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**CURRICULUM/STATUTES & REGULATIONS**

**FOR**

**5 YEARS DEGREE PROGRAMME**

**IN**

**ONCOLOGY**

**(MD ONCOLOGY)**

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**UNIVERSITY OF HEALTH SCIENCES,  
LAHORE**

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## STATUTES

### **1. Nomenclature Of The Proposed Course**

The name of degree programme shall be MD Oncology. This name is well recognized and established for the last many decades worldwide.

### **2. Course Title:**

MD Oncology

### **3. Training Centers**

Departments of Oncology (accredited by UHS) in affiliated institutes of University of Health Sciences Lahore.

### **4. Duration of Course**

The duration of MD Oncology course shall be five (5) years (first year in Part I, first two years in Part II and next three years in Part III) with structured training in a recognized department under the guidance of an approved supervisor.

The course is structured in three parts:

**Part I** is structured for the 1<sup>st</sup> calendar year. The candidate shall undertake didactic training in Basic Medical Sciences, Behavioural Sciences and Biostatistics & Research Methodology. At the end of first year the examination shall be held in Basic Medical Sciences. The clinical training in fundamental concepts of Internal Medicine shall start from the 1<sup>st</sup> day of enrollment.

**Part II** is structured for the 1<sup>st</sup> and 2<sup>nd</sup> calendar years. The candidate shall undertake clinical training in fundamental concepts of Internal Medicine. At the end of 2<sup>nd</sup> year, the examination shall be held in fundamental concepts of Internal Medicine. The clinical training in Oncology shall start from 3<sup>rd</sup> year onwards in the in recognized institutions.

**Part III** is structured for 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> calendar years in MD Oncology. The candidate shall undergo training to achieve educational objectives of MD

Oncology (knowledge & skills) along with rotation in relevant fields. The research component and thesis writing shall also be included in this part. Over the five years duration of the course, candidate will spend total time equivalent to one calendar year for research during the training. Research can be done as one block in 5<sup>th</sup> year of training or it can be done in the form of regular periodic rotations over five years as long as total research time is equivalent to one calendar year.

### **5. Admission Criteria**

1. For admission in MD Oncology course, the candidate shall be required to have:
  - MBBS degree
  - Completed one year House Job
  - One year experience in Oncology/Internal Medicine/Allied medical discipline in the given order of preference
  - Registration with PMDC
  - Passed Entry Test conducted by the University & aptitude interview by the Institute concerned
  - Having up to the mark credentials as per UHS rules (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, Rural/ Army services, research experience in a recognized institution, any research article published in a National or International Journal) may also be considered on case to case basis.
  
2. Exemptions: A candidate holding FCPS/MRCP/Diplomate American Board/equivalent qualification in Internal Medicine shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.

## **6. Registration and Enrollment**

- Total number of students enrolled for the course must not exceed 2 per supervisor/year.
- The maximum number of trainees that can be attached with a supervisor at a given point of time (inclusive of trainees in all years/phases of MD training), must not exceed 6.
- Beds to trainee ratio at the approved teaching site shall be at least 5 beds per trainee.
- The University will approve supervisors for MD courses.
- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered with UHS as per prescribed Registration Regulations.

## **7. Accreditation Related Issues of the Institution**

### **1. Faculty**

Properly qualified teaching staff in accordance with the requirements of Pakistan Medical and Dental Council (PMDC)

### **2. Adequate Space**

Including class-rooms (with audiovisual aids), demonstration rooms, computer lab and clinical pathology lab etc.

### **3. Library**

Departmental library should have latest editions of recommended books, reference books and latest journals (National and International).

- Accreditation of Oncology training program can be suspended on temporary or permanent basis by the University, if the program does not comply with requirements for residents training as laid out in this curriculum.
- Program should be presented to the University along with a plan for implementation of curriculum for training of residents.
- Programs should have documentation of residents training activities and

evaluation on monthly basis.

- To ensure a uniform and standardized quality of training and availability of the training facilities, the University reserves the right to make surprise visits of the training program for monitoring purposes and may take appropriate action if deemed necessary.

## **AIMS AND OBJECTIVES OF THE COURSE**

### **AIM**

The aim of five years MD programme in Oncology is to train residents to acquire the competency of a specialist in the field of Oncology so that they can become good teachers, researchers and clinicians in their specialty after completion of their training.

### **GENERAL OBJECTIVES**

MD Oncology training should enable a student to:

- Access and apply relevant knowledge to clinical practice:
  - Maintain currency of knowledge
  - Apply scientific knowledge in practice
  - Appropriate to patient need and context
  - Critically evaluate new technology
- Safely and effectively performs appropriate clinical skills & procedures:
  - Consistently demonstrate sound clinical skills
  - Demonstrate procedural knowledge and technical skill at a level appropriate to the level of training
  - Demonstrate manual dexterity required to carry out procedures
  - Adapt their skills in the context of each patient and procedure
  - Maintain and acquire new skills
  - Approach and carries out procedures with due attention to safety of patient, self and others
  - Critically analyze their own clinical performance for continuous improvement
- Design and implement effective management plans:
  - Recognize the clinical features, accurately diagnose and manage oncological problems
  - Formulate a well-reasoned provisional diagnosis and management plan based on a thorough history and examination
  - Formulate a differential diagnosis based on investigative findings

- Manage patients in ways that demonstrate sensitivity to their physical, social, cultural and psychological needs
- Recognize disorders of the oncological system and differentiate those amenable to medical treatment
- Effectively recognize and manage complications
- Accurately identify the benefits, risks and mechanisms of action of current and evolving treatment modalities
- Indicate alternatives in the process of interpreting investigations and in decision-making
- Manage complexity and uncertainty
- Consider all issues relevant to the patient
- Identify risk
- Assess and implement a risk management plan
- Critically evaluate and integrate new technologies and techniques.
- Organize diagnostic testing, imaging and consultation as needed:
  - Select medically appropriate investigative tools and monitoring techniques in a cost-effective and useful manner
  - Appraise and interpret appropriate diagnostic imaging and investigations according to patients' needs
  - Critically evaluates the advantages and disadvantages of different investigative modalities
- Communicate effectively:
  - Communicate appropriate information to patients (and their family) about procedures, potentialities and risks associated with surgery in ways that encourage their participation in informed decision making
  - Communicate with the patient (and their family) the treatment options including benefits and risks of each
  - Communicate with and co-ordinate health management teams to achieve an optimal surgical environment
  - Initiate the resolution of misunderstandings or disputes
  - Modify communication to accommodate cultural and linguistic sensitivities of the patients

- Recognize the value of knowledge and research and its application to clinical practice:
  - Assume responsibility for self-directed learning
  - Critically appraise new trends in Oncology
  - Facilitate the learning of others
- Appreciate ethical issues associated with Oncology:
  - Consistently apply ethical principles
  - Identify ethical expectations that impact on medico-legal issues
  - Recognize the current legal aspects of informed consent and confidentiality
  - Be accountable for the management of their patients.
- Professionalism by:
  - Employing a critically reflective approach to Oncology
  - Adhering with current regulations concerning workplace harassment
  - Regularly carrying out self and peer reviewed audit
  - Acknowledging and have insight into their own limitations
  - Acknowledging and learning from mistakes
- Work in collaboration with members of an interdisciplinary team where appropriate:
  - Collaborate with other professionals in the selection and use of various types of treatments assessing and weighing the indications and contraindications associated with each type
  - Develop a care plan for a patient in collaboration with members of an interdisciplinary team
  - Employ a consultative approach with colleagues and other professionals
  - Recognize the need to refer patients to other professionals.
- Management and Leadership
  - Effective use of resources to balance patient care and system resources
  - Identify and differentiate between system resources and patient needs
  - Prioritize needs and demands dealing with limited system resources.
  - Manage and lead clinical teams
  - Recognize the importance of different types of expertise which contribute to the effective functioning of clinical team



- Maintain clinically relevant and accurate contemporaneous records
- Health advocacy:
  - Promote health maintenance of patients
  - Advocate for appropriate health resource allocation

## SPECIFIC LEARNING OUTCOMES

Residents completing MD Oncology training will have formal instruction, clinical experience, and will be able to demonstrate competence in the evaluation and management of adult and paediatric patients and applying scientific principles for the identification, prevention, treatment and rehabilitation of acute and chronic illness in oncological disorders.

- Demonstrate understanding of basic sciences relevant to this specialty  
Demonstrate with knowledge of the clinical relevance of pathology, specifically with regard to malignant diseases
- Demonstrate knowledge of the epidemiology, prevention, natural history and management of the common and curable cancers
- Describe etiology, patho-physiology, principles of diagnosis and management of malignancies including emergencies, in adults and children e.g. lung, esophageal, head and neck, breast, prostate, bladder, testicular, renal, colorectal, gastric, pancreatic, melanoma, sarcoma and CNS primary as well as secondary cancers.
- Demonstrate knowledge of the clinical significance of information from the pathologic evaluation of tumors; including invasiveness, nodal spread, expression of oncogenes and the identification of potential targets for treatment of malignancies.
- Demonstrate knowledge of how serum tumor markers are used by the clinician in the diagnosis treatment and prevention strategies;
- Demonstrate the clinical correlation of pathology, molecular biology, immunohistochemistry, flow cytometry and tumor markers study.
- Demonstrate knowledge of the principles in the surgical management of cancer
- Demonstrate knowledge of principles of radiotherapy in treating patients with cancer
- Demonstrate knowledge of the principles of systemic therapy for cancer, including chemotherapy, hormonal therapy, biologic therapy, brachytherapy and clinical trial strategies
- Demonstrate knowledge of the approach and management of the common and curable malignancies; specifically lung, head and neck, colorectal, gynecological, breast and skin cancers; as well as pediatric tumors, brain tumors and lymphomas and leukemias
- Demonstrate knowledge of the principles of multidisciplinary care for patients with cancer in such a way as they can address basic questions of diagnosis, staging and treatment planning for surgery, radiation therapy and medical oncology
- Demonstrate the following oncological emergencies/urgencies and know how to diagnose and manage them
  - Febrile neutropenia
  - Superior vena cava obstruction (SVCO)
  - Cord compression
  - Increased intracranial pressure (ICP)
  - Hypercalcemia
  
  - Tumour lysis syndrome

○ Syndrome of inappropriate ADH secretion (SIADH)

- Describe indications and methods for blood transfusion and pheresis.

**Supportive care**

- Role of palliative care service – when and why to get them involved
- Know common side effects of chemotherapy and radiotherapy in general (myelosuppression, nausea, vomiting, mucositis etc) and basic approach to management with supportive measures (pain medication, transfusion, etc).
- Pain assessment - pain types (visceral, somatic, neuropathic)
- Managing opioid side effects – what to watch for and what to try and prevent (e.g. constipation)
- WHO ladder for pain control – describe briefly
- Rational approach to nausea/vomiting, anorexia/cachexia, diarrhea, bleeding diathesis etc. in the oncology patients with differential diagnosis and treatment approach.

**Professional Skills:**

Residents shall learn professional skills in:

- Patient Management including eliciting pertinent history, performing physical examination, ordering and interpreting the result of appropriate investigations and thereby deciding and implementing appropriate treatment plan and maintaining follow up
- Psychosocial and emotional effects of acute and chronic illness on patients and their families
- Management of end of life issues and palliative care
- Quality improvement and patient safety activities

**Procedural and Technical Skills:**

Residents shall learn technical and procedural skills in:

- Blood sample collection - venepuncture and finger prick methods of sample collection, use of different types of anticoagulants, containers and the effects of delay in processing and storage.
- Review of normal and abnormal blood films with emphasis on morphology of red cells, white cells and platelets.
- Performance of bone marrow aspiration; trephine needle biopsy
- Staining and diagnostic evaluation of bone marrow aspirates. Interpretation of cytochemical stains including Sudan Black, Myeloperoxidase, specific and non specific esterases, acid phosphatase, PAS and iron staining.
- Familiarization with cytogenetics, understanding the principles of cytogenetics and appreciating the relevance and significance of chromosomes in diagnostic hematology and oncology
- Clinical evaluation and screening of patients and donors for hematopoietic stem cell transplantation.
- Collection, cryopreservation and storage of hematopoietic stem cells.
- Understanding the principles involved in the molecular diagnosis of hematological and oncological disorders by
  - Flow cytometry
  - Polymerase chain reaction (PCR)
  - Fluorescence in situ hybridization (FISH)

- Western and Southern Blotting.
- Microarray technology
- Interpretation of imaging techniques commonly employed in the evaluation of patients with critical illness and/or oncological disorders
- Practice infection control procedures and perform continuous quality improvement.

Curriculum/Statutes & Regulations -MD Oncology

## REGULATIONS

### 1. Scheme of the Course

A summary of five years course in MD Oncology is presented as under:

Course Structure	Components	Examination
<b>Part I</b>	<ul style="list-style-type: none"> <li>• <b>Basic medical sciences</b> Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Behavioural Sciences and Biostatistics &amp; Research Methodology</li> </ul>	<p>Part-I examination at the end of 1<sup>st</sup> year of MD Oncology programme.</p> <ul style="list-style-type: none"> <li>• <b>Written:</b> Paper I: MCQs Paper II: SEQs</li> </ul>
<b>Part-II</b>	<ul style="list-style-type: none"> <li>• <b>Fundamental Concepts in Internal Medicine:</b> Training in clinical techniques of Internal Medicine with compulsory rotations for two years starting from the first day of enrollment</li> </ul>	<p>Part-II examination at the end of 2<sup>nd</sup> year of MD Oncology programme.</p> <ul style="list-style-type: none"> <li>• <b>Written:</b> Papers 1 &amp; 2: Problem-based questions in Internal Medicine</li> <li>• <b>Oral &amp; Practical/ Clinical Examination</b> <ul style="list-style-type: none"> <li>• OSCE</li> <li>• Clinical Examination (Long case, Short cases)</li> </ul> </li> <li>• <b>Log Book</b></li> </ul>
<b>Part-III</b>	<p style="text-align: center;"><b><u>Clinical component of Part III</u></b></p> <ul style="list-style-type: none"> <li>• <b>Professional Education in Oncology</b> Training in Oncology during 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> years of MD programme</li> </ul> <p>Three years of training with compulsory/ optional rotations in related fields (up to 6 months)</p> <p style="text-align: center;"><b><u>Research component of Part III</u></b></p> <ul style="list-style-type: none"> <li>• <b>Research and Thesis Writing:</b> Research work/Thesis writing project must be completed and thesis be submitted before the end of training.</li> </ul>	<p>Part-III examination in specialized components of Oncology at the end of 5th year of MD programme</p> <ul style="list-style-type: none"> <li>• <b>Written:</b> Paper 1 &amp; 2: Problem-based questions in the subject</li> <li>• <b>Oral &amp; Practical / Clinical Examination</b> <ul style="list-style-type: none"> <li>• OSCE</li> <li>• Clinical Examination (Long case, Short cases )</li> </ul> </li> <li>• <b>Log Book</b></li> </ul> <p>Part-III thesis examination with defence at the end of fifth (5th) year of MD Oncology programme.</p>

## **2. Examinations**

### **Part-I Examination**

1. All candidates admitted in MD Oncology courses shall appear in Part-I examination at the end of 1<sup>st</sup> calendar year.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination in 3 consecutive attempts availed or un-availed, shall be dropped from the course.
4. The examination shall have two components:
  - Paper-I MCQs (single best) 100 Marks
  - Paper-II SEQs 100 Mark
5. Subjects to be examined shall be Basic Sciences relevant to Oncology (Anatomy, Physiology, Biochemistry, General Pathology, Pharmacology), Behavioural Sciences and Biostatistics & Research Methodology.
6. To be eligible to appear in Part-I examination the candidate must submit;
  - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
  - ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
  - iii. Examination fee as prescribed by the University
7. To be declared successful in Part-I examination the candidate must secure 60% marks in each paper.

### Part-II Examination

1. All candidates admitted in MD Oncology courses shall appear in Part-II examination at the end of 2nd calendar year, and having passed Part-I examination.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination within 3 years of passing the Part-I examination shall be dropped from the course.
4. The examination shall have the following components:

a. Written	200 Marks
b. OSCE	50 Marks
c. Clinical examination	100 Marks
d. Log Book Evaluation	80 Marks (40 marks per year)
5. There shall be two written papers of 100 marks each:  
Paper 1 & 2: Principles of Internal Medicine
6. The types of questions shall be of Short/Modified essay type and MCQs (single best).
7. Oral & practical/clinical examination shall be held in clinical techniques in Internal Medicine.
8. To be declared successful in Part-II examination the candidate must secure 60% marks in each component and 50% in each sub-component.
9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/clinical Examination.
10. The candidates, who have passed written examination but failed in oral & practical/ clinical examination, will re-appear only in oral & practical/clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. To be eligible to appear in Part-II examination the candidate must submit;
  - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;

- ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
- iii. a certificate of having passed the Part-I examination;
- iv. Examination fee as prescribed by the University.



**Part-III Examination**

1. All candidates admitted in MD Oncology course shall appear in Part-III (clinical) examination at the end of structured training programme (end of 5th calendar year), and having passed the part I & II examinations. However, a candidate holding FCPS / MRCP / Diplomate American Board/equivalent qualification in Internal Medicine shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.
2. The examination shall be held on biannual basis.
3. To be eligible to appear in Part-III examination the candidate must submit;
  - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
  - ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
  - iii. Original Log Book complete in all respect and duly signed by the Supervisor (for Oral & practical/clinical Examination);
  - iv. certificates of having passed the Part-I & part-II examinations;
  - v. Examination fee as prescribed by the University.
4. The Part-III clinical examination shall have the following components:
 

▪ Written	300 marks
▪ Oral & practical/clinical examination	300 marks
▪ Log Book Evaluation	120 marks (40 marks per year)
5. There shall be two written papers of 150 marks each.
6. Both papers shall have problem-based Short/Modified essay questions and MCQs.
7. Oral & practical/clinical examination shall have 300 marks for:
 

i. 1 Long Case	100
ii. 4 Short Cases	100(25 marks each)
iii. OSCE	100
8. To be declared successful in Part-III examination the candidate must secure 60% marks in each component and 50% in each sub-component.

9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/ Clinical Examination.
10. The candidates, who have passed written examination but failed in Oral & Practical/ Clinical Examination, will re-appear only in Oral & Practical / Clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. The candidate with 80% or above marks shall be deemed to have passed with distinction.
13. *Log Book/Assignments:* Through out the length of the course, the performance of the candidate shall be recorded on the Log Book.
14. The Supervisor shall certify every year that the Log Book is being maintained and signed regularly.
15. The Log Book will be developed & approved by the Advanced Studies & Research Board.
16. The evaluation will be maintained by the Supervisor (in consultation with the Co- Supervisor, if appointed).
17. The performance of the candidate shall be evaluated on annual basis, e.g., 40 marks for each year in five years MD Oncology course. The total marks for Log Book shall be 200. The log book shall reflect the performance of the candidate on following parameters:
  - Year wise record of the competence of skills.
  - Year wise record of the assignments.
  - Year wise record of the evaluation regarding attitude & behaviour
  - Year wise record of journal club / lectures / presentations / clinico-pathologic conferences attended & / or made by the candidate.

### **3. Submission / Evaluation of Synopsis**

1. The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on UHS website.
2. The research topic in clinical subject should have 30% component related to basic sciences and 70% component related to applied clinical sciences. The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.
3. Synopsis of research project shall be submitted by the end of the 3<sup>rd</sup> year of MD program. The synopsis after review by an Institutional Review Committee shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / Dean /Head of the institution.

### **4. Submission of Thesis**

1. Thesis shall be submitted by the candidate duly recommended by the Supervisor.
2. The minimum duration between approval of synopsis and submission of thesis shall be one year, but the thesis can not be submitted later than 8 years of enrolment.
3. The research thesis must be compiled and bound in accordance with the Thesis Format Guidelines approved by the University and available on website.
4. The research thesis will be submitted along with the fee prescribed by the University.

### **5. Thesis Examination**

1. All candidates admitted in MD course shall appear in Part-III thesis examination at the end of 5<sup>th</sup> year of their training course.
2. Only those candidates shall be eligible for thesis evaluation who have passed Part I, II & III (clinical) Examinations.
3. The examination shall include thesis evaluation with defense.

4. The Vice Chancellor shall appoint three external examiners for thesis evaluation, preferably from other universities and from abroad, out of the panel of examiners approved by the Advanced Studies & Research Board. The examiners shall be appointed from respective specialty. Specialists from Internal Medicine and related fields may also be appointed/co-opted, where deemed necessary.
5. The thesis shall be sent to the external examiners for evaluation, well in time before the date of defense examination and should be approved by all the examiners.
6. After the approval of thesis by the evaluators, the thesis defense examination shall be held within the University on such date as may be notified by the Controller of Examinations. The Controller of Examinations shall make appropriate arrangements for the conduct of thesis defense examination in consultation with the supervisor, who will co-ordinate the defense examination.
7. The thesis defense examination shall be conducted by two External Examiners who shall submit a report on the suitability of the candidate for the award of degree. The supervisor shall act as coordinator.

#### ***6. Award of MD Oncology Degree***

After successful completion of the structured courses of MD Oncology and qualifying Part-I, Part-II and Part-III examinations, the degree with title MD Oncology shall be awarded.

## CONTENT OUTLINE

### Part I MD Oncology

#### **Basic Sciences:**

Student is expected to acquire comprehensive knowledge of Anatomy, Physiology, Pathology (Microbiology), Biochemistry, Pharmacology relevant to the clinical practice appropriate for Oncology

### 1. Anatomy

#### General Organization of the Body

- Anatomical nomenclature
- Terms of position
- Divisions of the body according to the regions and organ systems
- Detailed Anatomy of the organ systems, their blood supply, nerve supply, lymphatic drainage and important gross relations to other organs
- Developmental Anatomy and associated common congenital abnormalities
- Cell biology, cell cycle, cellular differentiation and proliferation.
- Tissues of Body: Light and electron microscopic details, structural basis of function, regeneration and degeneration of the organ systems.

#### General Features of Human Development

- Features of mitotic and meiotic modes of cell division. Genetic consequences of meiotic division.
- Abnormal mitotic and meiotic divisions of clinical importance.
- Gametogenesis: origin of germ cells.
- Oogenesis: prenatal and postnatal development of ova.
- Spermatogenesis: proliferation and maturation of male germ cells. Abnormal gametes, their clinical significance.
- Ovulation, fertilization and the consequences of fertilization.

#### Early Embryonic Development:

- Cleavage, morula and blastocyst formation and implantation. Formation of the three primary germ layers.
- List of the derivatives of the respective germ layers.

#### Period of the Growing Fetus:

- Various stages and salient features of the fetus development

#### Extraembryonic Membranes:

- Development, functions and anomalies of yolk sac, amnion, chorion, allantois, umbilical cord and placenta.

Development of the External Body Form:

- Shaping of the head, neck, trunk and limbs. Common developmental anomalies associated with this.

The Branchial Apparatus:

- Development and fate of the bronchial grooves, arches and pouches. Their derivatives and anomalies.

Teratogenesis:

- Factors known to be involved in the development of congenital anomalies. Concept of critical periods.

Structural and Functional Organization of the Tissues of Body

- Classification of tissues and identification of various tissues in routine histological preparations under the light microscope.

The Epithelial Tissue

- General structure, functions and classification of epithelia
- Their location in the body
- General characters of serous and mucous membranes
- General structural features of exocrine and endocrine glands

The Connective Tissue

- Cartilage
- Structure of bone marrow. Cell lines seen in haemopoiesis.
- Factors required for bone growth.

The Muscular Tissue

- Structural and functional differences between the smooth skeletal and cardiac types of muscle.
- Fine structure of skeletal and cardiac muscle fibers, and its relationship to the mechanism of contraction.
- Specialized conducting tissue of the heart.

The Neural Tissue

- The neuron, morphology of the perikaryon and its processes.
- Coverings of the axons in the peripheral nerves and the central nervous system.
- Types of neuroglia and their functions.
- Process of myelination in the peripheral nerves and the central nervous system.
- Axon terminals and synapses. Nerve fiber degeneration and regeneration.

The Nervous System

- Development of the nervous system and common developmental anomalies.

The Brain

- Subdivisions of the brain.

- External morphology of cerebellum, lobes, surface, sulci and gyri. External morphology of cerebellum and its subdivisions.
- External morphology of midbrain, pons and medulla.
- Different grey matter masses in the brain.
- Ventricular system of the brain.
- Circulation of cerebrospinal fluid and its composition.
- Blood supply of the brain. Parts of the cranial dura, formation and drainage of dural sinuses.
- Appearance of CT and MRI scans and identification of structures.
- Cerebrum as seen in horizontal sections.

#### Cerebral Cortex

- Gross and microscopic organization of the cortex, location of motor and sensory cortical areas.
- Functions and blood supply of various regions. White matter of the cerebrum, definition of association, commissural and projection fibers and their role in cortical functioning. Internal capsule, location, fibre content and blood supply.

#### Limbic System

- Core structures of the limbic system.
- Other nuclei and pathways associated with the limbic system.
- Functions of thalamus, hypothalamus and the limbic system.

#### Basal Ganglia

- Subdivisions, connections, functions and effects of lesions.

#### Thalamus

- Nuclear groups, afferent and efferent connections and their functional correlations.

#### Hypothalamus

- The nuclei, afferent and efferent connections and their functional correlations.
- Effects of lesions.

#### Internal Structure of Cerebellum

- Cerebellar cortex: organization and functions.
- Cerebellar nuclei: main connections.
- Cerebellar peduncles, cerebellar afferent and efferent connections, functional correlations
- Effects of lesions.

#### Spinal Cord

- External morphology, meninges and blood supply of the spinal cord. Relationship of the "segments" to vertebrae at different ages.
- Internal structure of the spinal cord, organization of the grey and white matter.
- Variations in the structure of the grey matter at different levels and location of the important nuclei.

- Location of ascending and descending tracts, and their functions.
- Effects of injury or disease.

#### Peripheral Nervous System

- Anatomy and functions of cranial nerves with their intracranial and extracranial course and distribution.
- Location of various cranial nerve nuclei.
- Anatomy and functions of spinal nerves.
- Foundation, course and distribution of a typical nerve.
- Effects of lesions.

#### Organs of Special Senses

- Development of special sense organs and common developmental anomalies of the eye, ear and nose.
- Basic mechanisms of olfaction, taste, vision and hearing.
- The nose skeleton, walls of the nasal cavity, morphological features, nasal conchae, meatuses, location of openings of the sinuses.
- Mucosa of the nasal cavity, blood supply and nerve supply.
- The paranasal sinuses, their location and general morphology.

#### Olfaction:

- Structure of olfactory mucous membrane, receptors, olfactory pathway and its termination.
- Characters of smell and its significance.

#### The Eye / Orbit

- Walls, bony constituents and salient morphological features.
- Disposition of the contents of the orbit including muscles, nerves and vessels. Structure and function of eyelids.
- Conjunctival sac, lacrimal gland and lacrimal apparatus, structure and functions.
- Orbicularis oculi muscle, attachments, nerve supply and functions.

#### Eyeball

- Tunics of the eyeball and their anatomical constituents.
- Microscopic anatomy of cornea and lens, layers of retina.
- Chambers of the eye, boundaries and contents.
- Formation, circulation and functions of aqueous humour, sinus venous sclerae (Canal of Schlemm), filtration angle.
- General morphological and structural features of refracting media.
- Blood supply of retina.
- The visual pathway and effect of lesions at different levels.
- Pupillary light reflex and its pathway.
- Accommodation, its mechanism and pathway.
- Colour vision and colour blindness.
- Photopic, scotopic and binocular vision.
- Field of vision and stereoscopic vision.



## The Ear

### External ear:

- Skeleton, general morphology of the auricle and the external acoustic meatus.
- Blood supply and nerve supply of the external ear.
- Tympanic membrane, size, shape, structure and nerve supply.

### Middle ear (tympanic cavity):

- Shape, size boundaries and contents.

### Internal ear:

- General morphology of bony labyrinth. Parts of membranous labyrinth, their general morphology, location of special sensory areas and nerve supply.
- Mechanism of hearing, auditory receptors and auditory pathway.
- Functions of the Vestibular apparatus.

## Organ of Taste

- Structure of taste buds and location.
- Gustation receptors, gustatory pathway and its termination.

## Gastrointestinal System

- Development of the gastrointestinal tract and common developmental anomalies e.g. oesophageal fistulae, Meckel's diverticulum, atresias.
- Rectal and associated urinary bladder anomalies related to partitioning of the cloaca.
- Rotation of gut, physiological herniation and its withdrawal and related anomalies.
- Development and partitioning of the coelomic cavity and formation of the diaphragm.
- Parts, relations, history, functional correlation with structure, common pattern of blood supply, nerve supply and lymphatic drainage of the mouth, tongue and salivary glands, oesophagus, stomach, small intestine, appendix, colon (including caecum), rectum, anal canal, liver, gallbladder, bile ducts and pancreas.

## Cardiovascular System

- Development of the heart and vascular system and common developmental anomalies such as septal defects, patent ductus arteriosus, Fallot's tetralogy and coarctation of aorta.
- Microscopic structure of the heart including conducting system
- Characteristics of the cardiac muscle contraction, duration, refractory period, pacemaker and rhythmicity.
- General structural features of atria, ventricles, conducting tissues, and valves of the heart and their relationship to cardiac function.
- Blood supply of heart.
- Structure and functions of the arteries, arterioles, capillaries and veins.

### Urinary System

- Development of the urinary system and common developmental anomalies.
- Morphology, including microscopic structure of the nephron.
- Relations, common pattern of blood supply, nerve supply and lymphatic drainage of the kidneys, ureters, urinary bladder, urethra and prostate.

### Respiratory System

- Development of the respiratory system and common developmental anomalies.
- Histology of the trachea, bronchi and the lung.
- Physiological anatomy and structure of the respiratory system.

### Larynx

- General form and skeleton of the larynx
- Blood and nerve supply of the larynx

### Endocrine and Reproductive System

- Development and common developmental anomalies of the pituitary, thyroid, parathyroid, adrenal glands, testis, uterine tubes, ovary, uterus etc.

### Musculoskeletal System

- Functions of the skeletal system.

### Bones

- Identification of bony outlines on plain x-ray.
- Classification of bones.
- Bone growth and ossification.
- Blood supply of all long and small bones of human body

### Joints

- Classification of joints
- Factors contributing to the stability of joints.
- Movements of the joints of shoulder, elbow, hip, knee and ankle.
- Movements of the shoulder girdle as a whole, supination and pronation of forearm, inversion and aversion of foot and movements of fingers and thumb. Maintenance of normal posture

### Muscles and Fasciae

- Muscles of the human body
- General disposition, nerve supply and effects of nerve lesions
- Muscle attachments, group actions and nerve supply.

### Body Cavities:

- Abdominal, thoracic, cranial, pelvic cavity
- A general description of the boundaries, land marks and surface anatomy of the internal organs and dermatomes of the body cavities

- General disposition, morphology, relations, blood and nerve supply, lymph nodes and areas of drainage of the viscera contained in these cavities.
- Identification of bony outlines on plain X-ray.

## 2. Physiology

Cellular organization, structure function correlations and physiological alterations in the endocrine organ systems of body

### **Structural and Functional Organization of the Cells of the Body**

- Concept of cells as the structural, functional and genetic units of the body.
- Composition of protoplasm, division into cytoplasm and nucleus.
- Role of macromolecules in the structural organization of the cell.
- Cell components with their role in cell function.
- Diversity of cell morphology as related to the varied functional demands. Physical activities of the living cells, intracellular movements, cellular locomotion, endocytosis and exocytosis.
- Basic concepts of the principles of transport through cell membrane, membrane potential and action potential.
- The cell cycle and cell division.
- Energy balance, metabolism & nutrition
- Uses of cell and tissue cultures.
- DNA and RNA structure and protein synthesis.

### **Blood:**

- General properties and composition.
- Structure, production, functions and fate of red blood cells, white blood cells and platelets.
- Structure, formation, functions, and fate of haemoglobin.
- Blood volume and principles of its measurement.
- Disorders of blood.
- Blood groups (ABO, Rh and other systems), blood transfusion and exchange transfusion.
- Precautions and hazards of blood transfusion.
- Plasma proteins, their production and functions.
- Diagnosis of various types of anaemias and leukaemias.
- Values of various components of blood in different age groups e.g. haemoglobin, WBCs, hormones etc.
- Interpretation of complete blood picture, haematological changes in infectious and non infectious diseases

### **Cardiovascular System:**

- Cardiac muscle: electrical and mechanical properties.
- Metabolism
- Origin of the HR beat, the electrical activity of the heart (normal and findings in cardiac and systemic diseases)

- Mechanism of production of heart sounds, their location, characters and relationship with the cardiac cycle.
- The normal electrocardiogram and characters of its various components. Significance of its parts, voltage and calibration, principles and methods of recording, electrocardiographic leads and general information obtained from ECG.
- Physiology and abnormalities of apex beat.
- Cardiac output, amount, distribution, measurement, control, cardiac index and cardiac reserve.
- Echocardiography, exercise tolerance test and the basis of ETT.
- Patho-physiology of cardiac failure, valvular heart disease and hypertension. Interpretation of data of diagnostic tests.
- Dynamics of blood and lymph flow: biophysics
- Arterial and arteriolar circulation capillary circulation, lymphatic circulation and venous circulation
- Laws of haemodynamics governing flow, pressure and resistance in blood vessels.
- Arterial blood pressure, measurement and regulation.
- Vasomotor system and control of blood vessels.
- Characters of arterial pulse and venous pulse.
- Significance of central venous pressure.
- Mechanism of haemorrhage and shock.
- Coronary, cutaneous, splanchnic and peripheral circulation.
- Its measurement, control and special features, circulatory changes during muscular exercise
- Cardiovascular regulatory mechanisms local regulation
- Endothelium; systemic regulation by hormones and systemic regulation by nervous system.
- Circulation through special organs: organs: coronary circulation, cerebral circulation and pulmonary circulation.
- Cardiovascular homeostasis in health and diseases: exercise, gravity, shock, hypertension and heart failure.

### **Respiration:**

- Pulmonary ventilation
- Mechanics of respiration, pulmonary volumes, capacities and pressures.
- Transport and exchange of oxygen and carbon dioxide.
- Regulation of respiration. (chemical and neural)
- Physiology of respiratory insufficiencies, hypoxia, dyspnoea, asphyxia and hypercapnia.
- Exercise hypoxia and cyanosis
- Physiological changes due to altitude and space travel
- Principles and methods of artificial respiration.
- Principles of pulmonary function tests.
- Interpretation of data of diagnostic tests.
- Cardiopulmonary resuscitation.
- Patho-physiology of respiratory failure.

**Renal function:**

- Renal circulation
- Glomerular filtration
- Tubular function
- Water excretion
- Acidification of urine
- Regulation of Na<sup>+</sup> and K<sup>+</sup> excretion
- Regulation of extracellular fluid composition and volume
- Homeostatic mechanisms to maintain
  - Tonicity
  - Volume
  - H<sup>+</sup> concentration of ECF.

**Endocrinology:**

- General concepts of chemical nature, mechanism, site of action and functions of hormones of the hypothalamus, pituitary, thyroid, adrenal, parathyroid, pancreas, and pineal glands, ovaries and testis.
- Comprehensive knowledge of all hormones including their chemistry, biosynthesis, storage, release, transport, mechanism of inactivation mode and site of action, distribution, physiological and pathological activities and assessment of functions.
- Calcium homeostasis
- Effects of hypo-and hyperactivity of the endocrine glands.
- Production and functions of hormones related to the sex characters in the male and female.
- Endocrinology of the menstrual cycle.
- Role of hormones in pregnancy, parturition and lactation.
- Functions of placenta. Libido, impotence and infertility.
- Endocrine function of the kidney, heart, lung and gastrointestinal tract

**Gastrointestinal function:**

- Digestion and absorption
- Regulation of gastrointestinal function
- Motility: mastication, swallowing, gastric motility, intestinal motility and gall bladder motility.
- Secretary activity: formation, composition, function and control of saliva, gastric, pancreatic, bile and intestinal secretions.
- GIT hormones controlling activities: Functions of the stomach, pancreas, gall bladder, liver and large intestine. Formation and composition of faeces, mechanism of defecation.
- Circulation of bile. Principles and assessment of liver function tests. Interpretation of data, diagnostic tests.
- Hyperbilirubinaemia and congenital hyperbilirubinaemias.
- Control of hunger, appetite and its disorders.

**Central Nervous System**

- Motor cortex corticospinal and corticobulbar system.
- Basal ganglia

- Cerebellum
- Autonomic Nervous System
- Overall functions of sympathetic and parasympathetic nervous systems. Autonomic reflex activity.
- Functional Aspects of the Nervous System
- Sensory activity: Peripheral sensory receptors, sensory pathways, physiology of pain and disorders of sensations.
- Motor activity: corticospinal and extracorticospinal pathways, cerebellum and Vestibular system.
- Motor neurons, motor units and neuromuscular junction.
- Disorders of motor activity.
- Muscle and nerve physiology.
- Reflex activity: Monosynaptic stretch reflexes, polysynaptic withdrawal reflexes, general characters of reflexes.
- Electroencephalogram and its uses.
- Sleep, types, physiological changes during sleep.
- Speech mechanism and its disorders.
- Cerebrospinal fluid, cerebral circulation, metabolism and functions.
- Blood brain and blood CSF barriers.

### 3. Biochemistry

- Membrane biochemistry and signal transduction
- Gene expression and the synthesis of proteins
- Bioenergetics; fuel oxidation and the generation of ATP
- Enzymes and biologic catalysis
- Tissue metabolism

#### **VITAMINS**

- Classification, components, sources, absorption and functions (physiological and biochemical role).
- Daily requirements, effects of deficiency and hypervitaminosis.
- Salient morphologic features of diseases related to deficiency or excess of vitamins.

#### **MINERALS**

- Sources of calcium, phosphorous, iron, iodine, fluorine, magnesium and manganese.
- Trace elements and their clinical importance.
- Absorption and factors required for it.
- Functions and fate.

#### **METABOLISM**

- Metabolic rate and basal metabolic rate
- Factors influencing metabolic rate, principles of measurement.

#### **Carbohydrates**

- Classification and dietary sources.
- Digestion, absorption and utilization of dietary carbohydrates. Glucose tolerance test.

- Glycogenesis, glycolysis, gluconeogenesis, glycogenolysis, processes with the steps involved and effects of hormones.
- Citric acid cycle, steps involved, its significance and the common final metabolic pathway.
- Hexose monophosphate shunt: mechanism and significance.

### **Lipids**

- Classification of simple, derived and compound lipids.
- Dietary sources.
- Digestion, absorption, utilization and control.
- Fatty acid oxidation with steps involved.
- Ketogenesis and its significance.
- Lipotropic factors and their actions. Lipoproteins, types and importance.

### **Proteins and Amino Acids**

- Classification and dietary sources of proteins.
- Digestion, absorption, utilization and control.
- Fate of amino acids.
- Urea formation with steps involved.
- Functions and effects of deficiency.
- Nucleoproteins:
- Structure and metabolism.
- Pigment Metabolism
- Basic concept of endogenous and exogenous pigments.
- Causes of pigmentation and depigmentation.
- Disorders of pigment metabolism, inherited disorders, acquired disorders from deficiency or excess of vitamins, minerals, fats, carbohydrates, proteins etc.

### **Balanced Diet**

- Requisites of an adequate diet.
- Role of carbohydrates, fats, proteins, minerals, vitamins and water in diet.
- Principles of nutrition as applied to medical problems
- Biotechnology and concepts of molecular biology with special emphasis on use of recombinant DNA techniques in medicine and the molecular biology of cancer

## **4. Pharmacology**

- The Evolution of Medical Drugs
- British Pharmacopia
- Introduction to Pharmacology
- Receptors
- Mechanisms of Drug Action
- Pharmacokinetics
  - Pharmacokinetic Process
  - Absorption
  - Distribution
  - Metabolism

- Desired Plasma Concentration
- Volume of Distribution
- Elimination
- Elimination rate constant and half life
- Creatinine Clearance
- Drug Effect
  - Beneficial Responses
  - Harmful Responses
  - Allergic Responses
  - Drug Dependence, Addiction, Abuse and Tolerance
  - Drug Interactions
- Drug use in pregnancy and in children
- Autonomic Pharmacology
- Basic concepts of pharmacokinetics and dynamics of:
  - Autacoids and their antagonists
  - Diuretics
  - Cardiovascular Drugs e.g. cardiac glycosides, antiarrhythmic, antianginal and antihypertensive drugs
  - Central Nervous System Drugs e.g. anxiolytics & hypnotics, antiepileptic, antiparkinsonians, opioid analgesics, antipsychotics & antidepressants
  - Nonsteroidal anti-inflammatory drugs and drugs used in gout
  - Endocrine pharmacology including calcium homeostasis
  - Gastrointestinal tract pharmacology
  - Respiratory pharmacology
  - Drugs Acting on the blood
  - Chemotherapy
  - Antibacterial, antimycobacterial, antiviral, antifungal and antiparasitic
  - Immunopharmacology
  - Vitamins and Antioxidants

## 5. Pathology

Pathological alterations at cellular and structural level along with brief introduction of Basic Microbiology and Haematological pathology as related to medicine

### **Cell Injury and adaptation**

- Reversible and Irreversible Injury
- Fatty change, Pathologic calcification
- Necrosis and Gangrene

#### Cellular adaptation

- Atrophy, Hypertrophy,
- Hyperplasia, Metaplasia, Aplasia

### **Inflammation**

- **Acute inflammation**
- Cellular components and chemical mediators of acute inflammation
- Exudates and transudate



- Sequelae of acute inflammation
- **Chronic inflammation**
- Etiological factors and pathogenesis
- Distinction between acute and chronic (duration) inflammation
- Histologic hallmarks
- Types of chronic inflammation, non-granulomatous and granulomatous, and their causes

### **Haemodynamic disorders**

- Etiology, pathogenesis, classification and morphological and clinical manifestations of Edema, Haemorrhage, Thrombosis, Embolism, Infarction & Hyperaemia
- Shock; classification etiology, and pathogenesis, manifestations.
- Describe the compensatory mechanisms involved in shock
- Describe the pathogenesis and possible consequences of thrombosis
- Describe the difference between arterial and venous emboli

### **Neoplasia**

- Dysplasia and Neoplasia
- Benign and malignant neoplasms
- Etiological factors for neoplasia
- Different modes of metastasis
- Tumor staging system and tumor grade

### **Immunity and Hypersensitivity**

- Immunity
- Immune response
- Diagnostic procedures in a clinical microbiology laboratory
- Protective immunity to microbial diseases
- Tumour immunology
- Immunological tolerance, autoimmunity and autoimmune diseases.
- Transplantation immunology
- Hypersensitivity
- Immunodeficiency disorders
- Immunoprophylaxis & Immunotherapy

### **Haematopathology**

- Normal blood picture & variation in disease

### **Microbiology**

- A brief account of the classification of microorganisms .
- Role of Microbes In Various Human Diseases
- Infection source

#### **Bacterial Growth and Death**

- Names, habitat, modes of transmission/infection, pathogenic mechanism and pathological changes produced by bacteria,

commonly causing human diseases in Pakistan

- Names of bacteria and diseases produced by bacteria not commonly found in Pakistan.
- Morphology: Identification of various shapes of bacteria and viruses under the microscope.
- Distribution, size, motility, reproduction and functions of bacteria and viruses.
- Gram staining and AFB staining, Culture of blood and fluid; details regarding methodology in collection, transportation and preservation.
- Culture media for common pathogens and methods of culture.
- Special culture media. Basis of sensitivity tests.

Fungal Diseases

- Names, general morphological features, and diseases produced by fungi commonly found in Pakistan, including dermatophytes, maduromycosis and opportunistic infections.

Important Parasites;

- Names and modes of infection of parasitic diseases commonly found in Pakistan including amoebiasis, malaria, leishmaniasis, ascariasis, cestodiasis, ankylostomiasis, giardiasis, hydatid disease and guinea worm disease.
- Important Viruses
- Sterilization and disinfection
- Immunization
- Nosocomial Infections
- Use Of Investigation And Procedures In Laboratory
- Sputum, Urine, Stool, Cerebrospinal Fluid(CSF), Pus, Aspirates

## 6. Biostatistics & Research Methodology

- Introduction to bio-statistics
- Introduction to bio- medical research
- Why research is important?
- What research to do?
  - Selecting a field for research
  - Drivers for health research
  - Participation in national and international research
  - Participation in pharmaceutical company research
  - Where do research ideas come from
  - Criteria for a good research topic
- Ethics in health research
- Writing a scientific paper
- Making a scientific presentation
- Searching the literature

## 7. Behavioural sciences

- Bio-psycho-social (BPS) model of health care
- Use of non-medicinal interventions in clinical practice
  - Communication skills
  - Counselling
  - Informational skills
- Crisis intervention/disaster management
- Conflict resolution
- Breaking bad news
- Medical ethics, professionalism and doctor-patient relationship
  - Hippocratic oath
  - Four pillars of medical ethics (autonomy, beneficence, non-maleficence and justice)
  - Informed consent and confidentiality
  - Ethical dilemmas in a doctor's life
- Delivery of culturally relevant care and cultural sensitivity
- Psychological aspects of health and disease
  - Psychological aspect of health
  - Psychological aspect of disease
  - Stress and its management
  - Psychological aspect of pain
  - Psychological aspect of aging

## **Part II MD Oncology**

Internal Medicine training for first two years starting from first day of enrollment. Resident should get exposure in the following organ and system competencies (listed below) while considering and practicing each system in terms of: -

- Medical ethics
- Professional values, student teachers relationship
- Orientation of in-patient, out-patients and Oncological labs
- Approach to the patient
- History taking
- General physical examination
- Systemic examination
- Routine investigations
- Special investigations
- Diagnostic and therapeutic procedures

### **Course Contents:**

#### **1. Cardiovascular Medicine**

*Common and / or important Cardiac Problems:*

- Arrhythmias
- Ischaemic Heart Disease: acute coronary syndromes, stable angina, atherosclerosis
- Heart Failure
- Hypertension – including investigation and management of accelerated hypertension
- Valvular Heart Disease
- Endocarditis
- Aortic dissection
- Syncope
- Dyslipidaemia

*Clinical Science:*

- Physiological principles of cardiac cycle and cardiac conduction
- Pharmacology of major drug classes: beta blockers, alpha blockers, ACE inhibitors, Angiotensin receptor blockers (ARBs), anti-platelet agents, thrombolysis, inotropes, calcium channel antagonists, potassium channel activators, diuretics, anti-arrhythmics, anticoagulants, lipid modifying drugs, nitrates, centrally acting anti-hypertensives

#### **2. Dermatology;**

*Common and / or Important Problems:*

- Cellulitis
- Cutaneous drug reactions
- Psoriasis and eczema
- Skin failure: e.g. erythroderma, toxic epidermal necrolysis

- Urticaria and angio-oedema
- Cutaneous vasculitis
- Herpes zoster and Herpes Simplex infections
- Skin tumours
- Skin infestations
- Dermatomyositis
- Scleroderma
- Lymphoedema

*Clinical Science:*

- Pharmacology of major drug classes: topical steroids, immunosuppressants

### **3. Diabetes & Endocrine Medicine**

*Common and / or Important Diabetes Problems:*

- Diabetic ketoacidosis
- Non-acidotic hyperosmolar coma / severe hyperglycaemia
- Hypoglycaemia
- Care of the acutely ill diabetic
- Peri-operative diabetes care

*Common or Important Endocrine Problems:*

- Hyper/Hypocalcaemia
- Adrenocortical insufficiency
- Hyper/Hyponatraemia
- Thyroid dysfunction
- Dyslipidaemia
- Endocrine emergencies: myxoedemic coma, thyrotoxic crisis, Addisonian crisis, hypopituitary coma, pheochromocytoma crisis

*Clinical Science:*

- Outline the function, receptors, action, secondary messengers and feedback of hormones
- Pharmacology of major drug classes: insulin, oral anti-diabetics, thyroxine, anti-thyroid drugs, corticosteroids, sex hormones, drugs affecting bone metabolism

### **4. Gastroenterology and Hepatology**

*Common or Important Problems:*

- Peptic Ulceration and Gastritis
- Gastroenteritis
- GI malignancy (oesophagus, gastric, hepatic, pancreatic, colonic)
- Inflammatory bowel disease
- Iron Deficiency anaemia
- Acute GI bleeding
- Acute abdominal pathologies: pancreatitis, cholecystitis, appendicitis, leaking abdominal aortic aneurysm
- Functional disease: irritable bowel syndrome, non-ulcer dyspepsia
- Coeliac disease
- Alcoholic liver disease
- Alcohol withdrawal syndrome
- Acute liver dysfunction: jaundice, ascites, encephalopathy
- Liver cirrhosis

- Gastro-oesophageal reflux disease
- Nutrition: indications, contraindications and ethical dilemmas of nasogastric feeding and EG tubes, IV nutrition, re-feeding syndrome
- Gall stones
- Viral hepatitis
- Auto-immune liver disease
- Pancreatic cancer

*Clinical Science:*

- Laboratory markers of liver, pancreas and gut dysfunction
- Pharmacology of major drug classes: acid suppressants, anti-spasmodics, laxatives, anti-diarrhoea drugs, aminosalicylates, corticosteroids, immunosuppressants, infliximab, pancreatic enzyme supplements

## **5. Renal Medicine**

*Common and / or Important Problems:*

- Acute renal failure
- Chronic renal failure
- Glomerulonephritis
- Nephrotic syndrome
- Urinary tract infections
- Urinary Calculus
- Renal replacement therapy
- Disturbances of potassium, acid/base, and fluid balance (and appropriate acute interventions)

*Clinical Science:*

- Measurement of renal function
- Metabolic perturbations of acute, chronic, and end-stage renal failure and associated treatments

## **6. Respiratory Medicine**

*Common and / or Important Respiratory Problems:*

- COPD
- Asthma
- Pneumonia
- Pleural disease: Pneumothorax, pleural effusion, mesothelioma
- Lung Cancer
- Respiratory failure and methods of respiratory support
- Pulmonary embolism and DVT
- Tuberculosis
- Interstitial lung disease
- Bronchiectasis
- Respiratory failure and cor-pulmonale
- Pulmonary hypertension

*Clinical Science:*

- Principles of lung function measurement
- Pharmacology of major drug classes: bronchodilators, inhaled corticosteroids, leukotriene receptor antagonists, immunosuppressants

## **7. Allergy**

### *Common or Important Allergy Problems*

- Anaphylaxis
- Recognition of common allergies; introducing occupation associated allergies
- Food, drug, latex, insect venom allergies
- Urticaria and angioedema

### *Clinical Science*

- Mechanisms of allergic sensitization: primary and secondary prophylaxis
- Natural history of allergic diseases
- Mechanisms of action of anti-allergic drugs and immunotherapy
- Principles and limitations of allergen avoidance

## **8. Haematology**

### *Common and / or Important Problems:*

- Bone marrow failure: causes and complications
- Bleeding disorders: DIC, haemophilia
- Thrombocytopaenia
- Anticoagulation treatment: indications, monitoring, management of over-treatment
- Transfusion reactions
- Anaemia: iron deficient, megaloblastic, haemolysis, sickle cell,
- Thrombophilia: classification; indications and implications of screening
- Haemolytic disease
- Myelodysplastic syndromes
- Leukaemia
- Lymphoma
- Myeloma
- Myeloproliferative disease
- Inherited disorders of haemoglobin (sickle cell disease, thalassaemias)
- Amyloid

### *Clinical Science:*

- Structure and function of blood, reticuloendothelial system, erythropoietic tissues

## **9. Immunology**

### *Common or Important Problems:*

- Anaphylaxis (see also 'Allergy')

### *Clinical Science:*

- Innate and adaptive immune responses
- Principles of Hypersensitivity and transplantation

## **10. Infectious Diseases**

### *Common and / or Important Problems:*

- Fever of Unknown origin
- Complications of sepsis: shock, DIC, ARDS
- Common community acquired infection: LRTI, UTI, skin and soft tissue infections, viral exanthema, gastroenteritis
- CNS infection: meningitis, encephalitis, brain abscess
- HIV and AIDS including ethical considerations of testing

- Infections in immuno-compromised host
- Tuberculosis
- Anti-microbial drug monitoring
- Endocarditis
- Common genito-urinary conditions: non-gonococcal urethritis, gonorrhoea, syphilis

*Clinical Science:*

- Principles of vaccination
- Pharmacology of major drug classes: penicillins, cephalosporins, tetracyclines, aminoglycosides, macrolides, sulphonamides, quinolones, metronidazole, anti-tuberculous drugs, anti-fungals, anti-malarials, anti-helminthics, anti-virals

## **11. Medicine in the Elderly**

*Common or Important Problems:*

- Deterioration in mobility
- Acute confusion
- Stroke and transient ischaemic attack
- Falls
- Age related pharmacology
- Hypothermia
- Continence problems
- Dementia
- Movement disorders including Parkinson's disease
- Depression in the elderly
- Osteoporosis
- Malnutrition
- Osteoarthritis

*Clinical Science:*

- Effects of ageing on the major organ systems
- Normal laboratory values in older people

## **12. Musculoskeletal System**

*Common or Important Problems:*

- Septic arthritis
- Rheumatoid arthritis
- Osteoarthritis
- Seronegative arthritides
- Crystal arthropathy
- Osteoporosis – risk factors, and primary and secondary prevention of complications of osteoporosis
- Polymyalgia and temporal arteritis
- Acute connective tissue disease: systemic lupus erythematosus, scleroderma, poly- and dermatomyositis, Sjogren's syndrome, vasculitides

*Clinical Science:*

- Pharmacology of major drug classes: NSAIDs, corticosteroids, immunosuppressants, colchicines, allopurinol, bisphosphonates



### **13. Neurology**

*Common or Important Problems:*

- Acute new headache
- Stroke and transient ischaemic attack
- Subarachnoid haemorrhage
- Coma
- Central Nervous System infection: encephalitis, meningitis, brain abscess
- Raised intra-cranial pressure
- Sudden loss of consciousness including seizure disorders (see also above syncope etc)
- Acute paralysis: Guillian-Barré, myasthenia gravis, spinal cord lesion
- Multiple sclerosis
- Motor neuron disease

*Clinical Science:*

- Pathophysiology of pain, speech and language
- Pharmacology of major drug classes: anxiolytics, hypnotics inc. benzodiazepines, antiepileptics, anti-Parkinson's drugs (anti-muscarinics, dopaminergics)

### **14. Psychiatry**

*Common and /or Important Problems:*

- Suicide and parasuicide
- Acute psychosis
- Substance dependence
- Depression

*Clinical Science:*

- Principles of substance addiction, and tolerance
- Pharmacology of major drug classes: anti-psychotics, lithium, tricyclic antidepressants, mono-amine oxidase inhibitors, SSRIs, venlafaxine, donepezil, drugs used in treatment of addiction (bupropion, disulpharam, acamprosate, methadone)

### **15. Cancer and Palliative Care**

*Common or Important Oncology Problems:*

- Hypercalcaemia
- SVC obstruction
- Spinal cord compression
- Neutropenic sepsis
- Common cancers (presentation, diagnosis, staging, treatment principles): lung, bowel, breast, prostate, stomach, oesophagus, bladder)

*Common or Important Palliative Care Problems:*

- Pain: appropriate use, analgesic ladder, side effects, role of radiotherapy
- Constipation
- Breathlessness
- Nausea and vomiting
- Anxiety and depressed mood

*Clinical Science:*

- Principles of oncogenesis and metastatic spread
- Apoptosis

- Principles of staging
- Principles of screening
- Pharmacology of major drug classes in palliative care: anti-emetics, opioids, NSAIDS, agents for neuropathic pain, bisphosphonates, laxatives, anxiolytics

## **16. Clinical Genetics**

*Common and / or Important problems:*

- Down's syndrome
- Turner's syndrome
- Huntington's disease
- Haemochromatosis
- Marfan's syndrome
- Klinefelter's syndrome
- Familial cancer syndromes
- Familial cardiovascular disorders

*Clinical Science:*

- Structure and function of human cells, chromosomes, DNA, RNA and cellular proteins
- Principles of inheritance: Mendelian, sex-linked, mitochondrial
- Principles of pharmacogenetics
- Principles of mutation, polymorphism, trinucleotide repeat disorders
- Principles of genetic testing including metabolite assays, clinical examination and analysis of nucleic acid (e.g. PCR)

## **17. Clinical Pharmacology**

*Common and / or Important problems:*

- Corticosteroid treatment: short and long-term complications, bone protection, safe withdrawal of corticosteroids, patient counselling regarding avoid adrenal crises
- Specific treatment of poisoning with:
  - Aspirin,
  - Paracetamol
  - Tricyclic anti-depressants
  - Beta-blockers
  - Carbon monoxide
  - Opiates
    - Digoxin
    - Benzodiazepines

*Clinical Science:*

- Drug actions at receptor and intracellular level
- Principles of absorption, distribution, metabolism and excretion of chemotherapeutic and palliative drugs
- Effects of genetics on drug metabolism
- Pharmacological principles of drug interaction
- Outline the effects on drug metabolism of: pregnancy, age, renal and liver impairment

## Investigation Competencies

*Outline the Indications for, and Interpret the Following Investigations:*

- Basic blood biochemistry: urea and electrolytes, liver function tests, bone biochemistry, glucose, magnesium
- Cardiac biomarkers and cardiac-specific troponin
- Creatine kinase
- Thyroid function tests
- Inflammatory markers: CRP / ESR
- Arterial Blood Gas analysis
- Cortisol and short Synacthen test
- HbA1C
- Lipid profile
- Amylase
- Full blood count
- Coagulation studies
- Haemolysis studies
- D dimer
- Blood film report
- Blood / Sputum / urine culture
- Fluid analysis: pleural, cerebro-spinal fluid, ascitic
- Urinalysis and urine microscopy
- Auto-antibodies
- Chest radiograph
- Abdominal radiograph
- Joint radiographs (knee, hip, hands, shoulder, elbow, dorsal spine, ankle)
- ECG
- Peak flow tests
- Full lung function tests

*More Advanced Competencies:*

- Viral hepatitis serology
- HIV testing
- Ultrasound
- Detailed imaging: Barium studies, CT, CT Oncological angiography, high resolution CT, MRI
- Echocardiogram
- 24 hour ECG monitoring
- Ambulatory blood pressure monitoring
- Exercise tolerance test
- Cardiac perfusion scintigraphy
- Tilt testing
- Neurophysiological studies: EMG, nerve conduction studies, visual and auditory evoked potentials
- Bone scan

### **Procedural Competencies**

- The trainee is expected to be competent in performing the following procedures by the end of core training. The trainee must be able to outline the indications for these interventions. For invasive procedures, the trainee must recognize the indications for the procedure, the importance of valid consent, aseptic technique, safe use of local anaesthetics and minimization of patient discomfort.
- Venepuncture
- Cannula insertion, including large bore
- Arterial blood gas sampling
- Lumbar Puncture
- Pleural tap and aspiration
- Intercostal drain insertion: Seldinger technique
- Ascitic tap
- Abdominal paracentesis
- Central venous cannulation
- Initial airway protection: chin lift, Guedel airway, nasal airway, laryngeal mask
- Basic and, subsequently, advanced cardiorespiratory resuscitation
- DC cardioversion
- Electrocardiogram
- Cytology: pleural fluid, ascitic fluid, cerebro-spinal fluid, sputum
- Urethral catheterization
- Nasogastric tube placement and checking

## Part-III Specialty training in Oncology

### Specific Program Content

1. Specialized training in Oncology
2. Compulsory rotations
3. Research & thesis writing
4. Maintaining of Log-book

### Cancer Biology

- Biology of normal cells.
- Basic processes of carcinogenesis.
- Gene structure, organization, expression and regulation.
- Cell cycle, its control by oncogenesis and interaction with therapy.
- Tumor cell kinetics, proliferation, programmed cell death and balance between cell death and proliferation.
- Understanding of molecular techniques such as PCR, chromosomal analysis and other techniques of molecular and tumor cell biology.

### Tumor Immunology

- Basic knowledge of cellular and humoral immunity.
- Cytokines and their action on immune system.
- Inter-relationship between tumor and host immune systems including tumor antigenicity, immune-mediated anti-tumor cytotoxicity and direct effect of cytokines on tumors

### Etiology, Epidemiology, Screening and Prevention

- Etiology of genetic and environmental factors in oncogenesis
- Basic knowledge of epidemiologic factors and descriptors of disease
- Basic principle of screening and risk assessment
- Sensitivity and specificity of a test and its cost benefit ratio
- Understanding of the situations where screening has a well-defined role and situations where its role is unclear or not defined
- Principles and indications for genetic screening and counseling
- Primary, secondary and tertiary prevention in cancer development

### Clinical Research Including Statistics

- Clinical trial design
- Phase I -II-III trials
- Review of ethical, regulatory and legal issues involved in study design
- Criteria for defining response to therapy
- Tools used to assess quality of life
- Basics of statistics including statistical methods, requirements for patients number in designing studies and proper interpretation of the data
- Toxicity assessment and grading
- Role and functioning of institutional review board and ethical committees
- Experience obtaining informed consent from patients

- Understanding of government regulatory mechanisms of surveillance
- Instruction in grant writing and information about mechanism of support for clinical research
- Cost of therapy and cost-effectiveness of therapy
- Instruction in preparing abstracts, oral and poster presentations and writing articles
- Critical evaluation of the scientific poster of published articles and their influence on daily clinical practice

### **Basic Principles in the Management and Treatment of Malignant Diseases**

- Treatment of malignant diseases with a multidisciplinary approach with integration of various subspecialties because of increasing complexity of modern treatment.
- Benefits and limitations of each modality.
- Assessment of patient's co morbid conditions, which may affect the toxicity and efficacy of treatment, in order to formulate a treatment plan and be aware of the special conditions that influence the treatment of the growing population of elderly patients with malignant disorders.

### **Pathology/Laboratory Medicine/Molecular Biology**

- Role of cytology and biopsy in definitive diagnosis of cancer
- Review of biopsy material and surgical specimens with pathologists
- Role of pathologist in confirming the diagnosis of cancer and determining the grade and stage of the disease
- Role of newer pathological techniques and their contribution to the staging and management of cancer
- Laboratory techniques appropriate in staging and follow-up of patients
- Utility of tumor markers (serum tumor markers, membrane markers, DNA markers) and recognize their limitations.

### **Staging Procedure**

- Tumor-Node-Metastasis (TNM) staging system and how to stage a cancer patient
- Other staging systems e.g. Duke's, Astler and Collar etc.
- Indications for clinical, radiological and nuclear medicine imaging procedures in the diagnosis, staging and follow-up of patients with malignant diseases and how to assess response to treatment using these tests

### **Therapy**

#### **Surgery**

- Indications and contraindications of surgery
- Role of surgery in staging, cure and palliation of patients with malignant diseases
- Indications of organ preservation and sequencing with other treatment modalities

- Risks and benefits of surgery as a definitive treatment and as an adjunct to radiotherapy and/or anticancer agent
- Post-operative care

### **Radiation Oncology**

- Principles of radiation biology
- Indications of radiation therapy as curative and palliative modality
- Principles of treatment planning and dosimetry
- Sequencing of radiation therapy with surgery and/or anticancer agents
- Acute and chronic effects of radiation therapy

### **Anticancer Agents**

- Indications and goals of anticancer agents in primary and secondary malignant diseases
- Indications of anticancer agents in concomitant, neo-adjuvant and adjuvant setting
- Importance of timing and treatment delay of specific anticancer agents
- Assessment of patient's co-morbid medical conditions in order to determine the risk/benefit ratio of chemotherapeutic agents in the individual patient
- Pharmacokinetics, pharmacogenomics and pharmacology of anticancer drugs
- Toxicity profile of each anticancer agent including long term hazards, how to adapt the dose and treatment schedule according to the individual patient in case of organ dysfunction, and how to handle these complications

### **Biologic Agents**

- Activities and indications for biologic therapy including cytokines and hematopoietic growth factors
- Specific side effects of biologic agents and their management and therapeutic combination with chemotherapy
- Basic concepts of targeted molecular therapies (monoclonal antibodies, tumor vaccines, cellular therapy, and gene directed therapy)

### **Supportive and Palliative Measurements**

#### ***Supportive Measures***

##### *Nausea and vomiting*

- Etiology of nausea and vomiting in patients with malignancies
- Mechanism of action and pharmacology of anti-emetics and their use in clinical practice

##### *Infections and neutropenia*

- Principles of diagnosis and management of infections and neutropenic fever in all types of cancer patients
- Prevention of infections
- Indications for the use of hematologic growth factors

*Anemia*

- Indications and complications of red blood transfusions
- Options regarding preparation and administration of red blood products
- Indications for the appropriate use of erythropoietin

*Thrombocytopenia*

- Indications and complications of platelet transfusions
- Options regarding preparation and administration of platelets containing products
- Marrow and peripheral-blood progenitor cells
- Methods for marrow and peripheral-blood progenitor cells procurement and cryopreservation

*Organ protection*

- Use of organ-protective measurements and treatments
- Indications and side effects of various organ-protective agents
- Techniques of gonad preservation to ensure the fertility of the patient (cryopreservation techniques)

*Mucositis*

- Differentiation between infectious and chemotherapy induced mucositis
- Use of pain medication and topical anesthetic as palliation

*Malignant effusions*

- Knowledge of signs, symptoms and treatment indications of ascites, pleural and pericardial effusions
- Treatment of effusions by paracentesis

*Extravasation*

- Diagnosis and treatment of extravasation
- Trainee should know that prevention is the most important factor in extravasation

*Oncologic emergencies*

- To recognize clinical presentations requiring immediate intervention (e.g. spinal cord compression, pericardial tamponade)
- Proper approach for obtaining a tissue diagnosis in whom a diagnosis of cancer is suspected
- Therapies in acute and chronic settings

*Paraneoplastic syndromes*

- Malignancies associated with paraneoplastic syndromes and the management of each syndrome.

*Nutritional support*

- Indications and complications of enteral and parenteral support

**Palliative Care and End-of-Life Care**

*Pain*

- Assessment of location and severity of pain
- Working knowledge of WHO pain ladder
- Pharmacology and toxicity of opiate narcotics and other analgesics
- Management of cancer patients with available modalities



- Indications of referral for an invasive palliative procedure

*Other symptoms*

- Palliation of other symptoms (respiratory tract, gastrointestinal tract, neurologic symptoms, cutaneous and mucosal symptoms, anorexia and cachexia, dehydration)
- Management of end-of-life symptoms

*Communication*

- Communication with the patient and family
- Communication and working together with other healthcare professionals in a team (e.g. nurses, social workers, psychologists)

*Rehabilitation*

- Role of physical therapy particularly in post-operative setting
- Role of occupational therapy, speech therapy and swallowing therapy

**Psychosocial Aspects of Cancer**

- Psychosocial influence of cancer and indications of intervention at all stages of disease with available resources
- Knowledge of cultural issues that have impact on the management of cancer
- Appreciation of spiritual conflicts associated with the diagnosis and treatment of cancer
- Recognition of adaptive and maladaptive behavior in coping with disease
- Recognition of acceptable coping mechanisms by patients and families within the context of the cancer diagnosis
- Awareness of the issues involved in end-of-life care
- Impact of cancer on sexuality and resulting dysfunction as a result of disease process, treatment or because of psychological effects
- Indications and uses of psychotropic drugs
- Knowledge of bereavement process
- Appreciation of the physician's personal coping
- Knowledge of how to integrate family members, pastoral care, nursing support, hospice, and cancer support groups in multidisciplinary treatment of patients
- Communication with patients and their family, disclosure of bad news and act adequately in difficult situations
- Communication and work together with other professional health care takers in a team

**Patient Education**

*Genetic counseling*

- Assessment of increased risk of cancer in the patient and patient's family
- Principles of genetic screening and counseling

*Health maintenance*

- Counseling the patient and her family about known risk factors for subsequent malignancy: diet, smoking, alcohol, and sun exposure

## **Management and Treatment of Individual Cancers**

For each individual cancer disease, the trainee should know the epidemiology, pathophysiology, signs and symptoms, diagnostic work-up, treatment, and follow-up. The trainee should be able to communicate and discuss these topics with the patients. Specific items associated with each tumor type are important and discussed below.

### **Head and neck cancers**

- Proper head & neck examination
- Risk factors for head & neck cancers and natural history of individual primary tumor sites
- Emphasis on staging as the proper evaluation for therapeutic recommendations and recognition that staging is the basis for selecting surgery and/or radiation therapy as a definitive treatment.
- Role of chemotherapy and palliation of advanced disease
- Long term management and risk of second malignancies
- Indications of organ preservation

### **Lung cancer and mesothelioma**

Risk factors for developing lung cancer and mesothelioma

#### *Small-cell lung cancer*

- Approach to early-stage disease and the role of chemotherapy in advanced disease.

#### *Non-small-cell lung cancer*

- Criteria of inoperability
- Surgical and non-surgical therapy in localized disease
- Combined modality treatment in localized disease
- Role of chemotherapy and/or radiation therapy in the palliation of advanced disease

#### *Mesothelioma*

- Criteria for operability and value of chemotherapy

### **Gastrointestinal cancers**

#### *Esophageal cancer*

- Risk factors
- Indications for endoscopy in diagnosis and staging
- Indications for nutritional support
- Importance of combined modality therapy
- Role of palliative chemotherapy and other supportive measures

#### *Gastric cancer*

- Risk factors
- Major surgical approaches to the disease and potentially curative role of combined modality therapy
- Role of palliative chemotherapy and other supportive measure

#### *Colon cancer*

- Risk factors and rationale for screening of colorectal cancer, as well as its chemoprevention
- Role of genetic testing in colorectal cancer
- Surgical staging

- Indications for adjuvant therapies in colon and rectal cancers and role of chemotherapy in stage III and IV disease
- Hereditary types of colon cancer and differences in their pattern of spread and management

*Anal cancer*

- Association of human papilloma virus and anal cancer
- Role of combined modality therapy in organ preservation

*Hepatobiliary cancers*

- Epidemiology and risk factors
- Role of alpha-fetoprotein in diagnosis, response assessment and screening of hepatobiliary cancers
- Indications for curative role of surgery in localized disease
- Role of systemic and intra-arterial chemotherapy

*Pancreatic cancer*

- Risk factors
- Genetic aspects of pancreatic cancer
- Role of endoscopy
- Role of molecular diagnosis
- Curative role of surgery in rare patients and palliation in others
- Palliative role of chemotherapy in advanced disease

**Genitourinary cancers**

*Renal cell cancer*

- Diagnostic and paraneoplastic aspects of disease
- Role of surgery in localized disease
- Role of biologic therapies in palliation of advanced disease

*Urothelial cancer*

- Risk factors
- Difference between localized and invasive disease and propensity of transitional-cell carcinoma to recur
- Role of urine cytology and cystoscopy in staging and follow-up of the patients
- Role of intravesical therapy in superficial bladder cancer and role of surgery in early-stage invasive disease
- Combined modality therapy in localized and urothelial disease and management of metastatic transitional-cell carcinoma

*Penile cancer*

- Role of human papilloma virus in the etiology of penile cancer
- Role of combined modality treatment

*Prostate cancer*

- Epidemiology
- Role of prostate-specific antigen in screening and follow-up of patients
- Histologic grading
- Role of observation, surgery, or radiation therapy in the management of early disease
- Role of hormone therapy and chemotherapy in advanced disease

*Germ cell tumors*

- Classification of germ cell tumors according to International Germ Cell Collaborative Group

- Role of tumor markers in diagnosis, prognosis, and follow-up of patients
- Role of surgery, radiation, and chemotherapy
- Role of combination chemotherapy in advanced disease

## **Gynecologic Malignancies**

### *Ovarian cancer*

- Role of genetics in predisposition of ovarian cancer
- Role of appropriate surgical procedures in staging and treatment
- Systemic treatment
- Indications of chemotherapy in localized and advanced disease

### *Uterine cancer*

- Role of hormones and hormonal therapies in the etiology of endometrial cancer
- Role of surgery in early-stage disease
- Role of radiation therapy in the multidisciplinary approach of more advanced disease
- Role of chemotherapy and hormone therapy in the management of both local and metastatic disease

### *Cervical cancer*

- Risk factors
- Role of staging as a basis for selecting surgery and/or radiation therapy
- Role of chemotherapy in the management of both local disease combined with radiotherapy in the treatment of advanced disease
- Vulvar and vaginal cancers
- Role of diethylstilbestrol (DES) in the induction of clear-cell carcinoma and role of proper surveillance and management of these patients
- Role of surgery in early-stage disease and need for combination therapy in advanced disease

### *Breast cancer*

- Working knowledge in the interpretation of mammogram, ultrasound, and magnetic resonance imaging scan of the breast
- Pathologic and prognostic features that assist in determining the indications for therapy, including how to manage preneoplastic lesions
- Issues that affect the choice of primary treatment, including the value of determination of receptors
- Role of hormone therapy and/or chemotherapy in advanced disease
- Indications of adjuvant therapy and role of elective chemotherapy
- Importance of family history and role of genetic testing and counseling

## **Sarcomas**

### *Bone sarcomas*

- Predisposing situations and conditions in the development of primary bone sarcomas
- Indications/consideration for limb preservation and adjuvant chemotherapy
- Role of combined modality therapy for specific tumors

### *Soft tissue sarcomas*

- Role of appropriate surgery for initial diagnosis
- Indications for limb preservation
- Role of chemotherapy, surgery, and radiation therapy, including the specific treatment available for gastrointestinal sarcomas

## **Skin cancers**

### *Melanoma*

- Risk factors
- Primary prevention and counseling of high risk patients
- Presentation of primary melanoma and its precursor lesions, such as dysplastic nevus
- Differentiation between benign and potentially malignant skin lesions
- Factors associated with the prognosis
- Role of surgery in diagnosis and curative resection of melanomas
- Indications of biologic therapies in the adjuvant setting and potential risks and benefits of chemotherapy in advanced disease

### *Basal cell and squamous cell cancers*

- Clinical appearance and association of these cancers with sun exposure
- Long term complication of cancer therapy

## **Endocrine cancers**

- Specific diagnostic work-up and treatment
- Association of endocrine cancers with cancer syndromes due to specific genetic defects
- Role of anticancer drugs in different endocrine cancers
- Central nervous system malignancies
- Role of surgery, radiation therapy, and chemotherapy in primary and metastatic disease involving the central nervous system
- Malignancy of unknown primary

## **Hematologic Malignancies**

### *Leukemia*

- Pathologic and molecular biologic techniques (cytogenetics, immunophenotyping, polymerase chain reaction) in the diagnosis of leukemia
- Current treatment recommendations and their applications in acute lymphoblastic and myeloid leukemia in both adult population and the elderly

### *Acute leukemias and myelodysplasia*

- Risk factors
- French-American-British classification and its implications for diagnosis and treatment
- Potential use of marrow transplantation in leukemia and value of differentiation therapy

### *Chronic leukemias*

- Appearance of chronic leukemias on peripheral-blood smear
- Current therapeutic approaches in the treatment of chronic leukemias and understanding the expectations of treatment
- Indications of marrow transplantation

## **Lymphoma**

- Ann Arbor Staging and World Health Organization classification as well as its strengths, limitations, and current initiatives to improve upon the staging classification

*Hodgkin's disease*

- Indications for surgical staging
- Role of radiation therapy in early-stage disease
- Indications of chemotherapy in stages II, III, and IV
- Long-term complications of treatment and follow-up of patients
- Indications for marrow transplantation in patients with relapsed or refractory disease

*Non-Hodgkin's lymphoma*

- Association of lymphomas with HIV and immunosuppression
- Revised European-American Lymphoma classification
- International Prognostic Factors
- Role of chemotherapy
- Value of marrow transplantation in relapsed or refractory disease
- Types of low-grade lymphomas with indications of treatment or observation only
- Role of radiation, surgery, and chemotherapy, including monoclonal antibodies in staging of intermediate grade non-Hodgkin's lymphomas
- Challenge and unique clinical properties of high-grade lymphomas and role of intensive treatment in this subgroup

*Cutaneous T-cell lymphoma*

- Clinical appearance of patients in different stages of disease
- Value of immunophenotyping in the diagnosis
- Roles of psoralen and ultraviolet radiation therapy, and topical chemotherapy in the initial management of patients
- Palliative roles of chemotherapy, biologic agents, and radiation therapy in advanced or refractory disease

*Plasma cell dyscrasias*

- Difference between plasma cell dyscrasias: monoclonal gammopathy of unknown significance, Waldenstrom's macroglobulinemia, plasmacytoma, multiple myeloma, POEMS (polyneuropathy, organomegaly, endocrinopathy, monoclonal protein, skin changes), and plasma cell leukemia
- Indications of treatment in each of the above mentioned diseases

**AIDS-associated malignancies**

- Association of central nervous system tumors with immunosuppression and AIDS
- Incidence of malignancy in HIV-positive population
- Indications for treatment of individual cancer and toxicities attributable to concurrent medical problems
- Prophylaxis and treatment for common opportunistic infections

**2. Compulsory rotations in the relevant fields for 3-6 months**

Clinical training experiences are described below:

**1. Intensive Care Units**

On this 3 month rotation, the resident shall develop competence in the differential diagnosis and management of the critically ill, and learn to integrate

these clinical skills with the biomedical instrumentation of bedside hemodynamic measurements, right heart catheterization, measurement and computation of gas exchange variables, cardiac output determination, and all aspects of mechanical ventilation and airway care. These principles, and those governing fluid therapy, nutritional support, and antimicrobial therapy in severely ill patients, shall be reviewed extensively.

## **2. Outpatient Services**

Oncological outpatient training shall be provided during the entire residency in a continuity to review findings and to discuss patient care issues. Residents shall assume primary responsibility for managing their patients

## **3. Radiation Oncology**

The resident shall learn to prescribe and monitor the different doses and methods of radiation therapy in management of different types of malignancies.

## **4. Organ Transplantation**

This popular rotation shall provide residents with an intense introduction to the selection of transplant candidates and the management of these patients after transplantation. Residents shall work with a dedicated group of organ and the bone marrow transplant physicians and learn the indications, contraindications and the relative protocols and precautions required for these transplantations.

## **5. Oncological Rehabilitation Rotation**

This rotation shall expose residents to issues in rehabilitation of patients with chronic oncological diseases

**6. Elective experiences in Pathology and Laboratory Methodology** as well as **Radiology** and **Infectious diseases centre** for 1 month each in the relevant departments

# **RESEARCH/ THESIS WRITING**

## **RESEARCH/ THESIS WRITING**

Total of one year will be allocated for work on a research project with thesis writing. Project must be completed and thesis be submitted before the end of training. Research can be done as one block in 5<sup>th</sup> year of training or it can be stretched over five years of training in the form of regular periodic rotations during the course as long as total research time is equivalent to one calendar year.

## **Research Experience**

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

### **Clinical Research**

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

1. Research design
2. Research involving human subjects including informed consent and operations of the Institutional Review Board and ethics of human experimentation
3. Data collection and data analysis
4. Research ethics and honesty
5. Peer review process

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

### **Case Studies or Literature Reviews**

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

### **Laboratory Research**

#### *Bench Research*

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

#### *Research involving animals*

Each resident participating in research involving animals is required to:

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

#### *Research involving Radioactivity*

Each resident participating in research involving radioactive materials is required to

1. Attend a Radiation Review session
2. Work with an Authorized User and receive appropriate instruction from him/her.



## METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged.

Following teaching modalities will be employed:

1. Lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. Grand Rounds
5. Clinico-pathological Conferences
6. SEQ as assignments on the content areas
7. Skill teaching in ICU, emergency and ward settings
8. Attend genetic clinics and rounds for at least one month.
9. Attend sessions of genetic counseling
10. Self study, assignments and use of internet
11. Bedside teaching rounds in ward
12. OPD & Follow up clinics
13. Long and short case presentations

In addition to the conventional teaching methodologies interactive strategies like conferences will also be introduced to improve both communication and clinical skills in the upcoming consultants. Conferences must be conducted regularly as scheduled and attended by all available faculty and residents. Residents must actively request autopsies and participate in formal review of gross and microscopic pathological material from patients who have been under their care. It is essential that residents participate in planning and in conducting conferences.

### **1. Clinical Case Conference**

Each resident will be responsible for at least one clinical case conference each month. The cases discussed may be those seen on either the consultation or clinic service or during rotations in specialty areas. The resident, with the advice of the Attending Physician on the Consultation Service, will prepare and present the case(s) and review the relevant literature.

### **2. Monthly Student Meetings**

Each affiliated medical college approved to conduct training for MD Oncology will provide a room for student meetings/discussions such as:

- a. Journal Club Meeting
- b. Core Curriculum Meetings
- c. Skill Development

#### ***a. Journal Club Meeting***

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

***b. Core Curriculum Meetings***

All the core topics of Oncology should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once a month. It should be chaired by the chief resident (elected by the residents of the relevant discipline). Each resident should be given an opportunity to brainstorm all topics included in the course and to generate new ideas regarding the improvement of the course structure

***c. Skill Development***

Two hours twice a month should be assigned for learning and practicing clinical skills.

**List of skills to be learnt during these sessions is as follows:**

1. Residents must develop a comprehensive understanding of the indications, contraindications, limitations, complications, techniques, and interpretation of results of those technical procedures integral to the discipline (mentioned in pg. 10).
2. Residents must acquire knowledge of and skill in educating patients about the technique, rationale and ramifications of procedures and in obtaining procedure-specific informed consent. Faculty supervision of residents in their performance is required, and each resident's experience in such procedures must be documented by the program director.
3. Residents must have instruction in the evaluation of medical literature, clinical epidemiology, clinical study design, relative and absolute risks of disease, medical statistics and medical decision-making.
4. Training must include cultural, social, family, behavioral and economic issues, such as confidentiality of information, indications for life support systems, and allocation of limited resources.
5. Residents must be taught the social and economic impact of their decisions on patients, the primary care physician and society. This can be achieved by attending the bioethics lectures and becoming familiar with Project Professionalism Manual such as that of the American Board of Internal Medicine.
6. Residents should have instruction and experience with patient counseling skills and community education.

7. This training should emphasize effective communication techniques for diverse populations, as well as organizational resources useful for patient and community education.
8. Residents may attend the series of lectures on Nuclear Medicine procedures (radionuclide scanning and localization tests and therapy) presented to the Radiology residents.
10. Residents should have experience in the performance of clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance and proficiency standards.
11. Each resident will observe and participate in each of the following procedures, preferably done on patients firstly under supervision and then independently.

## A. Patient Management

## Level of Competence

	3rd Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year
Obtains pertinent history	4	4	4
Performs physical examination	4	4	4
Orders appropriate investigations and interprets the results	3	4	4
Decides and implements appropriate treatment	3	4	4
Maintains follow-up	4	4	4
Maintains record of patients	4	4	4

## B. Procedures

## Level of Competence

	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	Minimum No. of procedures
Bone Marrow Aspiration	NA	4	4	30
Bone Marrow Biopsy	NA	4	4	30
Paracentesis	3	4	4	50
Liver biopsy	3	4	4	10
Fine needle aspiration	3	4	4	25
Proctoscopy	3	4	4	50
Intrathecal chemotherapy	NA	4	4	50
Insertion of long line	4	4	4	50
Pleural biopsy	4	4	4	10
Pleurodesis	4	4	4	10
Indirect laryngoscopy	4	4	4	10

NA = Not applicable

### **3. Annual Grand Meeting**

Once a year all residents enrolled for MD Oncology should be invited to the annual meeting at UHS Lahore.

One full day will be allocated to this event. All the chief residents from affiliated institutes will present their annual reports. Issues and concerns related to their relevant courses will be discussed. Feedback should be collected and suggestions should be sought in order to involve residents in decision making.

The research work done by residents and their literary work may be displayed.

In the evening an informal gathering and dinner can be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

## LOG BOOK

The residents must maintain a log book and get it signed regularly by the supervisor. A complete and duly certified log book should be part of the requirement to sit for MD examination. Log book should include adequate number of diagnostic and therapeutic procedures observed and performed, the indications for the procedure, any complications and the interpretation of the results, routine and emergency management of patients, case presentations in CPCs, journal club meetings and literature review.

### **Proposed Format of Log Book is as follows:**

Candidate's Name: -----

Supervisor -----

Roll No. -----

The procedures shall be entered in the log book as per format

Residents should become proficient in performing the related procedures. After observing the technique, they will be observed while performing the procedure and, when deemed competent by the supervising physician, will perform it independently. They will be responsible for obtaining informed consent, performing the procedure, reviewing the results with the pathologist and the attending physician and informing the patient and, where appropriate, the referring physician of the results.

### **Procedures Performed**

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure Performed	Supervisor's Signature
1					
2					
3					
4					

### **Oncological Emergencies Handled**

Sr. #	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure/ Management	Supervisor's Signature
1					
2					
3					
4					

**Case Presented**

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Case Presented	Supervisor's Signature
1				
2				
3				
4				

**Seminar/Journal Club Presentation**

Sr.#	Date	Topic	Supervisor's Signature
1			
2			
3			
4			

**Evaluation Record**

(Excellent, Good, Adequate, Inadequate, Poor)

At the end of the rotation, each faculty member will provide an evaluation of the clinical performance of the fellow.

Sr.#	Date	Method of Evaluation (Oral, Practical, Theory)	Rating	Supervisor's Signature
1				
2				

## **EVALUATION & ASSESSMENT STRATEGIES**

### **Assessment**

It will consist of action and professional growth oriented ***student-centered integrated assessment*** with an additional component of ***informal internal assessment, formative assessment*** and measurement-based ***summative assessment***.

### **Student-Centered Integrated Assessment**

It views students as decision-makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to '**own**' the evaluation and to use it as a basis for self-improvement. Therefore, it tends to be growth-oriented, student-controlled, collaborative, dynamic, contextualized, informal, flexible and action-oriented.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

### ***Self Assessment by the Student***

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant clinical situations. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

### ***Peer Assessment***

The students will also be expected to evaluate their peers after the monthly small group meeting. These should be followed by a constructive feedback according to the prescribed guidelines and should be non-judgmental in nature. This will enable students to become good mentors in future.

### ***Informal Internal Assessment by the Faculty***

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

It will include:

- a. Punctuality
- b. Ward work
- c. Monthly assessment (written tests to indicate particular areas of weaknesses)
- d. Participation in interactive sessions

### **Formative Assessment**

Will help to improve the existing instructional methods and the curriculum in use

#### ***Feedback to the faculty by the students:***

After every three months students will be providing a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

### **Summative Assessment**

It will be carried out at the end of the programme to empirically evaluate **cognitive, psychomotor** and **affective domains** in order to award degrees for successful completion of courses.



## **MD ONCOLOGY EXAMINATION**

### **Part I MD Oncology**

**Total Marks: 200**

All candidates admitted in MD Oncology course shall appear in Part I examination at the end of first calendar year.

#### **Components of Part-I Examination:**

Paper-I, 100 MCQs (single best, having one mark each)                      100 Marks  
 Paper-II, 10 SEQs (having 10 marks each)    100 Marks

#### **Topics included in paper:**

<b>Topics included in paper:</b>	<b>Paper-I</b>	<b>Paper-II</b>
1. Anatomy	(20 MCQs)	(2 SEQs)
2. Physiology	(20 MCQs)	(2 SEQs)
3. Pathology	(20 MCQs)	(2 SEQs)
4. Biochemistry	(15 MCQs)	(1 SEQ)
5. Pharmacology	(10 MCQs)	(1 SEQ)
6. Behavioural Sciences	(10 MCQs)	(1 SEQ)
7. Biostatistics & Research Methodology	(05 MCQs)	(1 SEQ)

### **Part II MD Oncology**

**Total Marks: 430**

All candidates admitted in MD Oncology course shall appear in Part II examination at the end of 2<sup>nd</sup> calendar year.

There shall be two written papers of 100 marks each, Oral & practical/ clinical examination of 150 marks and log book assessment of 80 marks.

#### **Topics included in paper 1**

Principles of internal medicine including;

1. Pulmonary Medicine	(10 MCQs)
2. Allergy and Immunology	(10 MCQs)
3. Cardiovascular Illness	(10 MCQs)
4. Endocrinology and Metabolism	(10 MCQs)
5. Ophthalmology & Otolaryngology	(05 MCQs)
6. Infectious Disease	(05 MCQs)

#### **Topics included in paper 2**

Principles of internal medicine including;

- |                                  |           |
|----------------------------------|-----------|
| 1. Nephrology                    | (10 MCQs) |
| 2. Neurology                     | (10 MCQs) |
| 3. Gastroenterology & Hepatology | (10 MCQs) |
| 4. Dermatology                   | (10 MCQs) |
| 5. Rheumatology                  | (10 MCQs) |

## Components of Part II Examination

### Theory:

<b>Paper 1:</b>	<b><u>100 Marks</u></b>	<b>3 Hours</b>
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

<b>Paper 2:</b>	<b><u>100 Marks</u></b>	<b>3 Hours</b>
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

The candidates, who pass in theory papers, will be eligible to appear in the structured viva voce.

Oral & practical/clinical examination shall be held in basic clinical techniques relevant to internal medicine.

**OSCE** **50 Marks**

10 stations each carrying 05 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

**Clinical** **100 Marks**

Four short cases (15 marks each)	60 Marks
One long case:	40 Marks

**Log Book** **80 Marks**

**Part III MD Oncology****Total Marks: 920**

All candidates admitted in MD course shall appear in Part-III examination at the end of structured training programme (end of 5th calendar year and after clearing Part I & II examinations).

There shall be two written papers of 150 marks each, practical/ clinical examination of 300 marks, log book assessment of 120 marks and thesis examination of 200 marks.

**Topics included in paper 1**

- |   |           |
|---|-----------|
| 1. Cancer Biology and Tumor Immunology                                    | (10 MCQs) |
| 2. Etiology, Epidemiology, Screening and Prevention                       | (15 MCQs) |
| 3. Basic Principles in the Management and Treatment of Malignant Diseases | (15 MCQs) |
| 4. Supportive and Palliative Measures                                     | (15 MCQs) |
| 5. Psychosocial Aspects of Cancer   | (10 MCQs) |
| 6. Clinical Research Including Statistics                                 | (10 MCQs) |

**Topics included in paper 2**

- |   |           |
|---|-----------|
| 1. Head and neck cancers                            | (10 MCQs) |
| 2. Lung cancer and mesothelioma                     | (10 MCQs) |
| 3. Gastrointestinal cancers                         | (10 MCQs) |
| 4. Genitourinary cancers                            | (10 MCQs) |
| 5. Gynecologic Malignancies                         | (10 MCQs) |
| 6. Hematologic Malignancies                         | (10 MCQs) |
| 7. Endocrine cancers & AIDS-associated malignancies | (10 MCQs) |
| 8. Skin cancers and Sarcomas                        | (05 MCQs) |

**Components of Part III Examination****Theory****Paper I**

15 SEQs (No Choice)  
75 MCQs

**150 Marks****3 Hours**

75 Marks

75 Marks

**Paper II**

15 SEQs (No Choice)  
75 MCQs

**150 Marks****3 Hours**

75 Marks

75 Marks

The candidates, who pass in theory papers, will be eligible to appear in the clinical & viva voce.

**OSCE/ Viva****100 Marks**

10 stations each carrying 10 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

**Clinical**

Four short cases (each 25 marks)

One long case:

**200 Marks**

100 Marks

100 Marks

**Log Book**

**120 Marks**

**Thesis Examination**

**200 Marks**

All candidates admitted in MD courses shall appear in Part-III thesis examination at the end of 5<sup>th</sup> calendar year of the MD programme and not later than 8th calendar year of enrolment. The examination shall include thesis evaluation with defense.