Nociceptors and Nociceptive Afferent Neurones, Wind-Up Phenomenon
- II. Dorsal Horn Transmission and Modulation
- III. Spinal and Supraspinal Neurotransmission and Modulation: Opioid Receptors
- IV. Autonomic Contribution to Pain: Visceral Pain Perception and Transmission
- V. Social, Vocational and Psychological Influences on pain perception
- VI. Gender and Age Differences in pain perception

Autonomic Nervous System (TERM 3)

- I. Sympathetic and Parasympathetic:
 - a. Receptors
 - b. Transmitters
 - c. Synthesis
 - d. Storage
 - e. Release
 - f. Response
 - g. Termination of Action
- II. Ganglionic Transmission
- III. Reflexes: Afferent and Efferent Limbs

Temperature Regulations (TERM 3)

- I. Temperature Sensing: Central and Peripheral
- II. Temperature Regulating Centers: Concept of Set point
- III. Heat Production and Conservation
- IV. Heat Loss: Mechanism
- V. Body Temperature Measurement: Sites and Gradient
- VI. Effects of Drugs and Anesthesia on Temperature Regulation

CNS Anatomy (TERM 3)*2

- I. Peripheral Nociceptors: Transduction
- II. Afferent pathways: Neurons, Dorsal horns, CNS Pathways

Respiratory System Pharmacology (TERM 3)

- I. Bronchodilators
 - a. Agonists
 - b. Anticholinergic
- II. Anti-inflammatory medications
 - a. Steroids
 - b. Leukotriene modifier drugs
 - c. Mast cell stabilizers
 - d. IgE blockers

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Endocrine and Metabolic Systems (TERM 3)

- I. Physiology:
 - a. Hypothalamus, Pituitary, Thyroid, Parathyroid, Adrenal Medulla, Adrenal Cortex, and Pancreas

Patient Safety (TERM 3)

- I. Informed Consent: Principles and Components
- II. Medication Errors: assessment and prevention
- III. Disclosures of Errors to Patients

TERM 4

Complications (TERM 4)*3

- I. Temperature:
 - a. Hypothermia: Etiology, Prevention, Treatment, Complications (Shivering, O₂ Consumption), Prognosis
 - b. Nonmalignant Hyperthermia: Complications and Treatment
 - c. Malignant Hyperthermia: Genetics, Pathophysiology, Pharmacogenetics
- II. Bronchospasm
- III. Anaphylaxis
- IV. Latex and other Allergy
- V. Laryngospasm
- VI. Post Obstructive Pulmonary Edema
- VII. Aspiration of Gastric Contents

Central and Peripheral Nervous System (TERM 4)

- I. Physiology:
 - a. Brain:
 - * Subcortical Areas: Basal ganglia. Hippocampus, Internal Capsule, Cerebellum, Brain Stem, Reticular Activating System
 - * Cerebral Blood Flow
 - * Effects of Perfusion Pressure, pH, PaCO₂, PaO₂, CMRO₂
 - * Inverse Steal: Gray Matter vs White Matter
 - * Auto regulation: Normal, Altered and Abolished
 - * Pathophysiology of Ischemia/Hypoxia: Global vs Focal, Glucose effects,
 - * Effects of Brain Trauma or tumors
 - * 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
 - * Cerebral Protection
 - b. Hypothermia
 - c. Anesthetic and Adjuvant Drugs

Gastrointestinal and Hepatic Systems (TERM 4)

- I. Physiology: Hepatic Function
 - a. Dual Blood Supply and Its regulation
 - b. Metabolic and Synthetic Functions
 - c. Excretory Function
 - d. Mechanism of Drug Metabolism and Excretion
 - e. Cytochrome p450
- II. Enhanced Recovery after colorectal surgery

Renal and Urinary System / Electrolytes Balance (TERM 4)

- I. Physiology:
 - a. Blood Flow, GFR, Tubular Reabsorption and Secretion
 - b. Renal Function Test
 - c. Hormonal Regulation of extracellular fluids
 - d. Hormonal Regulation of Osmolality
 - e. Regulation of Acid-Base Balance
 - f. Drug Excretion
 - g. Water and Electrolytes: Distribution and Balance: Compartments
 - h. Renin- Angiotensin- Aldosterone System
- II. Pharmacology:
 - a. Diuretics
 - * Mechanism of Action
 - * Comparison of Drugs
 - * Effects on electrolytes and Acid-Base Balance
 - * Adverse Effects
 - b. Dopaminergic Drugs

Hematologic System (TERM 4)

- I. Pharmacology:
 - a. Anticoagulants, Antithrombotic, and Antiplatelet Drugs
 - * Mechanism of Action
 - * Comparison of Drugs
 - * Drug Interaction
 - * Monitoring of effects
 - * Side Effects and toxicity
 - * Alternatives to Transfusion: Hemodilution, Sequestration, Autotrasfusion, Blood Substitutes,
 - * Erythropoietin
 - b. Immunosuppressive and Anti-Rejection Drugs
- II. Transfusion:
 - a. Indication
 - b. Blood Preservation and Storage
 - c. Blood Filters and pumps

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- d. Effects of Cooling and Heating: Blood warmer
- e. Blood Components therapy and Volume expanders
- f. Preparation for Transfusion: Type and Cross Type, Screen, Uncross matched Blood, Autologous blood, Designated donors
- g. Synthetic and Recombinant Hemoglobin
- III. Reactions to transfusion:
 - a. Febrile
 - b. Allergic
 - c. Hemolytic: Acute and delayed
- IV. Complications of Transfusion:
 - a. Infections
 - b. Citrate Intoxication
 - c. Electrolytes and Acid-Base Abnormalities
 - d. Massive Transfusion: Coagulopathies, Hypothermia
 - e. Pulmonary: Transfusion Related Acute lung Injury

Ventilators (TERM 4)*3

- I. CPAP, PEEP, Nasal CPAP
- II. Nebulizers, Humidifiers, Drug Delivery Systems (Nitric oxide)

Drug Delivery Devices (TERM 4)

- I. Patient Controlled Intravenous/Epidural Analgesia
- II. Epidural and Subarachnoid Continuous Drug Delivery Devices

PHARMACOLOGY: GENERAL CONCEPTS (TERM 4)

- I. Pharmacogenetics: Malignant Hyperthermia* (Including Diagnosis and Therapy)
- II. Addiction
- III. Antiemetic and Aspiration Prophylaxis

Regional Anesthesia (TERM 4)*2 and 3

- I. Peripheral and Autonomic Nerve Block:
 - a. Indications
 - b. Contraindications
 - c. Techniques
 - d. Clinical Assessment
 - e. Complications
 - f. Use of Nerve Stimulator
 - g. Use of Ultrasound
 - * Head and Neck
 - * Upper Extremities/ Brachial Plexus
 - * Lower Extremities
 - * Trunk

Respiratory System (TERM 4)*3

- I. Anatomy:
 - a. Divisions and Bronchoscopic Anatomy
 - b. Bronchial and Pulmonary Circulation
 - c. Microscopic Anatomy
- II. Biochemistry:
 - a. Normal Acid-Base Balance Regulation: Buffer System, Compensatory Mechanism
 - b. Effects of Imbalance on Electrolytes and Organ Perfusion
 - c. Strong Ionic Difference (SID)
 - d. ABG Interpretation
 - e. Anion Gap
 - f. Temperature Effect on Blood Gas: Alpha-Stat vs pH-Stat

Respiratory System Clinical Sciences (TERM 4)* 3, 5, 6

- I. Obstructive Pulmonary Disease:
 - a. Upper Airway: Congenital, Infectious, Neoplastic, Traumatic, Foreign body, Obstructive Sleep Apnoea
 - b. Tracheobronchial: Congenital, Infectious, Neoplastic, Traumatic, Foreign body
 - c. Parenchymal: Asthma, Bronchitis, Emphysema, COPD, Lung Abscess, Bronchiectasis, Cystic Fibrosis, And Mediastina Masses

Cardiovascular System Clinical Sciences (TERM 4)* 2 and 3

- I. Heart Failure and Cardiomyopathy (Ischemic, Viral, Hypertrophic)
 - a. Definitions and Functional Classifications
 - b. Perioperative Diagnosis and Treatment
 - c. Compensatory Responses
 - d. Right or left Ventricular Dysfunction: Etiology, Signs and Symptoms, Diagnostic Tests, Systolic vs diastolic Dysfunction
 - e. Treatment: Pulmonary Edema, Pulmonary Hypertension, Cardiogenic Stroke, Cardiac Transplantation

Endocrine and Metabolic System Clinical Sciences (TERM 4)* 2 and 3

- I. Diabetes Mellitus*
 - a. Pathophysiology
 - b. Control of Blood Sugar: Hypoglycemia, Hyperglycemia and Ketoacidosis
 - c. Elective Anesthesia: Perioperative Management
 - d. Emergency Anesthesia
 - e. Hyperosmolar Coma
 - f. Pancreas Transplantation
- II. Thyroid Disease
 - a. Hyperthyroidism: Metabolic and Circulatory Effects, Anesthetic Management,

- Thyroid Storm
- b. Hypothyroidism: Metabolic and Circulatory Effects, Myxedema Coma, Substitution Therapy, Anesthetic Implications
- c. Complications of Surgery: Hypocalcaemia, Recurrent Laryngeal Nerve Injury, Diagnosis and Treatment

Clinical Subspecialties: Painful Disease State (TERM 4) *3

- I. Pathophysiology
 - a. Acute pain
 - b. Cancer Related Pain
 - c. Chronic pain States: Acute and Chronic Neck and Low Back pain,
 - d. Neuropathic pain states:
 - * Complex Regional Pain Syndrome: Type I and II
 - * Post Herpetic Neuralgia
 - * Phantom Limb, Post Stroke
 - * Peripheral Neuropathies (Diabetic Neuropathy)
 - e. Somatic Pain Conditions: Myofascial Pain, Facet Arthropathy
- II. Treatment
 - a. Acute Post-operative and post traumatic pain
 - b. Post-operative epidural analgesia
 - c. Neuraxial Opioid
 - d. Peripheral Nerve Blockade and Catheters
 - e. Patient- Controlled Analgesia
 - f. Other Modalities: Multimodal Analgesia
- III. Treatment: Cancer Related Pain
 - a. Systemic Medication, Tolerance and Addiction
 - b. Continuous Spinal and Epidural Analgesia
 - c. Neurolytic and Non-neurolytic Blocks
 - d. WHO Analgesic Ladder
- IV. Treatment: Chronic Pain
 - a. Systemic Medication: NSAIDs, Opioid, Anticonvulsants, Antidepressants
 - b. Spinal And Epidural Analgesia
 - c. Peripheral Nerve Blocks
 - d. Sympathetic Nerve Blocks
 - e. Other techniques: TENS, Neuroablation, Spinal Cord Stimulation

Pediatric Anesthesia (TERM 4)*3

- I. Premedication
- II. Agents and Techniques
- III. Fluid Therapy and Blood Replacement
- IV. Problems in Intubation and Extubation
- V. Pediatric Medical problems with Anesthetic Implications

- VI. Anesthetic Implications for Common Non-neonatal Pediatric Subspecialty Surgery: Otolaryngology
- VII. Pediatric Anesthesia for Ophthalmology
- VIII. Pediatric Outpatient Anesthesia
- IX. Pediatric post-operative analgesia, PONV, Sedation

Obstetric Anesthesia (TERM 4)*3

- I. Pathophysiology of Complicated Pregnancy
- II. Resuscitation of Newborn

Anesthesia for Laparoscopic Surgery (TERM 4)*3

- I. Cholecystectomy
- II. Gynecological Surgery etc
- III. Anesthetic Management and Complications

Ophthalmologic Anesthesia (TERM 4)*3

- I. Retrobulbar and peribulbar Blocks
- II. Open Eye Injuries

Anesthesia for ENT Surgery (TERM 4)*3

- I. Airway Endoscopy
- II. Microlaryngeal Surgery
- III. Laser Surgery
- IV. Hazards and Complications (Airway Fire)

Third Year Resident

Special Problem or Issues in Anaesthesiology

Record and Documentation, Clinical Communication (TERM 5)*6

SBAR, Direct, Closed Loop

Ethics, Practice Management and Medicolegal Issues (TERM 5)*6

(In collaboration with KGUMBS and Other Departments)

Monitoring Methods (TERM 5)*6

- I. Vascular Pressure: Arterial (Invasive/noninvasive Differences), Central Venous (CVP), Pulmonary Arterial (PAP), Pulmonary Artery Occlusion (PAOP), Left Atrial (LAP), Left Ventricular End-Diastolic (LVEDP)
- II. Heart Function: Heart Tone, ECG, Echocardiography, Doppler, Cardiac Output
- III. Brain and Spinal Cord Function: EEG, BIS, Evoke Potentials etc.
- IV. Mixed Venous Oxygen Saturation (SvO2)
- V. Awareness Monitors

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Instrumentation (TERM 5)*6

- I. Cardiac Output
- II. Echocardiography
- III. Coagulation Monitors
- IV. Ultrasound Guided Placement of Invasive Catheters

Pharmacology: General concepts (TERM 5)*6, 3 and 4

- I. Alpha-2 Agonist
- II. Anti-convulsants
- III. Anti-depressants, Anti- Parkinson Drugs
- IV. Arousal Agents

Special Techniques: Clinical Sciences (TERM 5)*6

- I. Controlled Hypotension: Choice of Drugs, Use of posture, Ventilation
- II. Controlled Hypothermia: Techniques, System Effects, Shivering, Rewarming, Complications
- III. Hyperbaric Oxygen and Anesthesia
- IV. High Altitude Anesthesia

Central and Peripheral Nervous System (TERM 5)* 4 and 6

- I. Physiology:
 - a. Metabolism: Substrates, Aerobic and Anaerobic
 - b. Intracranial Pressure
 - * Brain Volume, Elastance and Compliance
 - * Increased ICP, Herniation
 - c. Electroencephalography (EEG)
 - * (Wave Patterns, Frequency and Amplitude, Raw and Processed, Spectral Edge
 - * Sleep, Convulsions; O₂ and CO₂; Hypothermia; Brain Death
 - * Depth of Anesthesia; Burst Suppression, Electrical Silence, Specific Anesthetic and Drug Effects
 - d. Evoked Responses
 - * Morphology, Effects of Ischemia and Anesthetics
 - * Sensory: Somatosensory, Visual, Brainstem Auditory
 - * Motor
- II. Pharmacology
 - a. Substance Abuse and Addiction: Dependence
 - b. Chronic Opioid Dependence and Therapy
 - c. Pharmacologically Assisted Opioid Withdrawal

CNS Clinical Sciences (TERM 5)*6

- I. Seizures
- II. Coma: Traumatic, Infectious, Toxic-Metabolic, Cerebrovascular Accident (CVA), Cerebral Hypoxia
Glasgow Coma Scale, Management of Traumatic Brain Injury
Therapeutic Barbiturate Coma
- III. Drug Intoxication (CNS Drugs, Carbon Monoxide, Insecticides, Nerve Gases)
- IV. Paraplegia, Quadriplegia, Spinal Shock, Autonomic Hyperreflexia
Airway Management in the Patient with Cervical Spine Disease
- V. Tetanus
- VI. Special Problems of Anesthesia for Neurosurgery
 - a. Increased Intracranial Pressure: Tumors, Hematomas, Hydrocephalus
 - b. Positioning: Prone, Sitting, Other, Head Stabilization in Tongs
 - c. Air Embolism
 - d. Cerebral Protection from Hypoxia, Ischemia and Glucose Effects
 - e. Aneurysms and A-V Malformations, Cerebral Vasospasm
 - f. Interventional Neuroradiology; Coils and Embolization
 - g. Pituitary Adenomas, Trans-Sphenoidal Hypophysectomy
 - h. Anesthetic and Ventilatory Effects on Cerebral Blood Flow and Metabolism
 - i. Fluid Management: Hypertonic Vs Isotonic Saline vs. Balanced Salt Solutions
 - j. Spinal Fluid Drainage
 - k. Stereotactic and Gamma-Knife Techniques, Deep Brain Stimulator Placement, Intra- Operative Wake-Up Techniques
 - l. Ventriculostomy
 - m. Awake Craniotomy

Respiratory System (TERM 5)*6

- I. Advanced Physiology:
 - a. Ventilation-Perfusion:
 - * Measurement of Ventilation/Perfusion (V/Q) Ratio,
 - * Implication of Alveolar- Arterial O₂ Gradient (A-aDO₂), Arterial-alveolar CO₂ Gradient (A-aDCO₂), Dead Space to Tidal Volume Ratio (Vd/Vt), Shunt Fraction (Q_s/Q_t),
 - * Lung Scan

Respiratory System Clinical Sciences (TERM 5)* 3, 4 and 6

- I. Restrictive Disease
 - a. Neurologic: CNS depression, Spinal Cord Dysfunction, Peripheral Nervous System
 - b. Musculoskeletal: Muscular, Skeletal, Obesity, Chest Trauma
 - c. Parenchymal: Atelectasis, Pneumonia, Interstitial Pneumonitis, Pulmonary Fibrosis, Respiratory Distress Syndrome (ARDS), Bronchopulmonary Dysplasia
 - d. Pleural and Mediastinal: Pneumo-, Haemo- and Chylothorax, Pleural Effusion, empyema, Bronchopleural Fistula

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- e. Others: Pain and Abdominal Distension
- II. Management of the Patient with Respiratory Disease
 - a. Evaluation: History and Physical Examination
 - b. Investigations: Chest X ray, ABGs, PFTs,
 - c. Assessment of Perioperative Risks

Respiratory Anesthetic Management (TERM 5)*6

- I. Preoperative Preparation
 - a. Respiratory therapy
 - b. Drug Therapy
 - c. Tobacco Smoking Cessation
- II. Intraoperative Management
 - a. Monitoring
 - b. Choice of Anesthesia
 - c. Anesthetic Techniques: Nonpulmonary Surgery, Thoracic and Pulmonary Surgery, One-Lung Ventilation, Thoracoscopic Procedures, Mediastinoscopy, Lung Transplantation
 - d. Postoperative Care: Pain Management, Respiratory Therapy, Ventilator Support, Extubation Criteria
- III. Management of Respiratory Failure
 - a. Nonventilatory Respiratory Management: O₂ Therapy and Toxicity, Tracheobronchial Toilet, Positive Airway Pressure, Respiratory Drugs
 - b. Ventilatory Management:
 - * Criteria for Ventilation and Weaning
 - * Mode of ventilation: CPAP, MIV, SIMV etc.
 - * Complications and Side effects of Mechanical Ventilations
 - * Management of Bronchospasm

Cardiovascular System (TERM 5)*6

- I. Advanced Anatomical Sciences:
- II. Anatomy of Heart and Major Vessels:
 - a. Echocardiographic Heart Anatomy: Chambers, Valves, Great Vessels, Pericardium, Basic TEE views
 - b. Radiographic: Roentgenograms, CT, MRI
 - c. Others

Cardiovascular System Clinical Sciences (TERM 5)*6

- I. Cardiac Tamponade and Constrictive Pericarditis
- II. Pulmonary Embolism
- III. Shock

Gastrointestinal/Hepatic System Clinical Sciences (TERM 5)*6

- I. Nutrition:
- II. Morbid Obesity: 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)

III. 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

Renal and Urinary System Clinical Sciences (TERM 5)*6, 7 and 8

- I. Pathophysiology of Renal Disease; Risk Factors for Acute Renal Failure
- II. Anesthetic Choice in Reduced Renal Function
- III. Anesthetic Management in Renal Failure
- IV. Anesthetic Management in Renal Transplant
- V. Perioperative Oliguria and Anuria
- VI. Urologic Surgery- Lithotripsy, Transurethral Resection of TURP/Irrigating Fluids/ Hyponatremia
- VII. Perioperative Electrolyte Abnormalities

Hematologic System Clinical Sciences (TERM 5)*6

- I. Diseases of Blood
 - a. Anemias; Compensatory Mechanisms
- II. Polycythemias; Primary vs. Secondary
- III. 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
- IV. Hemoglobinopathies, Porphyrias
- V. Massive Transfusion Protocol

Endocrine and Metabolic System Clinical Sciences (TERM 5)*6

- I. Parathyroid Disease
- II. Adrenal Disease

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Neuromuscular disease and disorders (TERM 5)*6

- I. Demyelinating Disease
- II. Myasthenia Syndrome

Pediatric Anesthesia (TERM 5)*6

- I. Congenital Heart and Major Valvular Disease
- II. Physiology
- III. Emergencies in the Newborn
- IV. Neurosurgery
- V. Thoracic Surgery
- VI. General and Urologic Surgery
- VII. Orthopedic Surgery

Anesthesia for ENT Surgery (TERM 5)*6, 3 & 4

Trauma Anesthesia (TERM 5)*6

- I. Massive Trauma
 - a. Evaluation of the Trauma Patient
 - b. Hemorrhagic Shock
- II. Management of Traumatic Brain Injury
 - I. Burn Management
 - II. Mass Casualty, Disaster Management, and Preparedness
- III. Chemical and Biological Warfare

Anesthesia for Ambulatory Surgery (TERM 5)*6

- I. Patient Selection and Preoperative Management
- II. Anesthetic Management
- III. Discharge Criteria and Postoperative Follow-Up, Including Continuous Nerve Blocks
- IV. Office-Based Anesthesia: Equipment, Safety, Organization, Patient Management

Geriatric Anesthesia and Aging (TERM 5)*6

- I. Pharmacological Implications, MAC Changes
- II. Physiological Implications: CNS, Circulatory, Respiratory, Renal, Hepatic

Infection Control (TERM 5)*6

- I. General and Universal Precautions
- II. Needle Stick Injury
- III. Catheter Sepsis
 - a. Intravascular
 - b. Urinary
- IV. Nosocomial Infections – Ventilator Associated Pneumonia
- V. Antibiotics: Antibacterial, Antifungal, Antiviral, Antiparasitic; Antimicrobial Resistance

Ventilator Management (TERM 5)*6

Anesthesia For Plastic Surgery, Liposuction (TERM 5)*6

Fourth Year Resident

Physician Impairment or Disability (TERM 7)

Cardiovascular Clinical Science (TERM 7)*8

Circulatory Assist:

- I. Cardiopulmonary Bypass
 - a. Components (Pump, Oxygenator, Heat Exchanger, Filters)
 - b. Cardiopulmonary Bypass Techniques
 - c. Mechanisms of Gas Exchange
 - d. Priming Solutions, Hemodilution
 - e. Anticoagulation and Antagonism; Activated Clotting Time (ACT) and Other Clotting Times, Heparin Assays, Antithrombin III, Protamine Reactions, Heparin and Protamine Alternatives
 - f. Prophylaxis with Aminocaproic Acid, Tranexamic Acid
 - g. Anesthetic Considerations During Bypass
 - h. Extracorporeal Membrane Oxygenation (ECMO)
 - i. Cooling and Warming, Deep Hypothermic Circulatory Arrest
 - j. Monitoring, Blood Pressure Management
 - k. Minimally Invasive Bypass Techniques
 - l. Myocardial Preservation: Physiology, Techniques, Complications
 - m. Preconditioning
- II. Minimal Invasive Cardiac Surgery
 - a. Off-pump coronary artery bypass (OPCAB)
 - b. Minimally invasive direct coronary artery bypass (MIDCAB)
 - c. Percutaneous valve repair/replacement
- III. Intraaortic Balloon: Rationale, Indications, Limitations
- IV. Ventricular Assist Devices and Artificial Heart: Internal and External

Renal and Urinary System Clinical Sciences (TERM 7)* 5, 6 and 8

Neuromuscular Disease and Disorders (TERM 7)*8

- I. Primary Muscle Disease
- II. Ion Channel Myotonia

Critical Care (TERM 7)*8

- I. Critical Care Shock States
- II. Poisoning and Drug Overdose
- III. Near Drowning

Special Issues and Problems in Anesthesiology (TERM 7)*8

- I. Electroconvulsive Therapy
- II. Organ Donors
- III. Transplant Anesthesia
- IV. Patients with do not resuscitate orders
- V. Ethics, Practice Management and Medico legal Issues

Quality Improvement Basics (TERM 7)*8

- I. Design, Analysis, Implementation of Quality Improvement Project

FIELD POSTING

Learning outcome

The learning outcomes elaborated here are in alignment with the learning outcomes of the programme.

At the end of the training, the resident will be able to:

- I. Integrate clinical experiences from previous specialty rotations and be able to work competently in a district hospital.
- II. Be familiarize with the anesthesia works and nature of surgery in district hospitals.

Content outline

The resident is able to describe and understand working system in district hospital and be able to apply the competencies acquired during earlier postings.

- I. Demonstrate Anesthetic clinical knowledge and skills commensurate with his level of training by managing cases presenting in district hospitals.
- II. Be able to describe the organization of the health care delivery system at the district level
- III. Be able to identify and refer those patients which require specialized hospital care.
- IV. Participate in the formal or non-formal (i.e. in-service)training of other health care workers and staff in the hospital, BHU and the community. (basic life supports)

EXAMINATION SYSTEM AND OVERVIEW

Examinations	Schedule	Components		Total Marks	% Weightage †
		Written	Practical		
Term 1-2	End of term 1	Paper I – V (Each paper) MCQ: 50% SAQ = 5 marks * 10	OSPE = 20 stations * 3 mins = 100 marks	600	Exams = 10 % (CA = 5 %)*
Term 3-4		Mini-Cex, DOPS, CBD, 360-degree feedback, log book/portfolio		100	(CA = 5 %)*
		Mini-Cex, DOPS, CBD, OSLE, 360-degree feedback, log book		100	
Term 5-6	End of term 4	Paper I & II (Each paper) MCQs: 50 marks SAQ = 5 marks * 6 SLEQ = 10 marks * 2	OSCE, 10 stations (5 mins each) 100 marks short case (2): 50 marks * 2 Long case (1): 100 marks (OSLER)	400	Exams = 20 %
	End of term 6	Mini-Cex, DOPS, CBD, OSLE, 360-degree feedback, log book/portfolio Thesis content and Presentation: 25 marks each Oral/viva voce: 50 marks		100	(CA = 5 %)* Thesis = 20 %
Term 7-8	Continuous assessment(CA)	Quality improvement project during 7th term (July-December) with report writing and submission to Dean's office through supervisor for QI project		100	(CA = 5 %)*
	Institute Examination III	Paper I & II (Each paper) MCQs: 50 marks SAQ = 5 marks * 6 SLEQ = 10 marks * 2	OSCE, 10 stations (5 mins) 100 marks short case (2): 50 marks * 2 Long case (1): 100 marks (OSLER)	500	Exams = 30 %
Total Cumulative percentage					100 %

Continues assessment (CA): Preferably by a faculty member but in special situations a senior resident can do as a part of peer assessment
CA: will be assessed 6 monthly basis (term)

*** Institute examination I, II, thesis and III are considered bar exams, a candidate must secure minimum of 50% separately in each theory paper, OSCE and Cases

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Institute Examination I:

Paper I: Anatomy and Physiology

Paper II: Biochemistry, Pharmacology and General Pathology

Paper III: Emergency Medicine and Patient safety

Paper IV: Laboratory Medicine, Chemical Pathology and Radiology

Paper V: Biostatistics, Epidemiology and Research

Institute Examination II:

*Paper I: **Basic & Clinical Sciences:***

*(**Anatomy; Physics; Monitoring, Anesthesia Equipment and Delivery Devices; Statistics; Pharmacology; Anesthesia Procedures, Methods and Techniques:** Evaluation of Patient and Pre-operative Preparation, Regional Anesthesia, General Anesthesia, Monitored Anesthesia Care and Sedation; **Complications; Post-operative Period; Intravenous Fluid Therapy During Anesthesia; Special Techniques:** Controlled Hypotension, Controlled Hypothermia, Hyperbaric Oxygen and Anesthesia Care, High Altitude Anesthesia)*

*Paper II: **Organ Based Basic and Clinical Sciences as Applied to Anesthesia:***

(Central and Peripheral Nervous System, Respiratory, Cardiovascular, Gastrointestinal/Hepatic, Renal and Urinary System, Electrolyte Balance, Hematologic, Endocrine and Metabolic & Neuromuscular Disease and Disorders)

Submission of Thesis:

Thesis Defense Examination

Institute Examination III:

Paper I: Basic sciences: Anatomy, Physics, monitoring and anesthesia delivery devices, pharmacology, clinical sciences regional anesthesia and special techniques organ based

*Paper II: **Anesthesia in Relation to Clinical Sub Specialties and special issues in anesthesia** (Pediatric, Neuroanesthesia, Cardiothoracic anesthesia, Obstetrics, Otorhinolaryngology, Ophthalmology, Orthopedics, Plastic Surgery, Laparoscopic Surgery, Burns and Trauma, Ambulatory Surgery, Geriatric, Critical care, ECT, organ donors, radiologic procedure's, ethics, practice management and medicolegal issues, painful disease states, **Pain Medicine, Critical Care Medicine, Special Problems /Issues in Anesthesiology, and Recent Advances in Anesthesia:***

*(**Pain Medicine:** Mechanism and Pathways, Acute Pain, Cancer Related Pain, Chronic Pain States, Neuropathic Pain; **Critical Care:** Shock States, Poisoning and Drug Overdose, Near-Drowning, Infection Control, Ventilator Management; Electroconvulsive Therapy; **Special Problems/Issues:** Organ Donors; Radiologic Procedures/Anesthesia in Locations Outside the Operating Rooms; Ethics; Medicolegal Issues; Physician Impairment; Patient Safety, Quality Assurance; **Recent Advances in Anesthesia.***

EVALUATION OF CURRICULUM

Curriculum evaluation will be approached as an ongoing process of continuous information collection and analysis to allow for a prioritization of quality improvement (QI) activities. At regular times, information will be collected from the stakeholders (residents, supervisors, course coordinator, University, Teaching Hospitals, Ministry of Health and District Health officials) with a view to detect where optimization of the quality of the programme is needed. As it will be impossible to engage in quality improvement processes over the whole range, prioritization of QI activities is needed and the curriculum evaluation will be used for this purpose. In line with the assessment strategy, we envision a curriculum evaluation programme that will use a variety of information sources to address the most pressing questions. We foresee a yearly cycle of Plan-Do-Check-Act.

The entire curriculum will be reevaluated every 5th year with the scope to incorporate and keep with the pace of recent development in the field of medical education in order to provide maximum learning opportunities to our learners.

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Annexure: I

FoPGM/Anesthesiology-Portfolio 2018

Name:.....






Batch:

Placement:

Date from:

To:

Portfolio Assessment form: Global assessment of the 6 competency domains of learning

Portfolio Assessment Scale (Global ratings)		Domains of learning in Anesthesiology								
 Not learned = 1  Needs further training = 2  Satisfactory = 3  Competent = 4  Mastery = 5		Patient Care	Applied Professional Knowledge and Skills	Practice-based learning and improvement	Interpersonal and communication skills	Professionalism	Systems-based practice			
Frequency Check (✓) as applicable		Assessor Check (✓) as applicable						Total Score	Average Score	Signature
Completion of Term/Rotation		Resident								
Completion of Term/Rotation		Specialist Supervisor								
At the end of assessment period	Term 1 Term 2-4 Term 5-6 Term 7-8	Course Coordinator								
Term Score (T)	Term 1 Term 2-4 Term 5-6 Term 7-8									

Guideline for assessors

The residents develop competency in cognitive, psychomotor and affective domains (described under six domains of Anesthesiology) and progress towards mastery. The milestones are color coded as red, orange, green, blue and grey, representing as not learned, needs further training, satisfactory, competent and mastery respectively. The following descriptions under each domain shall guide the assessors while coding the milestones. Log books, formative assessment tools and professional judgments based on workplace assessment are used to code the milestones

Domain 1: Patient Care

- I. Demonstrate skill in anesthesia care during preoperative, intraoperative and postoperative period.
- II. Demonstrate skill in general anesthesia and monitoring during anesthesia in patients undergoing surgeries with various comorbidities
- III. Demonstrate skills in airway management
- IV. Demonstrate skills in resuscitating patients (cardiopulmonary-cerebral resuscitation)
- V. Demonstrate skills in care and treatment of critically ill patients and respiratory care.
- VI. Demonstrate skills in pain management and treatment.

Domain 2: Applied Professional Knowledge and Skills

- I. Demonstrate understanding of anatomy, physiology, pharmacology and physics relevant to anesthesia
- II. Demonstrate relevant diagnostic and managerial anesthesia skills
- III. Keeps updated with recent advances and evidence based practice
- IV. Able to collaborate and coordinate care

Domain 3: Practice-based learning and improvement

- I. Analyze practice experience and perform practice-based improvement activities using a systematic methodology;
- II. Locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;
- III. Obtain and use information about their own population of patients and the larger population from which their patients are drawn;
- IV. Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness;
- V. Use information technology to manage information, access on-line medical information; and support their own education; and
- VI. Facilitate the learning of students and other health care professionals.

Domain 4: Interpersonal and communication skills

- I. Communication is clear, respectful, empathetic and appropriate to the person and socio-cultural context.
- II. Effective communication is used in challenging situations
- III. Communication with family, caregivers and others involved in the care of the patient is appropriate and clear
- IV. Complaints and concerns are managed effectively
- V. Ways in which health can be optimized and maintained are communicated to patients, family members and caregivers

Domain 5: Professionalism

- I. Demonstrate moral, ethical, and positive attitudes toward patients, relatives, colleagues, and the community
- II. Demonstrate accountability to patients, society, and the profession;
- III. Demonstrate commitment to excellence and on-going professional development;
- IV. Be committed to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information and informed consent.
- V. Demonstrate sensitivity and responsiveness to patients' culture, age, gender, and disabilities.

Domain 6: Systems-based practice

- I. Demonstrate knowledge of the health system of the country.
- II. Demonstrate knowledge and involvement in quality improvement system for patient care
- III. Practice cost-effective health care and resource allocation that do not compromise quality of care;
- IV. Adhere to system operating procedures and standard operating procedure
- V. Able to partner with healthcare managers and providers to assess, coordinate, and improve health care and know how these activities can affect system performance.

360 degree feedback form (Interpersonal and communication skills)

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, their families, and professional associates.

1. Assessment by: Self Others

2. Name of Resident:

Competency group:					
Communicates effectively to create and sustain a therapeutic relationship with patients and families					
	Not Applicable	Rarely demonstrates (<25-50% of the time)	Sometimes demonstrates (25% of time)	Demonstrates in most cases (50-75% of the time)	Demonstrates in majority of cases (>75% of the time)
Obtains historical information from appropriate individual (patient, caregiver, etc)	NA	1	2	3	4
Makes appropriate introductions and explains personal roles	NA	1	2	3	4
Respects privacy of patient/family by using various areas in facility for conversation, exams, etc	NA	1	2	3	4
Shows evidence of being able to sustain a continuing relationship with the patient	NA	1	2	3	4
Uses appropriate language at the proper developmental/educational level for the patient and/or caregivers/family members	NA	1	2	3	4
Uses a variety of techniques to elicit information from the patient	NA	1	2	3	4
Uses effective listening skills to elicit information	NA	1	2	3	4
Makes the patient comfortable enough to extract all necessary information when engaging in probing conversation	NA	1	2	3	4
Ensures the patient understands instructions	NA	1	2	3	4
Provides instructions to patients in a variety of ways	NA	1	2	3	4

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Competency: Work effectively with others as a member or leader of a health care team or other professional group					
	Not Applicable	Rarely demonstrates (<25-50% of the time)	Sometimes demonstrates (25% of time)	Demonstrates in most cases (50-75% of the time)	Demonstrates in majority of cases (>75% of the time)
Familiarizes with the health care team member	NA	1	2	3	4
Shows respect to team members and provides information when needed	NA	1	2	3	4
Facilitates team communication when in role of team leader	NA	1	2	3	4
Assumes the role of consultant where appropriate	NA	1	2	3	4
Provides constructive verbal and written feedback to other members of the health care team	NA	1	2	3	4
Medical records are thorough, readable, and done on time	NA	1	2	3	4

Date evaluated:

Case based discussion (CbD)

1. Department:

2. Brief case description:

3. Setting: OPD Ward Emergency ICU

4. Degree of difficulty: Low Moderate High

5. Basis for case discussion:

Inpatient record Discharge summary OPD prescription

Please score the trainee on the scale shown. Please note that your scoring should reflect the performance of the student against that which you would **reasonably expect at their stage of training** and level of experience. Please mark 'Unable to Comment' if you feel you have not observed the behaviour.

Assessments	Well below expectation	Below expectation	Borderline	Meets expectation	Above expectation	Well above expectation	Unable to Assess
Clinical assessment	1	2	3	4	5	6	UTA
Investigations & referrals	1	2	3	4	5	6	UTA
Management plan	1	2	3	4	5	6	UTA
Follow up & future planning	1	2	3	4	5	6	UTA
Record keeping	1	2	3	4	5	6	UTA
Overall clinical judgment	1	2	3	4	5	6	UTA

Feedback	
What went well?	
Any suggestion for improvement	

11. Assessor's Name and signature:

Trainee's reflection. What have I learnt? and Where I need to focus for improvement?

12. Trainee's name and signature:

Date: D/M/Y

Direct Observation of Procedural Skills (DOPS) form

1. Department:
2. Procedure:
3. Setting: OPD Ward Emergency
4. Conducted: on a patient during simulation exercise
5. Degree of difficulty: Low Moderate High
6. Reason for added difficulty:
7. Time pressure: Elective Critical
8. Number of times same procedure done before:

9. Assessment	Significant input required from assessor	Some guidance provided by assessor	Able to manage independently	Unable to assess
Clinical knowledge	<i>Understand indications and contraindication, understands relevant anatomy</i>			
	1	2	3	UTA
Consent	<i>Properly explain the procedure to patient and obtains informed verbal consent</i>			
	1	2	3	UTA
Preparation	<i>Properly explains the procedure and appropriately prepares for the procedure ensure assisting staff is present</i>			
	1	2	3	UTA
Infection control	<i>Demonstrates aseptic technique and follows universal precautions</i>			
	1	2	3	UTA
Technical ability	<i>Demonstrates manual dexterity and confidence; demonstrate adequate skill and practical fluency</i>			
	1	2	3	UTA
Patient interaction	<i>Communicates, reassures the patient, eye contact with patient for discomfort</i>			
	1	2	3	UTA
Insight	<i>Knows when to seek assistance, abandon procedure or arrange alternative care to prevent harm to patient</i>			
	1	2	3	UTA
Documentation	<i>Documents the episode including problems and complications; Clear post-procedure to the patients and staffs</i>			
	1	2	3	UTA
Team interaction	<i>Provides clear instructions to assisting staff and conveys relevant information concerning the patient and plans to team members</i>			
	1	2	3	UTA
Overall performance	1	2	3	

Feedback	
What went well?	
Areas that needed supervisory input	
Suggestions for getting greater independence	

11. Assessor's Name and signature:

Trainee's reflection on The procedure & learning

12. Trainee's name and signature:

Date: D/M/Y

**Mini – Clinical Evaluation
(Mini- CEX) Form**

Department: _____ Date: _____

Resident: _____ R-1 R-2 R-3 R-4

Patient Problem/Dx: _____

Setting: OPD Ward Emergency Other _____

Patient: Age: _____ Sex: _____ New Follow-up

Complexity: Low Moderate High

Focus: Data Gathering Diagnosis Therapy Counseling

Medical Interviewing skills (O Not Observed)	Facilitates patient’s telling of story; effectively uses questions/directionsto obtain accurate, adequate information needed; responds appropriately to affect, non-verbal cues.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Physical Examination Skills (O Not Observed)	Follows efficient, logical sequence; balances screening/diagnostic stepsfor problem; informs patient; sensitive to patient’s comfort, modesty.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Humanistic Qualities/ Professionalism	Shows respect, compassion, empathy, establishes trust;attends to patient’s needs of comfort, modesty, confidentiality, information.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Clinical Judgement (O Not Observed)	Selectively orders/performs appropriate diagnostic studies, considers risks,benefits.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Counseling Skills (O Not Observed)	Explains rationale for test/treatment, obtains patient’s consent, educates/ counselsregarding management.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Organization/Efficiency (O Not Observed)	Prioritizes; is timely; succinct.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		
Overall Clinical Competence (O Not Observed)	Demonstrates judgment, synthesis, caring, effectiveness, efficiency.								
	1	2	3	4	5	6	7	8	9
	Unsatisfactory			Satisfactory			Superior		

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Mini-CEX Time: Observing _____ Mins Providing Feedback: _____ Mins

Evaluator Satisfaction with Mini-CEX

1 2 3 4 5 6 7 8 9 HIGH

Resident Satisfaction with Mini-CEX

1 2 3 4 5 6 7 8 9 HIGH

Feedback

Which aspect of the encounter went well?

Suggested areas of improvement?

9. Assessor's name and signature:

--

10. Trainee's reflections on patient and areas of learning:

--

11. Trainee's name and signature

Date: D/M/Y

--

Note 1: Reprinted with permission from the American Board of Internal Medicine, www.abim.org.

Note 2: Discussed in: Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (Clinical Evaluation Exercise): a preliminary investigation. *Ann Intern Med* 1995;123:795-9.

Note 3: General Practice Curriculum, KGUMSB, 2016

Name:.....Placement:

Date from:..... To:..... Term.....

Sl. No.	Date	Learning activity	Remarks (observed, Assisted, Performed, Attended, Presented, Participated etc)	Sig. of supervisor

ANNEXURE II

GENERIC CURRICULUM

Content outline

The resident doctor, irrespective of discipline enrolled, must be able to describe and apply the values during training and throughout the professional life (KGUMSB, 2016)

MEDICAL EDUCATION: (30 Hours)

FUNDAMENTALS OF BASIC SCIENCE

- I. Fundamental principles and applications of anatomy
- II. Fundamental principles and applications of physiology
- III. Fundamental principles and applications of biochemistry
- IV. Fundamental principles and applications of pharmacology
- V. Fundamental principles and applications of pathology

BASIC LIFE SUPPORT AND ADVANCE CARDIAC LIFE SUPPORT SKILLS

BLS

- I. Key changes in basic life support, reflecting the new science from the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care
- II. Critical concepts of high-quality CPR
- III. The American Heart Association Chain of Survival
- IV. 1-Rescuer CPR and AED for adult, child and infant
- V. 2-Rescuer CPR and AED for adult, child and infant
- VI. Differences between adult, child and infant rescue techniques
- VII. Bag-mask techniques for adult, child and infant
- VIII. Rescue breathing for adult, child and infant
- IX. Relief of choking for adult, child and infant
- X. CPR with an advanced airway

ACLS

- I. Key changes in advanced cardiovascular life support, reflecting the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care
- II. Basic life support skills, including effective chest compressions, use of a bag-mask device and use of an AED
- III. Recognition and early management of respiratory and cardiac arrest
- IV. Recognition and early management of peri-arrest conditions such as symptomatic bradycardia
- V. Airway management
- VI. Related pharmacology
- VII. Management of acute coronary syndromes (ACS) and stroke
- VIII. Effective communication as a member and leader of a resuscitation team
- IX. Effective Resuscitation Team Dynamics

RADIO-DIAGNOSIS AND IMAGING**Plain Radiographs**

- I. Identify normal anatomy on PA, AP, and lateral chest films
- II. Recognize abnormal chest films including pleural effusion, pneumothorax, pneumonia and lobe location, changes of congestive heart failure, changes of chronic obstructive pulmonary disease, atelectasis, pulmonary nodules and masses, and hyaline membrane disease of the newborn
- III. Identify normal anatomy on four views of the abdomen
- IV. Recognize abnormal abdominal films including ileus, small bowel obstruction, large bowel obstruction, free air, and calcifications
- V. Identify normal anatomy of the spine and long bones in both adults and children
- VI. Recognize abnormal bone radiographs including fractures, degenerative joint disease, osteoporosis (including vertebral collapse), and primary versus metastatic bone malignancy
- VII. Identify normal anatomy on barium enema, and upper gastrointestinal series

Computed Tomography

- I. Recognize and treat contrast allergy, its signs and symptoms, and implications to the patient
- II. Discuss principles of CT function and applications
- III. Discuss differences between CT, MRI, plain film, and US, including the comparative benefits/drawbacks, strengths/weaknesses of each modality
- IV. Discuss general indications of when to use CT as the imaging of choice
- V. Identify normal anatomy found on CT of the head, spine, chest, abdomen, and pelvis
- VI. Recognize abnormal head CTs including acute hemorrhage infarcts, edema, mass effect, and hydrocephalus in an infant and adult
- VII. Recognize abnormal chest CTs including pulmonary nodules and masses
- VIII. Recognize abnormal abdominal/pelvis CTs including diverticular disease, appendicitis, bowel obstruction, abdominal aortic aneurysms, pancreatitis, abdominal abscesses, ascites, and hepatic, pancreatic and renal masses
- IX. Recognize abnormal CTs of the spine, including metastatic disease, degenerative joint disease, and disc disease.

Magnetic Resonance Imaging

- I. Discuss principles of magnetic resonance imaging, including differences in abilities and applications of MRI versus CT
- II. Identify normal anatomy on MRI of the head and spine
- III. Recognize abnormal head and spine MRIs including central nervous system infection, masses, stroke syndromes, multiple sclerosis, disc disease, metastatic vertebral column disease, and cord compression

Ultrasound

- I. Discuss general principles of ultrasound including the differences between 2D, Doppler, and M mode
- II. Discuss indications and limitations of
 - a. ultrasound for specific OB/Gyn situations (molar pregnancy, anencephalic pregnancy, placenta previa, fetal age using biparietal diameter and femur length, and ectopic pregnancy)
 - b. vascular Doppler ultrasound (aneurysm, deep vein thrombosis, and carotid artery and peripheral vascular disease)
 - c. ultrasound for gallbladder, bile ducts and liver
 - d. echocardiogram (transthoracic versus transesophageal echocardiography, chamber size, valvular disease, and pericardial effusions)
 - e. renal ultrasound for cysts and tumors
 - f. prostate ultrasound (for evaluation of nodules and biopsy)
 - g. FAST ultrasound for trauma.

Mammography

- I. Discuss basics of normal and abnormal mammograms
- II. Discuss indications and utility of mammography, including usefulness as a screening method and as a surgical tool for resection and biopsy.

Nuclear Medicine

- I. Discuss general principles and therapeutic uses of nuclear medicine
- II. Discuss mechanisms, indications, and limitations of HIDA scans, bone scans, tagged RBC scans, myocardial perfusion and function scans, bone densitometry scans, and ventilation/perfusion scans.

Angiography

- I. Discuss diagnostic and therapeutic principles of angiography
- II. Discuss indications for obtaining angiograms
- III. Discuss applications and utility of MRA angiograms
- IV. Recognize normal anatomy of the great vessels and other vasculature on angiograms
- V. Discuss indications for angiograms for abnormal processes including subarachnoid hemorrhage and berry aneurysms, vascular stenotic lesions, pulmonary angiogram for PE, aortic dissection, aortic trauma, and gastrointestinal bleeding

Become familiar with the various treatment modalities provided by interventional radiologists

- I. Ultrasound-guided vascular access
- II. Paracentesis
- III. Thoracocentesis, chest tube insertion and management
- IV. Ultrasound-guided cyst aspirations and soft tissue biopsy

- V. Embolization procedures
- VI. Vertebroplasty
- VII. Vascular stenting
- VIII. Thyroid ablation therapy
- IX. Thrombolytic therapy for PE/DVT

LABORATORY MEDICINE

Foundations of Laboratory Medicine

- I. Concepts of diagnostic sensitivity and specificity of a laboratory test to a specific clinical situation; negative and positive predictive values, situations in which predictive values provide critical information for developing patient care screening, diagnostic, prognostic, and therapeutic pathways/algorithms;
- II. How reference intervals are derived and used and the different types of reference intervals, including those derived from population distributions, from expert consensus recommendation, or from evidence-based determination of “threshold” values based on a test’s predictive value in a clinical algorithm; how reference intervals may be compartmentalized by age, sex, race, clinical state (eg, pregnancy);
- III. Concept of variability in repeated measurements, as well as variability within and between individuals; describe the contributors to analytical uncertainty (precision, accuracy, bias, coefficient of variation);
- IV. Discuss the long-reaching consequences of ordering unnecessary testing; consider whether routine daily monitoring tests constitute unnecessary testing; based on an understanding of reference intervals, explain why unnecessary testing may lead to higher health care costs and increased risk for the patient; similarly, discuss the consequences of failing to utilize noninvasive or minimally invasive diagnostic procedures before proceeding to invasive approaches (tier 1).
- V. Distinction between testing appropriate to the clinical laboratory and those relating to research environment;
- VI. External and internal validation of clinical laboratory tests;

Chemical Pathology and Immunology

- I. Basic principles of toxicology - the diagnosis and management of common clinical toxicology scenarios (eg, overdoses of acetaminophen, antidepressants, salicylates, ethylene glycol, ethanol, opiates, methanol);
- II. Interpretation of the results of “drugs of abuse” panels, including causes for false positive and false negative tests, the role of confirmatory testing, and the impact of specimen adulteration;
- III. Principles of therapeutic drug monitoring, including the determination of peak and trough levels vs random drug levels;
- IV. Uses of metabolic testing, including electrolytes, acid-base balance, osmolality, and blood gases; interpret results for the above tests;
- V. Tests relevant to diagnosis of myocardial infarction and acute coronary syndrome,

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- cardiovascular and stroke risk, and congestive heart failure;
- VI. Criteria for the laboratory diagnosis of diabetes mellitus and biochemical changes that are seen in diabetic ketoacidosis and nonketotic hyperosmolar coma;
- VII. Evaluation of renal function, and criteria for chronic kidney disease; review basic microscopic urinalysis, and describe key abnormal findings;
- VIII. Laboratory evaluation of hepatic, pancreatic, and gastrointestinal tract pathology;
- IX. Common tests used for plasma protein analysis, including total protein, albumin, serum protein electrophoresis, and immuno-fixation electrophoresis and their disease-specific relevance;
- X. Laboratory tests available for the evaluation of organ-specific and systemic autoimmune diseases, vasculitides, and immuno-deficiencies, including autoantibody testing, serum complement levels, and basic immuno-phenotyping of lymphocyte subpopulations;
- XI. Role of testing for tumor markers, including the differences in their uses for screening, diagnosis, prognosis, and therapeutic monitoring;
- XII. Tests available for use in reproductive biology, both prenatal and postnatal
- XIII. Common approaches used in endocrinology testing, including pituitary-adrenal, parathyroid, and thyroid testing; stimulation and suppression test physiology and interpretation.

Molecular Diagnostics

- I. General principles of molecular diagnostics testing in the screening, diagnosis, and/or monitoring of infectious, genetic, and oncologic diseases; describe the place of pharmacogenetic testing in clinical care;
- II. Legal, ethical, and social implications of genetic testing (see law and ethics module);

Hematology

- I. Methods for determination of the complete blood count, including measured vs calculated values, indications for manual vs automated leukocyte differential, and important interferences;
- II. Physiology of normal hematopoiesis and the erythrocyte, leukocyte, and platelet response to pathologic stimuli;
- III. Significance of erythrocyte, leukocyte, and platelet morphologic variations on the peripheral smear; know the types of leukocytes defined in the differential and their significance;
- IV. Laboratory evaluation and differential diagnosis of anemia, erythrocytosis, leukopenia, leukocytosis, thrombocytopenia, and thrombocytosis;
- V. Laboratory evaluation, both cellular and chemical, of body fluids, including urine and cerebrospinal, pleural, peritoneal, pericardial, and joint fluid;
- VI. Physiology of coagulation, including the mechanisms of action of naturally occurring and therapeutic anticoagulants;
- VII. Laboratory tests used to diagnose common bleeding and thrombotic disorders, including the hemophilias, platelet disorders, von Willebrand disease, and

- acquired bleeding diatheses; describe appropriate testing strategies for monitoring hemostatic and anticoagulant therapies;
- VIII. Evaluation of hemoglobinopathies, and be able to diagnose common hemoglobinopathies such as sickle cell disease when presented with patient data;
- IX. General principles of flow cytometric, molecular, and cytogenetic approaches used in the evaluation of leukemias, lymphomas, and related neoplastic disorders;

Microbiology

- I. Describe the pre-analytic variables that determine the quality and yield of microbiologic testing:
 - a. presence of normal microflora on skin and mucous surfaces;
 - b. presence of contaminants in samples and the effect on culture results;
 - c. effects of sample collection techniques, specimen transport media, timing, and storage conditions;
 - d. importance of sample volume in identifying pathologic organisms in normally sterile sites that may be present in very low concentrations;
 - e. effects of timing of samples to increase the recovery of various pathogens; and describe how the microbiologic workup depends on the site/samples submitted to the laboratory, and describe the basics of optimizing this workup;
- II. Most frequent agents (bacterial, viral, fungal, parasitic) causing infections in different body sites or systems; and how an understanding of bacterial, parasitic, and viral pathogenesis impacts sample choice and test interpretations;
- III. Factors affecting turnaround time in microbiologic workups, eg, fastidious organisms requiring special media and longer incubation times, as well as unusual tests performed infrequently;
- IV. Explain the use and limitations of stains as rapid diagnostic tools; understand the use of Gram stain on sites/samples that may contain normal flora, as well as those from normally sterile body sites;
- V. Use and limitations of serology in infectious diseases, to establish immune status, to diagnose acute infection, and as a retrospective means to support diagnosis; recognize the need for the use of paired serology (acute and convalescent phase samples) and for screening and confirmatory methods (such as those used in syphilis); explain why the time course and nature of serologic response is critical in the diagnosis of common disorders, eg, viral hepatitis and HIV;
- VI. Mechanisms of action of antimicrobial drugs of different classes; interpret the antimicrobial susceptibility report ;
- VII. Mechanisms of bacterial resistance to antimicrobials and the spread of resistant organisms in institutions; describe the role of health care providers and of hospital epidemiology and other monitors of infection control in the hospital and the community;

Transfusion Medicine

- I. Explain the following:
 - a. the blood components available for clinical use;
 - b. the recommended and evidence-based thresholds and indications for transfusion of the various blood components;
 - c. the appropriate evidence-based dosing of blood components;
 - d. the types of recombinant and other “blood component substitutes” available; and
 - e. the alternatives to allogeneic blood product infusion (eg, hematopoietic cytokines, autologous donations, and intraoperative blood salvage);
- II. Lifespan of transfused platelets, red blood cells, and the clotting factors present in plasma and how the efficacy of transfusion is monitored by laboratory testing (eg, expected hemoglobin and platelet count increments);
- III. Pathophysiology, presentations, and acute management (and prophylaxis) of the different types of transfusion reactions;
- IV. Common infectious disease risks of blood products that remain despite donor screening and blood product testing, including current data on transfusion-transmitted disease incidence and prevalence;
- V. Importance of blood specimen labeling, with an emphasis on the impact transfusion errors have on patient morbidity and mortality; and the process of issuing and administering blood products, including required patient safety checks, required infusion times, and appropriate blood product storage limitations once products are issued from the blood bank (tier 1).
- VI. Meaning of and rationale for type and screen (type and cross-match) for blood products and the time limits of such testing; explain the appropriate settings and processes for emergency release of blood and the use of “universal donor” blood;
- VII. Define “massive transfusion,” and describe the special needs of the patients in terms of metabolic derangements and the administration of blood products;
- VIII. Various kinds of blood donors (eg, autologous, directed, altruistic) and the important elements of screening pre-donation;
- IX. Clinical use of therapeutic phlebotomy; various types of apheresis procedures, and examples of how each is used;
- X. The HLA system and its role in transfusion and transplantation;

INFECTION CONTROL

- I. Concept of infection prevention and control
- II. Common misconceptions of infection prevention and control
 - a. Incidence of infections at the health care facility
 - b. Prevalence of infections in the community
 - c. How infections are transmitted
 - d. HIV and HBV
 - e. Use of screening
 - f. Feasibility of adhering to appropriate infection prevention and control practices

- III. Need for infection prevention and control in the
 - a. Health care facility
 - b. Home
 - c. Community
 - d. Individual
 - e. Institution
 - f. Home
 - g. Community
 - h. Consequences of non-compliance
- IV. Levels of responsibility.
- V. Definitions:
 - a. Acute care settings
 - b. Ambulatory care settings
 - c. Long-term care settings
 - d. Home-based care
 - e. Community-based care
 - f. Standard Precautions
 - g. Transmission-Based Precautions
 - h. Isolation
- VI. Common infections in each care setting and methods of prevention
- VII. Factors predisposing staff, patients, families, and visitors to infection
- VIII. Description and methods of
 - a. Standard Precautions
 - b. Transmission-Based Precautions
 - c. Isolation
- IX. Antisepsis
 - a. Definition
- X. Antiseptics
 - a. Types and their uses
- XI. Principles of
 - a. Decontamination
 - b. Cleaning
 - c. Disinfection
 - d. Sterilization
- XII. Categories of disinfectant, their uses and limitations
- XIII. Calculation of strengths of disinfectants
- XIV. National standards and regulations governing infection prevention and control in health care facilities, homes and communities
- XV. Barriers to implementation
 - a. Lack of knowledge
 - b. Misunderstanding of associated risks
 - c. Inadequate equipment and supplies
 - d. Poor supervision
 - e. Other

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- XVI. Quality assurance process
 - a. Definition
 - b. Standards
 - c. Indicators
 - d. Audit

PATIENT SAFETY

- I. Definition of terms
- II. What is patient safety
- III. What are human factors and why is it important to patient safety?
- IV. Understanding systems and the impact of complexity on patient care
- V. Being an effective team player
- VI. Understanding and learning from errors
- VII. Understanding and managing clinical risk
- VIII. Introduction to quality improvement methods
- IX. Engaging with patients and carers
- X. Minimizing infection through improved infection control
- XI. Patient safety and invasive procedures
- XII. Improving medication safety

MEDICAL LAWS AND ETHICS

- I. Medical Law and Ethics
 - a. Importance in the ambulatory healthcare settings
 - a. Codes of Ethics
 - b. Confidentiality
- II. Medical Practice Management
 - a. Group practices
 - b. Managed Care
 - c. Liabilities
 - d. Licensures, certifications, and registrations.
- III. Liability and Duties
 - a. Types of law- national and international
 - a. Controlled substances
 - b. Contracts
 - c. Statute of Limitations
 - d. Consent
- IV. Workplace Issues
 - a. Medical records
 - b. Employment practices
 - c. Legal implications
- V. Bioethical Issues
 - a. Ethical Issues in Biomedical research
 - b. Life, Death, and Dying and legal documents

BASIC EPIDEMIOLOGY

Principles of epidemiology

- I. Definition
 - a. Epidemiology
 - b. Epidemiology approach
 - c. Uses of epidemiology
- II. Phases of epidemiology approach
 - a. Descriptive epidemiology
 - ◇ What is the problem
 - ◇ Frequency of the problem
 - ◇ Who is involved
 - ◇ Where is the problem
 - ◇ When did it occur
 - b. Analytic epidemiology
 - ◇ Analysis of causes of disease
 - c. Experimental epidemiology
 - ◇ Clinical or community trials
 - d. Evaluation epidemiology
 - ◇ Measuring the effectiveness of different health services
- III. Key components of epidemiology data
 - a. What
 - b. Who
 - c. Where
 - d. When
 - e. How
 - f. Why
- IV. Sources of epidemiology data
 - a. Census
 - b. Vital statistics
 - c. Morbidity data
 - d. Mortality data
 - e. Reports of notifiable diseases
 - f. Hospital records
 - g. Private physicians' offices
 - h. Disease registers
 - i. Community
 - j. Other
- V. Measurements and their calculations
 - a. Ratios
 - b. Proportions
 - c. Incidence rates
 - d. Prevalence rates
 - e. Demographic rates

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- VI. Relationship between predictive value and disease prevalence
- VII. Screening
 - a. Definition
 - b. Screening tests
 - c. Validity and reliability of screening tests
 - d. Screening programmes
- VIII. Surveillance
 - a. Definition
 - b. Methods
 - c. Approaches
- IX. Preparation of tables and graphs
 - a. Graphs
 - b. Histograms
 - c. Population pyramids
 - d. Bar charts
 - e. Pie charts
 - f. Scatter diagrams
 - g. Maps.

Infectious disease process

- I. Definition
 - a. Carrier
 - b. Endemic
 - c. Epidemic
 - d. Pandemic
 - e. Immunity
 - f. Immune response
 - g. Herd immunity
 - h. Immunoglobulins
 - i. Host response
 - j. Hypersensitivity
 - k. Infection
 - l. Infectivity
 - m. Pathogenicity
 - n. Virulence
 - o. Immunogenicity
 - p. Sporadic
- II. Dynamics of disease transmission
 - a. Chain of infection
- III. Classification of the mechanisms of disease transmission
 - a. Contact transmission
 - b. Direct transmission
 - c. Indirect transmission

- d. Droplet transmission
- e. Airborne transmission
- f. Common vehicle transmission
- g. Vectorborne transmission
- IV. Description
 - a. Immunity
 - b. Host response
 - c. Herd immunity
 - d. Carrier
- V. Nosocomial infection
 - a. Definition
 - b. Modes of transmission
 - c. Preventive measures
- VI. Risk factors for the occurrence of communicable diseases among population groups
 - a. Extremes of age
 - b. Presence of underlying disease/infection
 - c. Natural/Passive immunity
 - d. Trauma/Invasive procedures
 - e. Medications
 - f. Lifestyle
 - g. Cultural
 - h. Socio-economic
 - i. Environmental
 - j. Organization of health services

RESEARCH AND BIostatISTICS

Research methods

- I. Definition of common terms and concepts used in research
 - a. Quantitative research
 - b. Qualitative research
 - c. Variable
 - d. Subject
 - e. Sampling
 - f. Population
 - g. Pilot study
 - h. Validity
 - i. Reliability
 - j. Bias
- II. Types of research
 - a. Historical
 - b. Descriptive
 - c. Experimental
- III. Basic research process

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- a. Identification of problem
 - b. Statement of problem
 - c. Definition of terms
 - d. Statement of hypothesis
 - e. Identification of assumptions
 - f. Literature search
 - g. Definition of setting: geographical, population, etc.
 - h. Definition of population to be studied
- IV. Problem statement
- a. Characteristics of a problem statement
- V. Methods of sampling and collection
- a. Sampling methods
 - b. Probability methods
 - c. Non-probability methods
 - d. Data collecting methods
 - ◇ Questionnaire
 - ◇ Interview
 - ◇ Observation
 - ◇ Focus group discussion
 - ◇ Document search
- VI. Principles of data collection, analysis, and interpretation
- a. Pre-testing of instrument
 - b. Validity
 - c. Reliability
 - d. Control for bias
 - e. Statistical analysis
 - f. Interpretation
 - ◇ Meaning
 - ◇ Limitation
 - ◇ Usefulness
- VII. Strengths and limitations of sources of health data
- a. Organizing data
 - b. Analyzing data
 - c. Interpreting data
 - d. Implications of findings
 - e. Limitations
 - f. Summarizing
 - g. Conclusion
 - h. Recommendations
- VIII. Ethical and legal issues relevant to research
- a. Consent
 - b. Benefits

- c. Confidentiality
- d. Acknowledgement
- e. Other
- IX. Research methods relevant to clinical practice
 - a. Surveys
 - b. Case studies
 - c. Experiments
 - d. Case-control studies
 - e. Cohort studies
- X. Design a research proposal in one's area of practice or related fields
- XI. Writing the research report
- XII. Presentation of study.

Biostatistics

- I. Definition of terms
 - a. Statistics
 - b. Biostatistics
 - c. Vital statistics
 - d. Descriptive statistics
 - e. Inferential statistics
- II. Purposes of statistics
 - a. Summarization of data
 - b. Comparison of data sets
 - c. Research methodologies
- III. Types of statistics
 - a. Descriptive
 - b. Inferential
- IV. Uses of statistics in clinical practice /public health
 - a. Surveillance
 - b. Presentation of data
 - c. Epidemiology
 - d. Identification of public health problems
 - e. Policy analysis and formulation
 - f. Planning
- V. Calculation of the following measures of central tendency
 - a. Mean
 - b. Median
 - c. Mode
- VI. Measures of variation and their calculation
 - a. Range
 - b. Variance
 - c. Standard deviation

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- VII. Theoretical distribution of variables
 - a. Normal distribution
 - b. Binomial distribution
- VIII. Relationship between sample statistics and population parameters
 - a. Sample mean and population
 - b. Sample proportion and population proportion
 - c. Sample variance and population variation