



# **ZAMBIA COLLEGE OF MEDICINE & SURGERY**

*Advancing Specialist Care & Professional Growth*

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Specialty Training Programme

Curriculum & learning guide

for

**ANATOMIC PATHOLOGY**

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## GENERAL INTRODUCTION

This Curriculum and Learning Guide describes the work and competence-based professional training programme for the Specialty Training Programme (STP) in Anatomic Pathology (AP) in Zambia. The intended readership for the curriculum and guideline include the following:

- ✦ Trainees, host departments and managers of AP healthcare services;
- ✦ STP AP trainers, which includes all those involved in supervising, coordinating, assessing and delivering specialist education and training in Anatomic Pathology;
- ✦ Academic, administrative and professional staff within Higher Education Institutions (HEIs), the Higher Education Authority (HEA), and the Zambia Qualifications Authority (ZAQA);
- ✦ Strategic partners involved in supporting pathology services and the training of healthcare practitioners in its related fields.

Zambia College of Medicine and Surgery (ZACOMS) advances professional training of medical specialists using the professional competence-based certification model beyond traditional university-based specialist training. It promotes specialist training as a vital pursuit for a successful professional medical career. The ZACOMS also promotes the increase in universal health coverage (UHC) by promoting equitable access to cost-effective quality specialist care as close to the family as possible for people in Zambia at all levels of socioeconomic status and geographical location. The ZACOMS certifies and admits members and/or fellows as specialists in a medical and/or surgical specialty in any of the various specializations of medicine and surgery.

The Zambia College of Medicine and Surgery (ZACOMS) oversees the training of Anatomic Pathology specialists working through the Pathology Association of Zambia (PAZ). The programme is independent but is aligned to the curriculum and requirements of the College of Pathology of East Central and Southern Africa (COPECSA).

Anatomic Pathology involves medical science primarily concerning the cause, origin and nature of disease. It involves the examination of tissues, organs, bodily fluids and autopsies in order to study and diagnose disease. The STP AP training provides specialist training in Anatomic Pathology. This is a relevant programme because of the critical shortage of Anatomic Pathologists. The STP AP will equip trainees with core competencies reflecting the wide array of subspecialties within Pathology. This will mean for every trainee who completes this programme, the population they serve will have gained access to an Anatomic Pathologist with a wide range of competencies. Furthermore, the graduate of this programme will offer support to the various medical and surgical subspecialties, improving outcomes in the management of a broad spectrum of pathology.

## **Vision**

Our vision is to be innovative in providing a teaching and support structure that will empower every trainee to excel in Anatomic Pathology knowledge, skills and research through internal and external collaboration.

## **Mission Statement**

The mission of the STP AP training in Zambia is to train specialists who shall endeavour to improve the Anatomic Pathology health care services to all by providing evidence based professional services in the field of Anatomic Pathology in an efficient and proficient manner to meet the needs of the Zambian community, and contribute to the field of Anatomic Pathology in the region and globally.

## **Values:**

- Professional excellence
- Integrity
- Sensitivity to reproductive health needs
- Interdisciplinary, inter institutional collaboration
- Continuous professional development
- Innovation
- Academic Excellence
- Self and peer review

## **RATIONALE FOR THE SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY**

The STP AP aims to train specialists in Anatomic Pathology in order to prepare them for specialist service in the healthcare system. . The STP AP aims to bridge the critical shortage of Anatomic Pathologists by advancing professional training of Anatomic Pathologists by using the competence-based certification model beyond traditional university-based specialist training. Simply put, this model works on the principle that every health facility equipped well enough to support an Anatomic Pathology practice has the basic requirements to train an Anatomic Pathologist. The curriculum is informed by the training requirements of the Health Professions Council of Zambia (HPCZ), the professional creed of the Pathology Association of Zambia (PAZ) and is alive to the unique opportunities obtaining across the various training sites. The training programme encourages self-directed learning, life-long learning, and student-centred approaches while providing robust and structured guidance.

The curriculum provides a framework for the four year postgraduate specialty training and educational curriculum in anatomic pathology. Trainees who successfully complete the requirements and minimum standards set out in this curriculum should be expected to demonstrate competence in anatomic pathology at specialist level.

The key outcomes are twofold as stipulated in Outcomes 1 and 2 below:

## **Outcome 1. Anatomic Pathology Specific Outcomes**

1. Apply the knowledge and technical skills that are essential in recognizing, interpreting and explaining pathological processes in clinical practice in all branches of anatomic pathology.
2. Communicate pathologic findings to colleagues and provide appropriate advice regarding patient management.
3. Undertake relevant investigative pathologic processes and procedures for individual patients and the general patient population.
4. Establish good relationships with professional colleagues and working in multidisciplinary teams
5. Manage pathology laboratory services in various settings
6. Undertake research independently and in collaboration with other scholars.
7. Provide leadership in education and training of different categories of medical consultants and other health professionals.

## **Outcome 2. Competence, at mastery level, in Anatomic Pathology Practice.**

On successful completion of the work-based Anatomic Pathology STP:

1. The trainees should have specialist expertise in Anatomic Pathology, underpinned by broader knowledge, skills, experience and professional attributes necessary for independent practice;
2. The trainees should be able to support the practice of a wide range of medical and surgical specialists as they undertake complex clinical roles, define and choose investigative and clinical options, and make key judgements about complex facts and clinical situations.
3. The trainees should contribute to the improvement of Anatomic Pathology services in the context of the national health priorities, by means of outstanding scientific research and application of safe, high quality, cost effective, evidence based practice within the Zambian health system.
4. The trainees should possess the essential knowledge, skills, experience and attributes required for their role and should demonstrate:
  - ✦ A systematic understanding of clinical and scientific knowledge, and a critical awareness of current problems, future developments, research and innovation in Anatomic Pathology practice, much of which is at, or informed by, the forefront of their professional practice in a healthcare environment;
  - ✦ Clinical and scientific practice that applies knowledge, skills and experience in a healthcare setting, places the patient and the public at the centre of care prioritizing patient safety and dignity and reflecting outstanding professional values and standards;
  - ✦ Clinical, scientific and professional practice that meets the professional standards defined by the Health Professions Council of Zambia (HPCZ);

- ✦ Personal qualities that encompass self-management, self-awareness, acting with integrity and the ability to take responsibility for self-directed learning, reflection and action planning;
  - ✦ The ability to analyse and solve problems, define and choose investigative and scientific and/or clinical options, and make key judgments about complex facts in a range of situations;
  - ✦ The ability to deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and to communicate their conclusions clearly to specialist and non-specialist audiences including patients and the public;
  - ✦ The ability to be independent self-directed learners demonstrating originality in tackling and solving problems and acting autonomously in planning and implementing tasks at a professional level;
  - ✦ A comprehensive understanding of the strengths, weaknesses and opportunities for further development of Anatomic Pathology as applicable to their own clinical practice, research, innovation and service development which either directly or indirectly leads to improvements in clinical outcomes and scientific practice;
  - ✦ Conceptual understanding and advanced scholarship in their specialism that enables the graduate to critically evaluate current research and innovation methodologies and develop critiques of them and, where appropriate, propose new research questions and hypotheses;
  - ✦ Scientific and clinical leadership based on the continual advancement of their knowledge, skills and understanding through the independent learning required for continuing professional development.
5. Once registered as a specialist in Anatomic Pathology, a range of career development options will be available including sub-specialist training. Alternatively, others may opt to undertake further career development in post, as specialist, through structured Continuing Professional Development (CPD), provided by Accredited CPD providers. Specialist Pathologists who have successfully completed the STP AP will be eligible to compete for available Consultant positions in Anatomic Pathology.

The outcomes of the STP AP training are affiliated to the following curriculum outcome categories:

### **Category I: Scientific foundations**

**Goal 1:** Understand the normal structure and function of the human body, at levels from molecules to cells to organs, to the whole organism.

**Goal 2:** Understand the major pathological processes and their biological alterations.

**Goal 4:** Understand how the major pathologic processes affect the organ systems.

**Goal 5:** Integrate basic science and epidemiological knowledge with clinical reasoning.

**Goal 6:** Understand the principles of scientific method and evidence-based medicine including critical thinking.

### **Category II: Clinical Skills**

**Goal 7:** Obtain a sensitive, thorough medical history.

**Goal 8:** Perform a sensitive and accurate physical exam including mental state examination.

**Goal 9:** Establish and maintain appropriate therapeutic relationships with patients.

### **Category III: Communication and Interpersonal Skills**

**Goal 11:** Develop the knowledge, skills, and attitudes needed for culturally-competent care.

**Goal 12:** Participate in discussion and decision-making with patients and families.

**Goal 13:** Work effectively with other providers in the health system.

**Goal 14:** Clearly communicate medical information in spoken and written form.

### **Category IV: Prevention**

**Goal 15:** Develop knowledge, skills, and attitudes to practice the basic principles of prevention.

**Goal 16:** Practice personalized health planning for long-range goals.

**Goal 17:** Understand the planning for communities and populations.

### **Category V: Diagnosis**

**Goal 18:** Elicit and correctly interpret symptoms and signs of clinical conditions.

**Goal 19:** Diagnose and demonstrate basic understanding of common disease and conditions.

**Goal 20:** Appropriately use testing to help guide diagnostic and therapeutic decisions.

**Goal 21:** Demonstrate sound clinical reasoning.

### **Category VI: Treatment, Acute and Chronic.**

**Goal 22:** Understand therapeutic options and participate in the multidisciplinary care of patients with complex problems.

**Goal 23:** Recognize acute life-threatening medical problems and initiate appropriate care

**Goal 24:** Acquire the knowledge and skills necessary to assist in the management and rehabilitation of chronic diseases.

**Goal 25:** Participate in care in a variety of settings; including knowledge about palliative care.

### **Category VII: Patient Safety**

**Goal 26:** Identify and remove common sources of medical errors.

**Goal 27:** Understand and apply models of Quality Improvement.

**Goal 28:** Appreciate the challenges associated with reporting and disclosure.

### **Category VIII: Information Management**

**Goal 29:** Use information and educational technology to facilitate research, education, and patient care.

### **Category IX: Ethics, Humanities, and the Law**

**Goal 30:** Develop a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to diversity.

**Goal 31:** Develop a critical understanding of the multiple factors that affect the practice of medicine, public health and research.

**Goal 32:** Incorporate ethical principles in clinical practice and research.

### **Category X: Professionalism**

**Goal 33:** Develop healthy self-care behaviours and coping skills.

**Goal 34:** Model service to patients and community.

### **Category XI: Leadership & Management**

**Goal 35:** Develop interpersonal and communication skills that result in leadership in patient health service delivery and health human resource management.

## **ADMISSION CRITERIA TO THE SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY**

Applicants to the STP AP must possess a primary qualification in medicine, that is, Bachelor of Medicine and Bachelor of Surgery (MB ChB) or equivalent, from a recognized university. Additionally, they must have completed internship and retain full registration and a practising licence issued by the Health Professions Council of Zambia. Other Ministry of Health policies and directives, for example, completion of rural posting, may apply.

## **CURRICULUM DESIGN/MODEL OF THE SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY**

The STP AP Curriculum is a work and competence-based professional training situated in an accredited training facility managed by specialists in Anatomic Pathology with oversight by the Zambia College of Medicine and Surgery (ZACOMS) working through PAZ. This curriculum is based on a process model of curriculum and is designed to be flexible and open ended rather than predetermined; maximizing the potential for growth and development.

During the STP AP programme the specialty registrar is an integral member of the clinical work of the department in which they are training to gain the required experience and



competence. The STP AP programme is a work and competence-based professional training leading to the award of the Certificate of Completion of Specialty Training (CCST) by the Zambia College of Medicine and Surgery (ZACOMS). Graduates are then eligible to apply to the Health Professions Council of Zambia to enter the Specialist Register in Anatomic Pathology.

## TEACHING METHODS IN THE SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY

The STP AP training is a work and competence-based professional programme and should encompass diverse teaching and learning approaches that are appropriate for the target educational domain, i.e., cognitive (knowledge), psychomotor (practical), or affective (attitude) domain. The teaching methods may include, but not limited to, the following: expository lectures, tutorials, seminars, practical classes, skills laboratories, clinical demonstrations, clinical clerkships (bedside teaching, ward rounds, ambulatory care teaching, operating theatre experience, post-mortem, and on-call duties), field and community based learning, and ICT supported learning experiences.

The Health Professions Specialty Training Guidelines for Zambia and Zambia College of Medicine and Surgery Society Objectives and By-Laws provide detailed guidance to the trainee about the STP and ZACOMS, respectively.

## SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY CURRICULUM STRUCTURE AND MAP

Curriculum Map for the STP AP Programme

STP YEAR 1 PAT 1014	ARCP	STP YEAR 2 PAT 2014	ZACOMS PT 1 ARCP	STP YEAR 3 PAT 3014	ARCP	STP Year 4 PAT 4014	ZACOMS CCST Exams
Epidemiology, Biostatistics & Bioethics & Jurisprudence Courses (3 months)		Surgical Pathology II (3 months)		Surgical Pathology III (3 months)		Laboratory Management (3 months)	
Surgical-, Cyto-, Forensic-, & Autopsy-Pathology Courses (3 months)		Cytopathology II (3 months)		Cytopathology III (3 months)			
		Forensic Pathology II (3 months)		Forensic Pathology III (3 months)			

Laboratory Medicine Courses (Chemical Pathology, Microbiology, Haematology, Molecular Biology) (3 months)	Autopsy Pathology II (3 months)	Autopsy Pathology III (3 months)	Anatomic Pathology Rotation (3 months)
	Immunopathology I (3 months)	Immunopathology II (3 months)	Health Systems management, Health Management & Medical Education Courses (3 months)
		Research methods (3 months)	Leadership and management (3 months)
Part 1: Generic Education & Training (1 year)		Part 2: Themed & Specialist Education & Training (3 years)	

N.B. The total number of years, in particular, the themed specialist education and training may vary between different specialties.

1. ARCP = Annual Review of Competence Progression
2. CCST = Certificate of Completion of Specialty Training Examination;
3. STP = Specialty Training Programme;
4. ZACOMS PT 1 = Zambia College of Medicine and Surgery Part 1 Examinations in Basic Sciences, Behavioural Sciences, Health Population Studies, and Professionalism & Ethics; ZACOMS CCST Examinations = Certificate of Completion of Specialist Training in Anatomic Pathology Examinations

## ASSESSMENT IN THE SPECIALTY TRAINING PROGRAMME IN ANATOMIC PATHOLOGY

Progression to the next level of training is NOT automatic and is dependent on the trainee satisfying all the competency requirements of each defined level as per this curriculum

and learning guide. Progression is based on passing both clinical and written examinations. The assessment framework is designed to provide a coherent system of assessing both formative and summative assessment which are workplace based and in examination settings.

Each training site must ensure that they use valid, reliable and appropriate methods for assessing the knowledge, clinical skills and attitude domains. The continuous assessments and final annual assessments are weighted at 40% and 60% of the final mark of Annual Review of Competence Progression, respectively. Assessment methods may include, but are not limited to, the following: Log of experiences and procedures completed, case reports, portfolios, project reports, multiple choice questions, essay questions, short answer questions, modified essay questions, short and long cases, objective structured practical examinations (OSPE), practical examinations, and Viva Voce.

It is emphasized that marks from theory examinations **may not** compensate for poor scores in the practical examinations; Students **MUST** pass the practical examinations in order to progress to the next stage of training or completion.

Assessment	Knowledge, Skill and Attitude Domain	Examining Body
Formative Workplace Based Assessments	Outcome 1 & 2	Training Site
Annual Review of Competence Progression	Outcome 1 & 2	Training Site in conjunction with ZACOMS
ZACOMS Part 1 Examination	Outcome 1	ZACOMS
ZACOMS Certificate of Completion of Specialist Registration Examinations	Outcome 2	ZACOMS

A candidate shall be allowed a maximum of three attempts for ZACOMS Part 1 and/or Part 2 Examinations. Candidates must have submitted a completed log book to eligible to attempt the ZACOMS Part 2 Examination.

For ease of tracking progress and planning for Anatomic Pathology care, all STP AP trainees will be registered with ZACOMS and PAZ for the duration of their training.

### **Grading Scheme**

The STP AP Curriculum and Guide are the basis for all specialty training which contextualize the standards of proficiency set down by the Zambia College of Medicine

and Surgery (ZACOMS) in consultation with the Pathology Association of Zambia (PAZ) in a way that is accessible to the profession and the public. The Certificate of Completion of Specialist Training (CCST) is not graded. Separate assessments and examinations may be graded to show the level of achievement of the trainee in a particular course or assignment.

#### Assessment of Attainment of Competence in an Academic Subject

<b>Status &amp; Level</b>	<b>Description of Competence Features</b>	<b>% Range</b>
Outright Fail [D]	<ul style="list-style-type: none"> <li>• Has poor and inaccurate command of the subject vocabulary</li> <li>• Has poor and inaccurate command of the concepts (knowledge, skills and attitudes) of the subject across a broad range of topics.</li> </ul>	44.9% & Below
Bare Fail [D+]	<ul style="list-style-type: none"> <li>• Has the basics of subject vocabulary</li> <li>• Has the basics of concepts (knowledge, skills and attitudes) of the subject across a broad range of topics</li> <li>• Unable to transfer and apply knowledge, skills and attitudes of the subject in a range of situations.</li> <li>• Unable to exercise independent judgement in a range of situations</li> </ul>	45 – 49.9
Clear Pass [C]	<ul style="list-style-type: none"> <li>• Has sound command of subject vocabulary</li> <li>• Has sound command of concepts (knowledge, skills and attitudes) of the subject across a broad range of topics</li> <li>• Able to formulate responses and demonstrate skill and exhibit appropriate attitude in well-defined and abstract problems/professional settings across a broad range of topics of the subject</li> </ul>	50 – 64.9
Meritorious Pass [B]	<p>All of above in level 3 and:</p> <ul style="list-style-type: none"> <li>• Able to transfer and apply knowledge, skills and attitudes and exercise significant independent judgement in a broad range of topics of the subject</li> </ul>	65 – 74.9

Distinction Pass [A]	All of the above in level 4 and: • Displays masterly of complex and specialised areas of knowledge, skills and attitudes in a broad range of topics of the subject.	75% & Above
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## **ANATOMIC PATHOLOGY HANDBOOK & CURRICULUM**

The detailed STP Anatomic Pathology Handbook and Curriculum is presented in full in the next section.

### ANATOMIC PATHOLOGY HANDBOOK & CURRICULUM

#### **Time Allocation for Content**

In order to rationalize the time allocation for the various content including rotations that are covered in the curriculum the guidelines for the contact hours are provided below:

Number of weeks in a year	52
Number of weeks for holiday	4
Total teaching/learning weeks	48
Total hours in a week	40
Total hours/ per week 48 weeks (40x48)	1920
Total teaching/learning hours in 4 years	7680

For purposes of allocating time for the content, the unit system and duration in months has been used.

The units are derived as follows:

- 1 Unit - 16 hours of lectures or 32 hours of tutorials or 48 hours of practical or self-directed learning laboratory work

#### **5.4 Coding of content**

The coding of content in Anatomic pathology is presented as follows:

**AP** Refers to Anatomical pathology

**APG** Refers to generic content in anatomic pathology  
**APS** Refers to Surgical Pathology content  
**APR** Refers to Anatomic Pathology Rotational content  
**APF** Refers to Forensic pathology content  
**APA** Refers to Autopsy Pathology content  
**APC** Refers to Cytopathology content

**5.5 Table I: Curriculum Structure YEAR I**

	<b>Time Allocation</b>		
<b>CONTENT</b>	<b>CONTENT TITLE</b>	<b>MONTHS</b>	<b>UNITS</b>
<b>CODE</b>			
<b>COM 710</b>	Epidemiology & Biostatistics - generic		1
<b>COM 711</b>	Bioethics & Jurisprudence		1
<b>COM 712</b>	Information Technology		1
<b>COM 713</b>	Research Methods		1
<b>COM 714</b>	Health Management		1
<b>COM 715</b>	Introduction to Medical Education		1
<b>APS 710</b>	Surgical pathology I	4	16
<b>APC 710</b>	Cytopathology I	2	8
<b>APF 710</b>	Forensic pathology I		3
<b>APA 710</b>	Autopsy pathology I		3

<b>APG 710</b>	Introduction to Lab Medicine		3
<b>APG 711</b>	Principles of Molecular Biology		3
<b>APG 712</b>	Principles of Clinical Immunology		3
<b>APR 710</b>	Chemical Pathology	1	4
<b>APR 711</b>	Microbiology	1	4
<b>APR 712</b>	Haematology	1	4
	Total	9	57

## YEAR II

	Time Allocation		
CONTENT CODE	CONTENT TITLE	MONTHS	UNITS
<b>APS 720</b>	Surgical pathology II	4	16
<b>APC 720</b>	Cytopathology I	2	8
<b>APF 720</b>	Forensic pathology II	1	4
<b>APA 720</b>	Autopsy Pathology II	1	4
<b>APG 724</b>	Immunopathology I	2	8
	Part I Examination	1	4
<b>Total</b>		11	44

**YEAR III**

	<b>Time Allocation</b>		
<b>CONTENT CODE</b>	<b>CONTENT TITLE</b>	<b>MONTHS</b>	<b>UNITS</b>
<b>APC 730</b>	Surgical Pathology III	4	16
<b>APC 730</b>	Cytopathology III	1	4
<b>APF 730</b>	Forensic III	1	4
<b>APA 730</b>	Autopsy Pathology III	1	4
<b>APG 734</b>	Immunopathology II	2	8
<b>Total</b>		9	36

**YEAR IV**

	<b>Time Allocation</b>		
<b>CONTENT CODE</b>	<b>CONTENT TITLE</b>	<b>MONTHS</b>	<b>UNITS</b>



<b>APG 740</b>	Laboratory management	2	8
<b>APR 740</b>	Anatomic Pathology Rotation	3	12
<b>APR 742</b>	Part II Examination	1	4
<b>Total</b>		6	24

## 6.0 DESCRIPTION OF CONTENT

### YEAR I CONTENT

#### COM 710 EPIDEMIOLOGY & BIOSTATISTICS 1 UNIT

##### **Purpose**

The content is designed to enable the trainee to acquire knowledge and skills that are essential in managing health problems through the application of Epidemiology and Biostatistics.

##### **Objectives**

At the end of this, the trainee is expected to:

1. Explain the purpose and principles of epidemiology and its application in disease prevention and control.
2. Design simple epidemiological studies.
3. Apply the principles of epidemiology in health care research studies.
4. Explain the purpose of Biostatistics in research.
5. Describe the application of descriptive and inferential statistics in health research.
6. Use different sampling methods in health care research.
7. Analyze, interpret and present health care research data.

##### **Content**

Epidemiological concepts and principles: scope; variations in severity of disease and models of disease causation; Epidemiological aspect of infectious disease; including causes, types of epidemics, spread of infectious diseases, attack rates, investigation of epidemic etc; Disease determinant and descriptive epidemiology; Screening mechanisms; Design of simple epidemiological studies; Application of epidemiological principles in health care research. Purpose of biostatistics; Concepts of descriptive and inferential statistics; parametric and non- parametric statistics; types of statistics and concepts of probability including normal binomial; Poisson and Bayes Theorem; Sample

Selection and sampling methods: sample size, sampling methods, simple random, systematic, stratified and cluster; Data Analysis: confidence limits and confidence intervals, hypothesis, testing, statistical tests; z-score, students-test, chi-square test. Analysis, interpretation, and presentation of health care research data.

## **COM 711 BIOETHICS AND JURISPRUDENCE      1 UNIT**

### **Purpose**

The purpose of this content is to enable the trainee to get knowledge on the application of bioethics and jurisprudence in the management of patients and in conducting research.

### **Objectives**

At the end of this content, the trainee will be expected to:

1. Describe the laws and codes governing the practice of medicine.
2. Apply ethical principles in patient care and research.

### **Content**

Ethical principles and application in clinical practice; Legal medicine, sexual harassment, laws governing practice of medicine, notifiable disease, national and international codes; physicianship; Integrity; compassion, respect, availability, lifelong professional competence, continuing education.

Ethics; consent, patient requests, decisional capacity, patient impairment, surrogate decision maker, dying and death, privacy, withdrawal of treatment, substance abuse in colleagues, autonomy, beneficence, non-maleficence, justice, Physician-patient and Physician- colleague relationship, research ethics.

## **COM 712 INFORMATION TECHNOLOGY      1 UNIT**

### **Purpose**

The content is designed to provide the necessary information technology skills to the trainee to facilitate effective use of the computer for patient care, education and research.

### **Objectives**

At the end of this content the trainee will be expected to:

1. Apply the skills of computer technology in medical literature search, medical record keeping and retrieval.
2. Use computer technology to store and process research data.

### **Content**

File organization, hard disc storage and protection of information, word processing, spreadsheet, databases, and computer-based presentations; internet access, Medline, Cochrane database; Statistical curriculums, statistical tests, data entry, data cleaning, variables and coding.

## **COM 713 RESEARCH METHODS      1 UNIT**

### **Purpose**

This content is designed to enable trainee to acquire in knowledge and skills on principles and methods of conducting research in their areas of specialties. This content will also enable the trainee to understand the process of planning and development of research protocols for purposes of carrying out a research study.

### **Objectives**

At the end of the content the trainee will be able to:

1. Describe different types of research and their characteristics.
2. Explain the purposes and scope of research in health professions.
3. List the major steps in planning and developing a research proposal.
4. Describe various research designs and methodologies relevant to the various medical disciplines.

### **Content**

Concept of research and types of research including basic, applied, developmental and action research, characteristics of different types of research including qualitative and quantitative research; purposes of research in health professions and sources of information including primary and secondary sources; process of planning and development of research proposal including problem identification, review of literature, formulation of objectives/hypothesis, identification of research design and methodology, analysis of data and making conclusions.

### **Research designs**

Descriptive, historical, survey, analytical, explorative, correlation, causal comparative, cross sectional, evaluations, experimental design: single group design, one-shot case study, one pre-test post study, and control group design. Research methodology: Different types of research instruments; factors considered in selecting research instruments, types of research instruments including questionnaires, interview guides, document analysis, videotaping, methods of data analysis including appropriate statistics, ethical issues in health research, confidentiality, informed consent, procedure and process of ethical approval, International and National Guidelines in health research, components of research proposal including work plan and budget.

## **COM 714 HEALTH MANAGEMENT      1 UNIT**

## **Purpose**

The purpose of this content is to enable the trainee to acquire knowledge and skills on policy issues, planning process and management practices that are essential for effective management of health services.

## **Objectives**

At the end of this content the student will be able to: -

1. Describe national health policies and factors related to their development and implementation.
2. Assess systems for health resources development, allocation, use and sustainability.
3. Apply appropriate methods of economic appraisal in health care interventions.
4. Analyze and interpret health policies and strategies at different levels.
5. Formulate and develop health policy as a basis for planning and provision of health services.
6. List the major strategic development plan for a health system/institution.
7. Describe management functions and practices of a health manager.

## **Content**

National health policies and factors related to their development: policy formulation and analysis, interpretation and strategies for implementation; key actors and impacts of policy; Appropriate methods for economic appraisal in health care interventions; Monitoring and evaluation of health policy; emerging health policies; Process of formulating and developing health policy. Major steps in planning process, assessment of health systems for various functions;

Formulation of strategic development plans for health, appropriate methods for health systems and institutions. Management functions and practices of a health planner: providing leadership and managing people, managing work, operations and related resources, providing policy decisions and leadership, management of individual and institutional conflicts, management of change and organizational development, evaluating the effectiveness of individuals and institutions.

## **COM 715 INTRODUCTION TO MEDICAL EDUCATION     1 UNIT**

### **Purpose**

The purpose of this content is to enable the trainee to acquire essential knowledge and competence in relevant areas of medical education that will facilitate the learning process. The content will also enable the trainee to participate in planning and implementing teaching/learning activities for health professionals and other relevant target groups.

### **Objectives**

At the end of the content the trainee will be expected to:

1. Explain major factors considered in planning and developing educational programs in health professions
2. Describe various principles of teaching and learning with emphasis in health professions.
3. Explain the application of educational objectives in teaching and learning
4. Identify and describe the current models/approaches for planning, developing and implementing educational programs in health professions
5. Demonstrate ability to apply traditional and innovative teaching/learning methods in health professions.
6. Describe various assessment methods in health professions
7. Demonstrate ability to prepare and implement a lesson plan for classroom and clinical setting.

### **Content**

Health needs and problems, training needs availability and adequacy of required resources, technology, government and institutional policies, institutional SWOT analysis. Concepts of teaching and learning, principles of teaching and learning, principles of adult learning and experiential learning.

## **APS 710 SURGICAL PATHOLOGY I 4 MONTHS**

### **Purpose**

This content is designed to enable the trainee to acquire knowledge and skills in surgical pathology which is a specialty that deals with recognition and diagnosis of disease by gross and microscopic examination, including degenerative, inflammatory, neoplastic and autoimmune disorders. Surgical pathology rotations will be distributed throughout the four years of training. In the first year, general pathology, immunohistochemistry, immunofluorescence and routine laboratory techniques in surgical pathology is expected to be covered.

### **Objectives**

At the end of the content, the trainees will be expected to:

1. Acquire knowledge of basic gross anatomy skills, normal histology and histopathology
2. Demonstrate ability to make basic diagnosis and construct differential diagnoses in surgical cases based on gross and microscopic findings
3. Demonstrate application of knowledge of general pathologic processes
4. Understand principles of immunohistochemistry techniques and their application to anatomic pathology.
5. Integrate morphologic and immunohistochemistry data to make a pathologic diagnosis.
6. Understand principles of immunofluorescence stains and their application in anatomic pathology.

## **Content**

**General Pathology:** Cell reaction to injury; Inflammation; Healing and repair; Genetic disorders;

Congenital malformation and teratology; Degenerative disorders: calcification and amyloidosis; Congestion and oedema; Diseases of blood vessels, Hypertension; Thrombosis; Embolism and infarction, Iatrogenic diseases, Principles of fixation and staining; special techniques, surgical pathology (dissection), Disordered cell growth; Benign and malignant tumours: nomenclature and characteristics Carcinogenesis; Spread and effects of tumour; Epidemiology of tumours; Iatrogenic diseases.

**Immunohistochemistry (IHC):** – Basic principles of IHC, techniques and their applications to anatomic pathology; appropriate panel of antibodies for differential diagnosis of neoplastic diseases; collection, fixation and preparation of tissues for IHC; integration of morphologies and IHC data to make a pathologic diagnosis; interpretation of positive and negative IHC results and artefacts; prognostic factors detectable by IHC studies on paraffin sections.

## **Immunofluorescence**

### **Frozen sections**

### **Practical experience**

Introduction to procedures in surgical pathology laboratory, structured to emphasize on gross pathology and microscopy, emphasis will be maintained through second, third and fourth year by which time the trainees will progress in responsibility and in the complexity of cases and procedures assigned to them. Procedures including: tissue dissection, selection for processing, tissue processing, embedding techniques, microtomy and staining techniques.

### **Mode of learning**

Lectures / tutorials / clinicopathologic case presentations.

## **APC 710 CYTOPATHOLOGY I 2 MONTHS**

### **Purpose**

This content is designed to enable the trainee acquire core knowledge and skills in cytopathology for diagnosis, screening and monitoring of disease. In the first year, general principles in cytotechnology is expected to be covered.

### **Objectives**

At the end of the content the trainee will be expected to:

1. Demonstrate knowledge of minimal clinical data requirement in requisition forms for cytologic specimens.
2. Demonstrate knowledge and skills of specimen collection, preservation and staining techniques.
3. Demonstrate knowledge and skills of screening cytology slides and labelling abnormal cells
4. Demonstrate knowledge and skills of fine-needle aspiration techniques and be expected to obtain representative material from palpable lumps.
5. Identify a normal pap smear and evaluate deviations from normal.

### **Content**

History of cytology, Principles of Cytotechnology and Cytomorphology, Principles and application of techniques in staining. Laboratory techniques in diagnostic cytology; specimen collection and preservation, fixatives. Introduction to screening techniques. Special techniques in cytotechnology. Application of immunocytochemical techniques in diagnosis. Flow cytometry and its application to diagnosis. Use of autopsy material; use of fresh surgical material for quick assessment: frozen sections; tissue imprints; wet preparations; cell blocks. Exfoliative cytology. Fine needle aspiration biopsies. Application of Bethesda System terminology for reporting on gynaecologic cytopathology specimens, principles and application of human papilloma virus probe analysis, reporting of cytopathology specimens, (normal, reactive, infectious, dysplastic and neoplastic conditions, benign or malignant) and giving definitive diagnosis where applicable.

### **Mode of learning**

Lectures / tutorials / Practical

## **APF 710 FORENSIC PATHOLOGY I 3 UNITS**

### **Purpose**

The content is designed to enable the trainee acquire core knowledge that is essential in understanding and carrying out medico-legal investigation of death, which is important to the society, the individual, the legal and judicial systems in the carriage of justice. The trainee will be introduced to the intricacies of proper death certification after elucidating the manner and the cause of death and where possible assess the time of death.

This part of the content will cover aspects of medical jurisprudence, medical ethics and introduction to forensic autopsies. Theoretical as well as applied knowledge and technical skills will be taught.

### **Objectives**

At the end of the content, the trainee will be expected to:

1. Explain basic principles of a forensic autopsy
2. Explain basic legal aspects of a forensic autopsy
3. Understand legal nature and possession of the corpse, legal pre-requisites for autopsy and for collecting diagnostic, therapeutic and teaching material.

4. Understand the limitations, privileges, rights, obligations and ethics in medical practice.
5. Understand and interpret disease processes.
6. Explain various injury patterns related to specific incidents.

## **Content**

**Jurisprudence:** Relevant laws related to medical practice including medical evidence, role of the expert witness, science of proof and torts; Court visits by the trainees with the pathologist for selected court cases/procedures. Demonstration of knowledge of origin and divisions of law in respective country.

History of law, sources of law, formal and socio-economic sources, law and the state, the judiciary, the court system, establishment, composition and Jurisdiction, the judicial process, the civil process. The criminal trial, law and the individual; Elements of law, elements of the law of contracts, elements of law of Torts; relevant ACTS: Medical practitioners, Nurses, Pharmacy and Poisons, Public health, Science and Technology, Mental health, Children and Young persons, Human tissue, Anatomy, Research, Birth and Death registrations, Penal code.

**Medical Ethics:** Basic principles and origins of medical ethics, Ethical versus legal obligations in health care professions, conflict, Doctor patient relationship, informed consent, medical treatment without consent in emergency, confidentiality, medical malpractice and professional negligence, legally recognized medical procedures, Ethical codes, The Hippocratic oath, Declaration of Geneva of 1948 as Amended, International code of Medical Ethics of 1949, Declaration of Tokyo of 1975, Declaration of Oslo of 1970, Declaration of Helsinki of 1948 as amended.

## **Mode of learning**

Lectures/Tutorials/Observing, performing forensic autopsies, death certification and forensic report synthesis.

## **APA 710 AUTOPSY PATHOLOGY I 3 UNITS**

The content is designed to enable the trainees in Anatomic Pathology to acquire knowledge and skills in prosecution, gross pathology and microscopic pathology. The content will prepare the trainee to elicit the cause of death.

## **Objectives**

At the end of the content, the trainee will be expected to:

1. Acquire essential knowledge and skills in clinical autopsies and health and safety in post- mortem room



2. Observe the process of autopsy prosecution using routine techniques.
3. Perform at least five autopsies under supervision.
4. Understand the role of autopsy in hospital care by identifying various risks in new diagnostic and therapeutic activities.
5. Assist the family in assuagement of guilt and grief by providing accurate information on the disease process leading to death and risks of contagion.
6. Assist in genetic counselling in cases of familial, genetic disorder.
7. Understand the value of autopsy for the society in providing accurate statistics, identifying incipient epidemics of infectious diseases and clusters of occupational and environmental disease.
8. Understand the role of autopsies as a source of organs tissues for transplantation and assure their freedom from disease.
9. Appreciate the contribution of autopsy pathology in education and training of Physicians, medical students, pathology practice and research.

### **Content**

Hospitals administrative requirements for autopsy, permission prior to beginning the autopsy. Familiarization with laws regarding permission for autopsy; Classification of autopsies requiring medico-legal status and follow protocols for such cases; Review of clinical charts; Discussion of cases with physician who requested the autopsy, resolving points of clinical uncertainty; techniques such as Rokitansky-style organ removal, en bloc dissections, needle biopsies, aspirations of fluids and procurement of spinal fluid. Removal of brain and spinal cord without causing injury to either structures; Removal of epiglottis, tongue, inner and middle ears, Examination of leg veins, bones and joints; Identification of cases for which blood samples and vitreous eye fluid are required for biochemical tests;

Collection of samples appropriately; Recognition and acquisition of circumstances for which specimens (fluids and tissues) should be kept for toxicological studies; Description, weighing and taking appropriate sections for microscopy; Performance of two autopsies with assistance. Writing the report on autopsies according to an approved format within 21 days of completion of post-mortem examination.

## **APG 710 INTRODUCTION TO LABORATORY MEDICINE                      3 UNITS**

### **Purpose**

This content is designed to enable the trainee to acquire in depth insight into the scope and extent of anatomic pathology as a sub-specialty of laboratory medicine, and the critical importance of ethics in laboratory practice.

### **Objectives**

At the end of this content the trainee will be expected to:

1. Explain what constitutes Anatomic Pathology as a sub-specialty of pathology.

2. Acquire knowledge of the principles of pre-analytical specimen sampling, preservation and transportation.
3. Describe the broad principles of the laboratory analytical process and general laboratory organization.
4. Acquired knowledge of the various hazards associated with clinical laboratory practice and the relevant preventive measures.

### **Content**

The history of pathology, evaluation of anatomic pathology as distinct sub-specialty, samples and sampling in laboratory medicine, Specimen preservation, transport and storage, Hazards and safety procedures in laboratory medicine, Basic steps in the analytical process and the reporting procedure, Ethics in laboratory medicine.

### **Mode of learning**

Lectures, tutorials and practical.

## **APG 711 PRINCIPLES OF MOLECULAR BIOLOGY                      3 UNITS**

### **Purpose**

This content is designed to enable the trainee to acquire knowledge of the fundamental principles of molecular biology and their application in diagnostic pathology. The trainee will also acquire practical experience in the performance of molecular genetics, molecular oncologic and molecular pathogen detection and quantitation.

### **Objectives**

At the end of this content, the trainee will be expected to:

1. Acquire knowledge of clinical interpretation and physiological basis of nucleic acids based testing with emphasis on genetics, oncology and pathogen detection.
2. Acquire knowledge of the molecular basis of disease – with specific reference to some of the common diseases in the region.
3. Demonstrate ability to apply and interpret basic molecular techniques in disease diagnosis,
4. i.e. genetic diseases, molecular oncologic testing and molecular pathogen detection.
5. Demonstrate understanding of current advances in molecular therapeutics.
6. Understand the principles of quality control with emphasis on specific issues in nucleic acids based testing.
7. Explain measures of quality improvement, risk and cost effectiveness as they relate to molecular pathology.
8. Demonstrate ability to perform statistical analysis on descriptive statistics and probabilities.
9. Understand the role of a Pathologist as a clinical consultant in molecular genetics, molecular oncologic testing and molecular pathogen detection.

## **Content**

Molecular basis of Life: DNA and chromosome structure, replication, repair, regulation of gene expression, transgenic models, gene knockouts, RNA and transcription, processing post transcriptional regulation, MRNA, TRNA SNRNA, protein synthesis, structure, motifs, enzymology, proteomics, cellular regulation, cell cycle, cell signalling, signal transduction. Molecular basis of disease: Viral diseases with emphasis on HIV / AIDS and Hepatitis B, Bacterial infections with emphasis on Tuberculosis, Parasitic disease with emphasis on Malaria, Neoplastic disorders (familial polyposis, hereditary breast /ovarian carcinoma, haematolymphoid disorders)

**Molecular therapeutics:** Gene therapy, Nucleic acid therapeutics, antisense, oligonucleotides, ribosomes, aptamers, RNAi, immunotherapy, pharmacogenetics, molecular modelling.

**Practical experience:** Hands on exposure to all tests currently conducted in the laboratory and at other laboratories (extramural linkages) with emphasis on clinical relevance and appropriateness, principles of test methods, test interpretation, quality control.

**General techniques:** centrifugation, spectrophotometry, electrophoresis, chromatography.

**Protein techniques:** western blots, Elisa. Molecular biology techniques: DNA / RNA analysis, PCR based testing, post PCR analysis, PCR/RT gel electrophoresis, Southern, Northern blot, DNA separation and sequencing, DNA foot-printing, mutation detection, automated DNA extraction, karyotyping, fluorescence, in-situ hybridization, gene rearrangement performed by Southern blotting, genotyping studies in under-studied ethnic population, PCR-based cloning studies.

**Development of tests:** Technical development of new tests (“Home brew” or commercial kit). Validation of new test.

## **APG 714 PRINCIPLES OF CLINICAL IMMUNOLOGY      3 UNITS**

### **Purpose**

This content is designed to introduce trainees in Anatomic Pathology to immune system in health, components of immune system, the recognition of antigen and development of adaptive immune responses and lymphocyte repertoires.

### **Objectives**

At the end of the content the trainee will be expected to:

1. Describe the anatomical and physiological organization of the components of the immune system.
2. Demonstrate the ability to correlate structure and functions of components of the immune system.
3. Describe the mechanism by which the various immune system components are regulated (immune regulation).

### **Content**

Structure and organization of Lymphoid system, B cell development, Thymus and development of T. lymphocytes, Innate Immunity (cellular and humoral component), Adaptive Immunity, B cell antigen receptor, B cell activation, development and antibody production, Structure, function, variations and isotypes of immunoglobulins, Immunoglobulin genes, interaction with specific antigen, generation of diversity in the humoral immune response, FC receptor bearing accessory cells, complement system in humoral immunity, T cells: antigen recognition, ligands, the major histocompatibility complex of genes, polymorphism, T cell receptor gene rearrangement and receptor expression, production and properties of armed effector T cells, macrophages activation, cytokine actions and interactions as regulators of immune response, cellular collaboration, immune responses in normal individuals in the tropics. Immunoregulation: Central lymphoid tolerance, peripheral tolerance, apoptosis: clinical relevance. Cell-cell interactions: help/induction and suppression. Idio-type networks: inhibition and stimulation. Immune system nutrition. Neuro immunology: The role of the neuroendocrine axis in immunity.

### **Mode of learning**

Lectures, tutorials and practical experience, immunodiagnostic techniques.

## **APR 710 CHEMICAL PATHOLOGY AND TOXICOLOGY 1 MONTH**

### **Purpose**

The purpose of this content is to enable the trainees in Anatomic Pathology acquire basic knowledge on analytical techniques and instrumentation. The content will also enable the trainee to interpret basic biochemical investigations in screening, diagnosis and management of patients. The trainee will learn to correlate laboratory findings with gross and microscopic pathologic changes in cells, tissues and organs.

### **Objectives**

At the end of the content, the trainee will be expected to: -

1. Describe the analytical principles of various instrumentation relevant in biochemical analysis.

2. Explain the pathophysiology and describe the biochemical investigations relevant to important fluid and electrolyte disturbances and how these changes relate to pathologic findings in tissue and organs.
3. Describe the utility and limitations of enzymes in clinical diagnosis and their relevance in related organ pathology.
4. Perform quality control appropriate to chemical pathology, laboratory operation, post-mortem biochemistry and toxicology
5. Demonstrate ability to interpret results of biochemical investigations in patient management and in forensic and clinical autopsies.
6. Demonstrate knowledge of the principles of detection and qualification of common drugs and toxins in body fluids and its application in forensic pathology.

### **Content**

Flame emission photometry; spectrophotometry; atomic absorption photometry; fluorimetry; infra-red photometry; chromatography; electrophoresis; osmometry; mass spectrometry, immunoassays; electrochemistry; fluid and electrolyte disorders; acid – base disturbances; disorders of carbohydrate, lipid and protein metabolism; disorders of calcium, magnesium, phosphate and uric acid metabolism; diagnostic enzymology, toxicology.

### **Mode of learning**

Lectures /tutorials /practical and clinicopathologic case presentations

### **Practical experience**

The trainee will interact with chemical pathologists and biomedical scientists, and supervisors. He/ she will be involved in evaluation and clinical correlation of test results. The trainee's performance and progress will be monitored by the attending staff directly involved in the trainees' training.

## **APR 711 MICROBIOLOGY 1 MONTH**

### **Purpose**

This content is designed to enable the trainee in Anatomic Pathology to acquire basic knowledge and skills of the concept and principles of bacteriology, parasitology, virology and mycology. The trainee will be expected to apply the skills in understanding gross and microscopic pathologic changes in tissues and organs due to microbial diseases.

### **Objectives**

At the end of the content the trainee will be expected to:

1. Describe classification of common microbes, metabolism and physiology.
2. Explain and apply the principles of sterilization and disinfection.

3. Explain the principles and demonstrate ability in techniques used for specimen collection, transportation and processing in clinical microbiology and parasitology.
4. Demonstrate ability in the techniques used for common bacterial, viral, fungal and parasitic identification.
5. Analyse Pathogenesis of common infectious diseases.
6. Analyse Pathogenesis of common parasitic diseases.
7. Demonstrate knowledge of common bacterial, viral and fungal pathogens which cause particular diagnostic problems at autopsy.
8. Acquire skills and knowledge in methods of obtaining and handling post-mortem microbiology specimens.

### **Content**

Classification of microbes, anatomy of micro-organisms, Bacterial genetic and drug resistance; pathogenesis of microbial diseases; disinfection; sterilization; collection and handling of specimens; isolation and identification of pathogenic microbes; action of antimicrobial agents, antibiotic, sensitivity test performance; structure and classification of viruses, intracellular, replication of viruses, laboratory growth of viruses, immunity to viral infections; quality control. Safety in the laboratory and post-mortem room; staining techniques and microscopy; media and culture techniques; isolation and identification of common microbes, general properties of viruses; serology tests in virology, pathogenesis associated with common infectious diseases and associated gross and microscopic pathology.

### **Mode of learning**

Lectures /tutorials /practical /clinicopathologic case presentations.

## **APR 712 HAEMATOLOGY 1 MONTH**

### **Purpose**

The content is designed to enable the trainee in Anatomic Pathology to acquire basic knowledge and skills of principles and techniques for cell counting, haemoglobin measurements; coagulation screen and blood grouping. The trainee will also acquire knowledge of the various causes and clinical presentations of anaemia, coagulation disorders and transfusion reactions. He/she will learn to correlate various haematologic laboratory data with pathologic changes seen in tissues during surgical pathology, forensic and autopsy pathology.

### **Objectives**

At the end of the content, the trainee will be able to:

1. Explain the principles of instrument-based tests including red cells, white cells, platelets, red cell indices.

2. Demonstrate ability to evaluate blood cell morphology by examining peripheral blood smears, bone marrow aspiration and biopsies.
3. Interpret the investigations relevant to haematological disorders and correlate these findings to gross and microscopic tissue changes.
4. Describe the structure and function of haemopoietic and Lymphoreticular systems.
5. Explain pathology and pathophysiology of haematological disorders.
6. Interpret coagulation tests, serum and haemoglobin electrophoresis.

### **Content**

Quantitative blood cell counting, hemoglobin measurement; Interpretation of quantitative blood cell count; Fixation and staining of peripheral blood films and bone marrow aspirates; Full blood count, differential white cell count; Examination of bone marrow; Special stains; Osmotic fragility test, Coomb's test, Ham's test, Analysis of abnormal haemoglobins including haemoglobin electrophoresis, sickling test. Immunophenotyping of blood cells.

Flow cytometry principles and interpretation of this technique in the understanding of normal cell ontogeny and knowledge of more commonly used monoclonal antibodies. Protein electrophoresis and immunofixation. Principles of cytogenetic analysis. Origin and development of blood and blood forming tissues. Haemopoiesis and its regulation. The bone marrow and its examination. The erythrocyte and erythropoiesis. Leucocytes, reticuloendothelial system and the spleen. The lymphatic system and lymphopoiesis. Platelets, primary haemostasis and blood coagulation.

Approach to the patient with anaemia, classification of anaemias polycythaemia, erythrocytosis, porphyria's, haemostasis and bleeding disorders, disseminated intravascular coagulation, leukopenia, reactive and inflammatory, proliferation of white blood cells and nodes, neoplastic proliferation of white blood cells and nodes, plasma cell dyscrasia and related disorders, histiocytosis.

### **Mode of learning**

Lectures /tutorials /practical /clinicopathologic case presentations

### **Practical experience**

The trainee will work closely on the bench with the biomedical scientists looking at routine, peripheral blood films and those selected for variety, perform bone marrows under supervision of a Haematologist and interact with clinicians on day to day queries. The trainee will study cases where surgical biopsies/cytologic specimens have also been requested and correlate laboratory findings. The trainee will actively participate in the diagnostic daily work conference over multiple/ two headed microscopes.

The trainee's performance and progress will be monitored by the attending staff directly involved in the trainee's training.



## **YEAR II      CONTENT**

### **APS 720      SURGICAL PATHOLOGY II      6 MONTHS**

#### **Purpose**

The purpose of this content is the same as for surgical pathology I. The topics covered will include perinatal and paediatric pathology, gynaecological pathology, breast pathology, pulmonary pathology, gastrointestinal pathology, liver and biliary system and pathology of urinary bladder. Each of these broad areas have been given units to ensure that they are adequately covered during the period. The objectives for the various units are similar and therefore have not been repeated for each topic.

#### **Objectives**

At the end of this content, the trainee will be expected to:

1. Build upon knowledge and skills acquired in year I.
2. Make diagnosis and construct differential diagnosis in complex cases based on gross and microscopic findings
3. Develop skills in synthesizing comprehensive histopathology reports.
4. Demonstrate ability to perform frozen section techniques and interpretation.
5. Demonstrate ability to request relevant special and immuno-histochemical stains and make their interpretation.
6. Demonstrate application of knowledge of ultrastructural changes
7. Demonstrate knowledge of paediatrics and perinatal pathology
8. Demonstrate knowledge and skills in the subspecialties of surgical pathology.

### **ELECTRON MICROSCOPY      2 UNITS**

Electron microscopic techniques and their application to anatomic pathology. Integration of clinical, morphologic and ultrastructural data for making pathological diagnosis.

#### **Practical experience**

Electron microscopy application for pathologic diagnosis

#### **Mode of learning**

Lectures /tutorials /clinicopathologic case presentations.

### **PAEDIATRIC PATHOLOGY      2 UNITS**

#### **Content**

Grossing paediatric neoplasms, differential diagnosis of common paediatric lesions based on gross and microscopic findings. Congenital and developmental abnormalities, Inflammatory and Infectious diseases; Benign and Malignant tumours of childhood.



**Practical experience**

Trainees will be responsible for the interpretation of biopsies, frozen sections and the intraoperative management of paediatric cases under the supervision of senior pathologist.

**PERINATAL PATHOLOGY 2 UNITS****Content**

Perinatal autopsy techniques, synthesize clinical, gross and microscopic data into a cohesive oral and written autopsy report; Embryopathology, causes of wastage in pregnancy, later fetal loss, neonatal diseases, childhood tumours, infection both in utero and in early childhood, disorders of immunity, hereditary disorders, non-hereditary malformations and functional defects are emphasized; routine gross and microscopic placental pathology in fetal distress, birth asphyxia, meconium staining, suspected infection, maternal disease, normal twins or triplets or other multiple births. Electron microscopy of the selected placentas, gestational trophoblastic disease.

**GYNAECOLOGIC PATHOLOGY 2 UNITS****Content**

Normal anatomy, histology, cytology. Endocrinology of the menstrual cycle and pregnancy. Diseases of vulva, vagina, uterine cervix and endometrium. Diseases of myometrium, ovaries, fallopian tubes. Diseases of placenta and pregnancy related problems, infertility.

**Practical experience**

Gynaecological gross specimens and Pap smear evaluation is carried out throughout the content duration. Accurate and complete staging of gynaecological tumours is emphasized. This unit will cover diseases of female genital tract mainly through practicals, lectures and seminars.

**BREAST PATHOLOGY 2 UNITS****Content**

Applied anatomy, histology, cytology, inflammatory lesions of the breast, fibrocystic disease, benign and malignant tumours, diseases of male breast.

**Practical experience**

Breast biopsies/mastectomies are handled throughout the content. This unit will incorporate the core knowledge of breast diseases and evaluation of breast tissues through lectures/seminars and practicals. The trainee will be expected to learn fine needle aspiration techniques, stereotaxic techniques.

## **PULMONARY PATHOLOGY    2 UNITS**

### **Content**

Applied Anatomy, histology and cytology of the respiratory system, diseases of nose, nasal sinuses, nasopharynx, larynx and trachea, acute pulmonary infections, chronic obstructive airway disease, Bronchiectasis, chronic pulmonary infections, respiratory failure, pulmonary oedema, pulmonary vascular disease, pulmonary fibrosis, Pneumoconiosis and industrial lung diseases. Tumours of Bronchi, lungs and pleura.

### **Practical experience**

Evaluation of biopsies and cytologic specimens from the respiratory system and evaluation of lungs from autopsy material.

## **CARDIOVASCULAR SYSTEM   2 UNITS**

### **Content**

**Heart:** Introduction, normal anatomy, myocardial biopsy, congenital heart disease, cardiomyopathies, hypertensive heart disease and ischaemic heart disease, infective diseases of the heart, cardiac valves, heart transplant, coronary artery bypass, primary and secondary tumours. Diseases of blood vessels: arterio sclerosis, cystic and ventilio degeneration, fibromuscular dysplasia, mesenteric vascular occlusion, traumatic and iatrogenic injuries, thromboangiitis obliterans, arteritis, tumours, thrombophlebitis and thromboembolism, stasis ulcers, varicose veins, lymphedema pathology and treatment.

### **Practical experience**

Evaluation of surgical biopsies/specimens from cardiovascular system.

### **Mode of learning**

Lectures/ tutorials/ practicals/ clinicopathologic conferences.

## **GASTRO-INTESTINAL PATHOLOGY            2 UNITS**

### **Content**

**Oral cavity and oropharynx:** applied anatomy, histology and cytology, inflammatory diseases, non-neoplastic lesions, tumours and tumour-like lesions, tumours of odontogenic epithelium, tumours of melanocytes, tumours and tumour-like lesions of lymphoid tissue.

**Mandible and maxilla:** applied anatomy, histology, simple bone cyst, giant cell containing lesions, benign fibro-osseous lesions, epithelial cysts, odontogenic tumours, tumours and tumorlike conditions, disease of temporomandibular joint. Major and minor salivary glands: applied anatomy, heterotopia, inflammatory lesions, benign lymphoepithelial lesions, HIV related lesions, Mikulicz's disease, Sjogren's syndrome, irradiation effect, non-neoplastic lesions, tumours. Oesophagus: applied anatomy, histology, cytology, congenital malformations, achalasia and related muscular disorders, reflux oesophagitis, tumours and tumour-like conditions. Stomach: applied anatomy, histology, cytology, heterotopic pyloric stenosis, chronic gastritis, peptic and other benign ulcers of the stomach, non-neoplastic lesions, dysplasia, tumours and tumour-like conditions. Small intestine: applied anatomy, congenital defects, malabsorption, ulcers, vascular disease, Crohn's disease, AIDs-related inflammatory diseases, other inflammatory diseases, irradiation effect, intussusception, other non-neoplastic diseases, tumours of small intestine.

Large intestine: applied anatomy, Hirschsprung's disease and related disorders, diverticulitis colitis, other non-neoplastic lesions, tumours. Appendix: applied anatomy, acute appendicitis, chronic appendicitis, parasitosis and other inflammatory processes tumours.

### **Practical experience**

Evaluation of surgical biopsies from the gastrointestinal system.

## **LIVER AND BILIARY SYSTEM                      2 UNITS**

### **Content**

Liver: Normal anatomy, biopsy indications in non-neoplastic conditions, hepatitis, drug-induced liver disease, alcohol-induced liver disease, non-alcoholic steatosis, extrahepatic biliary obstruction, primary biliary cirrhosis, degenerative lesions, Granulomatous hepatitis, neonatal hepatitis and biliary atresia and parental nutrition in liver disease.

### **Practical experience**

Evaluation of surgical biopsies/specimens from liver and biliary system.

## **URINARY BLADDER AND URETHRA                      2 UNITS**

### **Content**

Applied anatomy, congenital abnormalities, diverticulosis, lithiasis, endometriosis, amyloidosis, cystitis, metaplastic conditions, tumour-like conditions, benign and malignant tumours.

### **Practical experience**

Evaluation of surgical specimens from urinary bladder and urethra.

## **APC 720 CYTOPATHOLOGY II      2 MONTHS**

### **Purpose**

This content is designed to enable the trainee acquire knowledge and skills in cytopathology for diagnosis, screening and monitoring of disease.

### **Objectives**

At the end of the content, the trainees will be expected to:

1. Integrate skills acquired in the first year of study.
2. Demonstrate knowledge and skills of microscopic diagnostic skills in all cytologic specimens.
3. Examine and formulate provisional/differential diagnosis on all trends of cytological material (Gynaecological and non-gynaecological)
4. Acquire knowledge of good principles and practices of laboratory practice.
5. Understand the role of internal and external quality control.

### **Content**

Cytomorphology of all human body systems with introduction to exfoliative, fluid and fine needle aspiration cytopathology; male and female reproductive systems; the respiratory system; the liver, the urinary tract, the pancreas and other endocrine organs, breast, salivary glands, skin, lymph nodes and bone marrow, and all body cavities: normal, reactive, benign and malignant changes and report writing.

### **Learning Experiences**

Lectures /tutorials/practicals.

**Consultation:** Most communication is by reports, trainees are encouraged to respond to inquiries about proper mechanisms for specimen collection and to participate in discussions with referring clinicians on difficult or interesting cases.

**Clinical Correlation:** Correlation with surgical pathology and prior cytopathology results is critical. Trainees actively participate in this process.

**Quality Assurance:** Trainees are expected to actively participate in the quality control and quality assurance aspects of the laboratory.

**Departmental Conferences:** Review conference of selected slide sets with laboratory personnel. These may also have surgical pathology correlation where applicable

**Interdepartmental Conferences:** Tumour board of cases, which include significant cytopathology input.

**Documentation:** The trainee will be required to document all cases he/she has handled and signed out with the pathologist throughout the training.

## **APF 720 FORENSIC PATHOLOGY II 1 MONTH**

### **Purpose**

The content is designed to enable the trainee in Anatomic Pathology to carry out medico-legal investigation of death under supervision. The trainee will develop skills to investigate death by dangerous drugs and chemicals, gunshots, suicide, homicides, accidents and industrial diseases. The trainee will also acquire knowledge of investigation of paternity disputes, rape, all forms of sexual assaults and interpretation of toxicological studies performed on sudden unexplained unnatural deaths. This part of the content will cover aspects of forensic pathology, forensic science and forensic medicine.

### **Objectives**

At the end of the content, the trainee will be expected to:

1. Demonstrate knowledge and understanding of forensic medicine
2. Demonstrate skills in provision of efficient and reliable service in injuries.
3. Demonstrate knowledge of disease processes
4. Interpret gross lesions in the living and the dead for benefit of clinicians and the courts.
5. Demonstrate the application of knowledge in the use of biological and forensic sciences in assessing the mechanism and cause of accidental, homicidal and suicidal deaths and reconstruction of the circumstances associated to deaths.
6. Synthesize and evaluate a detailed and comprehensive forensic autopsy report.

### **Content**

**Forensic Autopsy:** Perform medicolegal autopsies under supervision; Fundamentals of external examination of a body, proper certification of death without autopsy e.g. through view and grant examination); Elicitation of time of death and changes after death; Identification of Human remains.

Anatomical dissection, post-mortem examination, potential roles of autopsy, post-mortem changes, cooling, rigor mortis, lividity, putrefaction and decomposition, autopsy

procedures, external, internal examination, the perinatal autopsy, decomposed bodies, weights of organs. Special approach for medico-legal autopsy including checking for an embolism in suspected abortion death, checking for pneumothorax, demonstration of thrombi in the calves, reconstruction of skull for personal identification and determination of type of violence, removal of the jaws for dental identification, removal of the tongue, stomach contents for crystalline material, removal of spinal cord by anterior approach, fixation of brains, neck dissections, genital injuries, pelvic block, carotid angiography in neck blows, Autopsy Room Photography.

**Categories of medico-legal autopsies:** criminal abortions, decomposed bodies, sudden unexpected deaths in adults, trauma and disease, blunt force injury, sharp force injury, injury by gunfire, Ballistics. Thermal injuries, asphyxia, drowning, electrical and lightning injuries. The road traffic victim, Air crash investigation, mechanical injuries of brain and Meninges, explosions, investigation of deaths in child hood: Infanticide, sudden infant death syndrome, the Battered child; sex crimes, investigation of deaths from drug abuse.

**Scene Investigation:** Observation of selected techniques in ballistics, scene investigation from the point of preservation of evidence, with emphasis placed on the “custodial chain” of evidence, fingerprints, hair and fibre examination, questioned documents, and other relevant and related topics. Working with members of a team investigating particular problems which require the expertise of interrelated disciplines, such as engineering in automobile and aircraft accidents, psychiatry in suicide investigations, anaesthesiology in operating room deaths in hospitals, and radiation biology in deaths from therapeutic or accidental exposure to radioactive substances.

**Forensic Toxicology and Serology:** application of toxicology, analytical methodology, processing of current cases in the department. Familiarization with common drugs and toxic agents such as barbiturates, alcohol, carbon monoxide, lethal levels; proper removal and preservation of tissues and fluids derived from the autopsy for submission for maximum results in recovery and interpretation. Examination of dried stains, seminal fluid identification, elementary paternity testing, and methodology regarding liability for human blood group interpretation.

**Forensic Anthropology:** principles of osteology, identification of skeletal and dental remains relating to body parts, age, race, sex, and disease; investigation of mass disasters.

**Clinical Forensic Medicine:** Demonstration of knowledge of completion of medicolegal reports mainly on living patients in instances where legal proceedings may follow from an incident. Bodily harm and its forensic evaluation, (battered child and spouse syndrome, abuse of the elderly), sexual offences: genital and extragenital findings, sampling evidence documentation, abortions, poisons, masked administration of poisons, forensic alcoholology, drug abuse, medico- legal implication of mental disease and certification, decreased criminal responsibility due to mental illness (other diseases), attempted

suicide, human rights infringement e.g. torture and maltreatment; DNA profiling, paternity testing, seminal analysis.

### **Mode of learning**

This content will be covered through didactic lectures/ tutorials, performing forensic autopsies, analysis of toxins and poisons and other practical experiences.

Lectures/Tutorials/Practicals

**Consultation:** Interactions with law enforcement personnel and other professionals concerning the aspects of individual cases. Mutual discussions of findings both anatomic and analytic with the toxicologist.

**Clinical Correlation:** Integration of scene findings, forensic science data, toxicology data and autopsy results to prepare a final report.

**Quality Assurance:** Trainees are expected to actively participate in the quality control and quality assurance aspects of the laboratory.

Interdepartmental Conferences.

## **APA 720 AUTOPSY II     2 MONTHS**

### **Purpose**

The content is designed to enable the trainee in Anatomic pathology to acquire knowledge and skills in prosection, gross pathology and microscopic pathology. The content will enable the trainee to determine the cause of death, participate in morbidity and mortality conferences, clinical audit and research. The content will be organized mainly through performance of autopsy. Therefore, the content will be practically oriented in its implementation and the trainee will be expected to build upon the knowledge acquired in first year of study.

### **Objectives**

At the end of the content, the trainee will be able to:

1. Demonstrate ability in both adult and paediatric autopsy prosection using routine techniques (adult and paediatric autopsies),
2. Demonstrate ability in completing gross examination in a period of 3 hours for uncomplicated cases or 4 hours of gross examination for complicated cases.
3. Describe common abnormalities of diseased organs by gross and microscopic examination, including congenital, degenerative, inflammatory, neoplastic and autoimmune disorders.
4. Synthesize and make a provisional anatomic diagnostic report of autopsy findings within forty-eight (48) hours of completing the post mortem examination.
5. Demonstrate ability to make a final autopsy report in accordance to an approved format, within 21 days of completing the post mortem examination, including accurate and complete anatomic diagnoses, through gross and microscopic

- description and pertinent clinicopathologic correlations and mechanistic interpretations.
6. Make oral presentation of autopsy in a clear and concise manner.
  7. Perform six (6) brain removals and spinal cords, dissect after fixation to reveal specific pathology.

### **Content**

Presentation of patient's summary, pertinent clinical laboratory data, treatments; Demonstration of specific organ pathology; Responding to questions and giving clinical correlations. Determination of cause of death and making available a list of provisional diagnosis for patients' physician within 48 hours; Co-signing of provisional diagnosis by senior staff pathologist; Completion of comprehensive final report by the trainee when histologic slides and other investigations are made available; Fixation of brains in adequate volumes of 10% buffered formalin for at least 14 days; Cutting under pathologists supervision; Completion of six removals of brains and documentation of the procedure; participate in Brain Cutting Conference.

Taking standard sections of lesions in the brain for microscopy; Additional selection for special stains where appropriate. In cases involving the spinal cord, the extended cord is placed in 10% neutral formalin with anterior and posterior dura incised to allow adequate fixation. Discussion and recording of histological findings and making final diagnoses which is added to the autopsy report for the medical record. Saving of the brains for later use and teaching as part of museum specimen. Review of cases involving neurological diseases with neurosurgeons. Performance of perinatal autopsies by the trainees during autopsy rotation; Discussions with paediatricians during interdepartmental clinical pathological conferences.

### **Mode of learning**

Performing full adult, perinatal and paediatric autopsies; Writing complete autopsy reports with clinical correlations, Ensuring quality assurance; Participation in departmental conferences and documentation.

The trainee is expected to complete 30 autopsies with complete reports by end of the fourth year at least half of which should be completed by end of second year.

**Consultation:** Consultation between the trainees and physicians prior to the autopsy on clarification related to the autopsy, planning the autopsy approach and anticipation the need for special procedures. Communication of preliminary findings in the case to the referring physicians.

**Clinical Correlation:** Evaluation and synthesis of patient history and laboratory data with the autopsy findings for the final autopsy report.



**Quality Assurance:** Importance of quality assurance in autopsy and careful chart review for identification of clinically significant problems in patient care and management.

**APG 724      IMMUNOPATHOLOGY I      2 MONTHS**

**Purpose**

This content is designed to enable the trainee acquire the core knowledge necessary to understand immunopathogenesis of infectious diseases and hypersensitivity reactions, acquire knowledge of appropriate use of laboratory tests for prevention, diagnosis and treatment of immune mediated diseases.

**Objectives**

At the end of the content the trainee will be expected to:

1. Recognize and understand the host defenses against infection and pathogenesis of failure of host defenses.
2. Demonstrate ability to perform and interpret immunodiagnostic techniques relevant to infectious diseases, hypersensitivity reactions and immunodeficiency diseases.
3. Demonstrate ability to diagnose and manage allergic conditions in adults and children.
4. Demonstrate knowledge of new developments in therapy of allergic disease.
5. Demonstrate knowledge of diagnosis and management of immunodeficiency disorders in adults and children.
6. Demonstrate knowledge of manipulation of immune response and immunotherapeutics.

**Content**

Immune responses to infections: viral, bacterial, protozoal diseases, persistent infection in normal individuals, inherited immunodeficiency diseases, acquired deficiency diseases, pathogenesis management of immunodeficiency diseases, Immune response in absence of infection: hypersensitivity reactions, types, examples, diagnostic techniques and management, Detection of Immune responses: measurement and use of antibodies, study of lymphocytes, immunogenetics, analysing immune response in an intact organism, manipulation of immune response immunodiagnostics, immunotherapeutics, prophylaxis of infections in immunosuppressed patient, management of patients with HIV, scientific basis of therapy of primary immunodeficiency, immunomodulation, new developments in therapy.

**Mode of learning**

Lectures / tutorials, practical / case presentations / clinics.

## **YEAR III CONTENT**

### **APS 730      SURGICAL PATHOLOGY III      4 MONTHS**

#### **Purpose**

The purpose of this content is the same as in Year I and II. The areas covered are: Dermatopathology, neuromuscular pathology, renal pathology, soft tissue pathology, diseases of bone and cartilage, pathology of endocrine and exocrine system, pathology of male reproductive system, pathology of special organs, and diseases of Lympho-reticular system.

The units will be covered through lectures, tutorials, clinico-pathological conferences and evaluation of surgical specimens.

#### **Objectives**

At the end of the content the trainee will be expected to:

1. Demonstrate knowledge and skills in all subspecialties of surgical pathology
2. Demonstrate ability to write appropriate reports based on clinical, gross and microscopic findings from moderate to high complexity cases
3. Demonstrate ability to prepare and interpret frozen sections appropriately and orally communicate pathologic findings in a clear and useful manner
4. Demonstrate ability to participate in various clinical pathological conferences.

### **DERMATOPATHOLOGY      2 UNITS**

#### **Content**

Normal histology of skin, lesions involving the epidermis (Psoriasiform hyperplasia, vesicles, bullous lesions, atrophy). Disorders of melanocytes, vacuolation of the basement membrane, inflammatory conditions of papillary and reticular dermis, granulomatous inflammation, disorders of pilosebaceous unit, sweat glands, panniculitis, cysts, hyperplasia's and neoplasia.

#### **Practical experience**

Skin biopsies, dermatological pathology, inflammatory dermatoses. Immunofluorescence and other special procedures, patient examination at Dermatopathology rounds.

### **NEUROMUSCULAR PATHOLOGY      2 UNITS**

#### **Content**

Applied anatomy, cytology, histology of CNS and muscle and the reactions of CNS to disease, pathology of intracranial expanding lesions, Hydrocephalus, Head injury,

circulatory disturbances, bacterial infections, viral infections, misc. (inborn errors of metabolism, etc). Dementias, primary and secondary tumours, disease of spinal cord and peripheral nerves, diseases of muscle.

### **Practical experience**

Surgical specimens from CNS and muscle.

## **RENAL PATHOLOGY 2 UNITS**

### **Content**

Applied Anatomy, Histology, Cytology and Ultrastructure of kidneys. Acute and chronic renal failure, effects of hypertension, Glomerulonephritis, effects of diabetes mellitus, gout, Amyloidosis, Renal lesions in pregnancy, Interstitial nephritis, Drugs and chemicals, potassium deficiency, renal transplants and rejection, infections, tumours.

### **Practical experience**

Evaluation of renal biopsies utilizing clinical data, histology, ultrastructure and Immunofluorescence.

## **SOFT TISSUE PATHOLOGY 2 UNITS**

### **Content**

Normal anatomy, infections, tumour-like conditions, benign and malignant tumours, classification, special techniques in diagnosis, grading and staging of tumours, prognosis, therapy, pathogenesis.

### **Practical experience**

Surgical biopsies from soft tissues.

## **BONE AND CARTILAGE PATHOLOGY 2 UNITS**

### **Content**

**Bone:** Normal anatomy, metabolic diseases, fracture, osteomyelitis, bone necrosis, Paget's disease, osteoporosis, tumours and tumour-like conditions.

Joints and related structures – normal anatomy, non-neoplastic diseases, tumour and tumour like conditions.

### **Practical experience**

Surgical biopsies from bone and cartilage lesions.

Pathology of endocrine and exocrine system 2 units Content

**Pituitary:** Anatomy, hyperpituitarism, hypopituitarism, neoplasms.

**Thyroid gland:** Anatomy, hyperthyroidism, hypothyroidism, thyroiditis, Graves' disease, diffuse and multinodular non-toxic goitre, neoplasms.

**Parathyroid glands:** Anatomy, primary hyperparathyroidism, secondary hyperparathyroidism, neoplasms.

**Adrenal cortex:** Anatomy, developmental anomalies, hypo/hyper function, non-functional cortical neoplasms, other mass lesions of adrenal cortex.

**Adrenal medulla:** Anatomy, phaeochromocytoma, neuroblastoma, ganglioneuroma, tumours of extra-adrenal paraganglia (Paragangliomas).

**Pineal gland:** Anatomy, germ cell neoplasms, pineal parenchymal neoplasms

**Thymus:** Anatomy, thymic agenesis and hypoplasia, thymic hyperplasia, tumours.

### **Practical experience**

Surgical biopsies from these organs.

### **Mode of learning**

Lectures and seminars

## **PATHOLOGY OF MALE REPRODUCTIVE SYSTEM                    2 UNITS**

### **Content**

Prostate normal anatomy, nodular hyperplasia, infarct, prostatitis, calculi, tumour-like conditions of prostate and prostatic urethra, intraepithelial proliferative lesions, carcinoma and other tumours. Testis normal embryology and anatomy, cryptorchidism, atrophy and infertility, other non-neoplastic lesions, tumours. Testicular adnexa: Non-neoplastic lesions and tumours of the epididymis, diseases of spermatic cord and rete testis. Penis and scrotum: normal anatomy, non-neoplastic lesions tumours. Scrotum: normal anatomy, non-neoplastic lesions tumours.

### **Practical experience**

Surgical specimens from the prostate and testis.

## **PATHOLOGY OF SPECIAL ORGANS                    2 UNITS**

### **Content**

**Eyelids:** normal anatomy, developmental anomalies, inflammation, cysts, tumours and tumour-like lesions. Lacrimal passages inflammations, cysts, tumours. Lacrimal gland: Mikulicz's disease tumours. Orbit: dysthyroid ophthalmology, inflammatory processes, primary and secondary tumours.

**Conjunctiva:** Developmental anomalies, cysts, degeneration, graft – versus – host disease inflammations, tumours and tumour like conditions. Cornea: endothelial decompensation, fibrosis and vascularization, keratoconus, failed previous graft. Intraocular tissues: Developmental anomalies, trauma, inflammation, degenerations, tumour and tumour-like conditions. Ear: normal anatomy, diseases of external ear, disease of middle and inner ear.

### **Practical experience**

Evaluation of surgical specimens from the eye, ocular adnexa and ears.

## **LYMPHORETICULAR SYSTEM      2 UNITS**

### **Content**

**Lymph node:** applied anatomy, lymph node evaluation including immunophenotyping, EM. Chromosomal studies: Gene rearrangement analysis, DNA ploidy studies. primary immunodeficiencies; patterns of hyperplasia, inflammatory and hyperplastic diseases, malignant lymphoma, lymph node inclusions, other non –neoplastic lesions, tumours of dendritic cells and macrophages, vascular tumours and tumour-like conditions, metastatic tumours. Other primary tumours and tumour-like conditions.

**Spleen:** applied anatomy, biopsy and fine needle aspiration, rupture and splenectomy, congenital anomalies, cysts inflammation, hypersplenism, other non-neoplastic disorders, haematolymphoid tumours and tumour-like conditions, other primary tumour and tumour –like conditions, metastatic tumours.

**Bone marrow:** Biopsy procedure, processing of specimen, immunohistology, normocellular bone marrow, alterations in cellularity, osteopetrosis, bone marrow necrosis, inflammatory disorders, acquired immunodeficiency syndromes, leukaemia's and related disorders, non-Hodgkin's lymphoma, angioimmunoblastic lymphadenopathy lymphoma/leukaemia, Benign lymphocytic aggregates, Hodgkin's disease, histiocytic disorders, plasma cell dyscrasias, systemic polyclonal B-immunoblastic proliferation, systemic mastocytosis, metastatic diseases, lipid storage disease, bone marrow transplantation.

### **Practical experience**

Evaluation of Surgical biopsies from lymph nodes.

## **APC 730 CYTOPATHOLOGY YEAR III 1 MONTH**

### **Purpose**

This content is designed to enable the trainee to build upon the knowledge and skills already acquired in cytopathology for diagnosis, screening and monitoring of disease.

### **Objectives**

At the end of this content, the trainee will be expected to:

1. Perform fine-needle aspirates under ultrasound guidance from non-palpable lesions.
2. Compose a clear, concise cytopathology report for specimens from various body samples.
3. Demonstrate knowledge of ancillary techniques in cytopathology.
4. Teach and train junior trainees in skills pertaining to Cytopathology.

### **Content**

Cytopathology report writing for specimens from various commonly sampled body sites based upon the final diagnostic findings, recommend clinical follow-up. Principles of automated screening for gynaecologic cytopathology specimens. Performance of quality assurance, including the correlation of gynecologic and non-gynecologic cytopathology with surgical pathology.

### **Mode of learning**

Practicals /clinico-pathological conferences

## **APF 730 FORENSIC PATHOLOGY YEAR III 1 MONTH**

### **Purpose**

The content is designed to enable the trainee to acquire theoretical knowledge and skills in performing medico-legal autopsies.

### **Assessment**

Written and practical examination will be done at the completion of the content at the end of year 4.

## **APA 730 AUTOPSY YEAR III 1 MONTH**

### **Purpose**

This content is designed to enable the trainee in Anatomic pathology to perform autopsies with limited supervision. It will enable the trainee to acquire skills in prosection, gross pathology and microscopic pathology. This part of the content is entirely practical and the trainee will complete 50 autopsies by the end of the fourth year.

**Mode of learning**

Complete autopsies, compose reports, attend mortality and morbidity clinicopathologic conferences, teach and train mortuary assistants.

**APG 732 RESEARCH METHODOLOGY II, YEAR III 3 UNITS****Purpose**

The content is designed to enable the trainee to acquire knowledge on concepts, principles, research designs and methodology that are appropriate in conducting research in pathology. The content will also enable the trainee to understand the process of planning, designing and developing research protocols for conducting research, which addresses a particular problem relating to clinical and anatomic pathology.

**Objectives**

At the end of the content, the trainee will be expected to:

1. Assess critically reported research findings in their field of study.
2. Explain the purpose and scope of research in health sciences with particular emphasis in pathology.
3. Describe the major steps in planning and development of a research proposal.
4. Select and describe appropriate research designs and methodologies that are relevant in conducting research in a specific area of interest.
5. Demonstrate ability to identify a research problem, formulate a research proposal, set a work plan and a budget for research proposal.
6. Demonstrate ability to carry out a research in a medical discipline (anatomic pathology) and write a dissertation as a requirement for the award of M. Med in Anatomic pathology.

**Content**

Concept of research and types of research including basic, applied, developmental and action research. Characteristics of different types of research including qualitative and quantitative research; Purpose of research in health professions and source of information including primary and secondary sources. Process of planning and development of research proposal; Problem identification, Review of literature, Formulation of objectives/Hypothesis, Identification of research design and methodology, analysis of data and making conclusions, Research designs: Descriptive, historical, survey, analytical, explorative correlation, causal comparative, cross sectional evaluations, experimental design; single group design, e.g. one shot case study, one pretest – post-test and control group design.

**Research methodology:** different types of research instruments; factors considered in selecting research instruments; types of research instruments including questionnaires, interviews guides, document analysis, video-taping, methods of data collection including observation, interviewing methods of data analysis including appropriate statistics; Ethical issues in health research; confidentiality, informed consent; procedure and process of ethical approval, International and National Guidelines in health research, Components of research proposal including work plan and budget

## **APG 734      IMMUNOPATHOLOGY II, YEAR III   2 MONTHS**

### **Purpose**

This content is designed to enable the trainee to acquire the core fundamentals of applied immunopathology. This will enable the trainee in Anatomic Pathology advice and rationalize the use of appropriate laboratory tests for preventive, diagnostic and curative aspects of immune mediated conditions. The trainee will also acquire skills and knowledge of clinical and laboratory aspects of transplant immunology and immunology of neoplasia.

### **Objectives**

At the end of the content, the trainee will be expected to:

1. Demonstrate knowledge of appropriate use of curative agents utilized in immune mediated conditions in neoplasms and transplantation immunological set ups.
2. Demonstrate ability to provide comprehensive laboratory back-up and follow-up strategies for environment induced immune disorders.
3. Demonstrate ability to provide concise consultative support to other clinical disciplines in management of Immune mediated disease and vaccine development.
4. Develop protocols for hospital and community based preventive strategies in combating immune mediated diseases.
5. Demonstrate knowledge of diagnosis and management of autoimmune diseases and transplant rejection and its prevention.

### **Content**

**Autoimmune Disease:** Systemic diseases: Systemic lupus erythematosus, rheumatoid arthritis, Sjogren syndrome, systemic sclerosis, ankylosing spondylitis, vasculitis syndromes (Wegener's granulomatosis and others).

**Organ specific Diseases:** Immunologic renal diseases, Autoimmune thyroid disease, Diabetes and related autoimmune diseases, immunologic diseases of the gastrointestinal tract, Autoimmune liver disease, Myasthenia gravis, Immunologic disease involving the nervous system, Autoimmune blistering skin diseases, immune mediated infertility and abortion.



**Transplantation Immunology:** (major and minor histocompatibility complex), organ transplantation, Hematopoietic stem cell transplantation, Graft-versus Host reaction, Concept in choosing graft donor/ recipient, Immune tolerance/Graft rejection, prevention of rejection, renal biopsies from transplant patients, scientific basis of immunosuppression in transplant patient, complications.

**Immunology of Neoplasia:** Lymphoproliferative disorders - Acute lymphoblastic leukaemia, chronic lymphocytic leukaemia, lymphomas, monoclonal, gammopathies, virus induced T cell malignancies, immunophenotyping, Tumour immunology, tumour markers, tumour antigens, cancer immunotherapy. Laboratory diagnosis of Neoplastic diseases.

**Immunotoxicology:** drug or environmental induced immunodisorders.

**Immunoprophylaxis/vaccines:** Immunization of patients with immunodeficiency, Contraindications to immunization, Prevention of adverse reactions.

**Immunotherapy including Immunosuppressants:** Steroids, Azathioprine, Cyclophosphamide, Cyclosporin, Tacrolimus and other agents as they enter clinical use, immunoglobulin replacement, gene therapy, Immunomodulation: interleukins and interferon, monoclonal antibodies, colony stimulating factors, cytokines and their receptors, plasmapheresis: Indications, adverse reactions.

### **Mode of learning**

Lectures / tutorials / practicals / clinicopathological case studies, clinics.

## YEAR IV CONTENT

### **APG 740      LABORATORY MANAGEMENT      2 MONTHS**

#### **Purpose**

This content is designed to enable the trainees in Anatomic Pathology and Clinical pathology to acquire knowledge and skills in laboratory management, which include finance, human resource, laboratory design, equipment procurement, ethics in laboratory practice, computer skills and laboratory information systems.

#### **Objectives**

At the end of the content, the trainee will be able to:

1. Demonstrate the ability to provide effective leadership, direction and Management of pathology laboratory.
2. Undertake competent, fair and decisive decisions and management of laboratory staff.

3. Acquire essential knowledge and skills necessary for management and supervision of finances economically for high quality laboratory performance.
4. Demonstrate ability to develop and maintain budgetary policy guidelines for pathology department.
5. Draw up contracts and maintain sufficient supply chain for laboratory materials.
6. Demonstrate ability to rationalize staffing norms for the effective management of laboratory services.
7. Demonstrate ability to participate in laboratory design and selection of equipment for laboratory use.
8. Demonstrate ability to apply ethical policies as pertains to laboratory practice.
9. Demonstrate ability to use computer skills in laboratory data management.
10. Demonstrate ability to use laboratory information system for purposes of extraction and dissemination of laboratory information to the relevant departments.
11. Participate in internal and external quality assurance and control programs in laboratory management.

### **Content**

Introduction to the basic principles of management; laboratory personnel management; Procurement, Storage and dispensing of laboratory reagents; Accurate record-keeping of inventory and reagent stocks; Safety principles and practice; Interpersonal relationship; the role of the pathologist in the community. Basic skills in book-keeping and management of laboratory finances; laboratory organization. Histology/Cytopathology standards. National reference laboratories. Quality control, Quality assurance curriculums. Responding to emergencies and laboratory errors.

Develop policies on the retention and storage of pathological records and archives. Development of laboratory quality assurance, policy manual (to include retention and storage of documents, specimens, slides photographic transparencies, preventive maintenance and repair records, turnaround times for reports, requisition guidelines, specimen rejection, staffing, volumes, follow up mechanisms); Cost/benefit analysis of methods and instruments, Finance Management including budget contractual obligations and supplies; Local Labour Laws and Human resources.

Laboratory design and selection of equipment. Good laboratory practice, laboratory, ethics and laboratory information system. Total Quality Management of the laboratory activities. Interaction with hospital administration.

### **APR 740      ANATOMIC PATHOLOGY ROTATION      3 MONTHS**

#### **Purpose**

This rotation is designed to enable the trainee to select any one or two of the following core rotations (Surgical Pathology, Autopsy Pathology, Cytopathology and Forensic Pathology), in order to acquire more experience. The rotation will also help the trainee

complete the required number of forensic and clinical autopsies for progress examination results for M. Med Part II Examination.

### **Objectives**

At the end of the content, the trainee will be able to:

1. Perform the functions and roles of a junior consultant, with supervision.
2. Teach junior trainees and lead departmental and interdepartmental conferences.

### **Content**

Performance of functions and responsibilities of consultant pathologist under supervision.

### **Mode of learning**

The trainee will work as a junior consultant and sign out reports under supervision.

## **APR 74 ELECTIVE ROTATION 3 MONTHS**

### **Purpose**

This content is designed to enable the trainee to widen their experience in relevant areas of pathology in different settings, choose to do electives in an area of own interest or choose to do electives in a specialty, which may not be present at their institution.

### **Objectives**

At the end of this content, the trainee will be able to:

1. Broaden and acquire experience in postgraduate education and address areas of weaknesses.
2. Develop ability in other institutions to participate in planning and implementation of individual learning activities and experience.
3. Increase responsibility for self-determination, self-directed learning and creativity.
4. Have the ability to develop links with the other institutions.
5. Provide him with adequate time for self-study during the elective period

## **7.0 TEACHING AND LEARNING STRATEGIES/METHODS**

The implementation of the curriculum will utilize innovative learning strategies. Learning will occur predominantly as a result of the trainee's involvement as a member of a hierarchical team structure with Chair of pathology as head of the team and working together with the curriculum directors, consultant pathologists, laboratory manager, trainees and technical staff. Trainees will be given graded responsibility related to the acquisition of competence. They will be given the opportunity to take independent decisions commensurate with their level of competence. Formal accounting of their

actions by consultants will provide necessary feedback. The principles of adult learning will be a key component in the learning process. The trainees will take responsibility for their learning and develop critical thinking and reasoning in the process of learning.

Problem based learning, small group teaching and a few select guided overview lectures will be the main teaching and learning approaches.

Specifically, the following learning methods/ strategies will be used in the program: -

**Acquisition and development of technical competencies:** Specimen collection, Grossing specimens, processing, microtomy, staining. This will be on the bench training. Autopsies (clinical and forensic) will be performed by the trainee under supervision. Acquisition of knowledge, teaching/learning. The following methods will be used:

1. Core lectures
2. Seminars, workshops, conferences, Inter departmental/departmental.
3. Small group tutorials
4. Clinicopathological discussions
5. Presentation of research findings
6. Meetings on quality assurance
7. Morbidity and mortality meetings and audits
8. Journal club
9. Autopsy presentations
10. Information technology and Internet based teaching

## **8.0 ASSESSMENT OF TRAINEES**

The purpose of assessing the trainee is to collect information regarding acquisition of knowledge and skills for development of professional qualities. The assessment will involve both formative and summative assessment. A continuous as well as periodic evaluation and feedback process will be an essential and integral part of this training curriculum in order to make appropriate decisions regarding promotions to the next level, remedial work and discontinuation of student from the curriculum.

Autopsies and bench work in the histology / cytology section that involves staining of slides will form part of the formative assessment.

As a pre-requisite to qualify to sit for the Part I and Part II exam in Anatomical Pathology, Trainees will be expected to pass a formative assessment in autopsies, the date and time of which will be communicated at least a month before the Part I and Part II exam.

Each of the Common Content: Epidemiology & Biostatistics; Biomedical Ethics and Jurisprudence; Information & Communication Technology; Research Methods; Health Management and Introduction to Medical Education shall be treated as modules. Performance in

Modules shall be evaluated during the teaching-learning process and the entire curriculum period. Assessment of trainees shall be based on (a) application of knowledge in critical appraisal of literature at journal clubs and research project; ethical problems

encountered during patient care; use of on-line data in patient management and clinical audits; presentation of cases dealing with healthcare management issues; and teaching other trainees. (b) attendance (c) take away/sit-in assignments and/or projects deemed necessary and in fulfilment of the content objectives as stated in the curriculum.

High-order clinical skills, which includes the integration of clinical findings, investigations and management rapport and communication with patients in the clinical setting; and the application of research evidence in individual patient care are assessed across a range of clinical cases seen in the workplace. This assessment, together with evidence of constructive feedback will be clearly documented throughout the period of the program. Trainees must pass each component of the examinations separately.

### **8.1 Record of In-training evaluation (RITA)**

The resident will be evaluated at the end of each rotation and the record of evaluations will be maintained by the resident supervisor. The written reports and completed evaluation forms will be kept in the resident's personal file. Residents may review their file from time to time as need arises. The evaluations will assess practical skills, knowledge of subject, ability to synthesize reports, resident communication and interpersonal skills with patients and colleagues, acceptance of supervision, work ethic, patient-centred focus, understanding and application of socioeconomic principles in patient care. The assessment will focus on clinical knowledge and skills and also on professional qualities.

## **8.2 Types of Assessments**

### **8.2.1 Written Papers**

The trainees will be given multiple-choice questions or SAQS and ESSAYS at the end of each rotation. This will form part of objective based evaluation of knowledge of the subject.

### **8.2.2 Objective structured Practical Examination (OSPE )**

The trainees will have an OSPE examination at the end of each content. The objective structured practical examination is a reliable and practical method of evaluating practical skills of the trainees. The main components of the examination will be unknown Histology slides, cytopathology slides, and gross specimens' examination.

### **8.2.3 Log Book**

Log books will be used to monitor practical skill acquisition by the resident. The log book will be completed regularly and will document all practical activities that the resident should demonstrate competency in (e.g. FNA, Bone marrows, laboratory experience, clinical autopsies (adult and paediatric), forensic autopsies (adult and paediatric), tissue dissection, microscopy (surgical and cytology specimens) and rotations). It will be used to assess the overall training of the candidate and to determine deficiencies if any so that they may be corrected. The assigned supervisors will inspect and sign all entries. This

will enable educational supervisors keep track of competencies acquired form year 1 – 4. Remedial action will be taken for deficiencies in training.

### **8.3 Regulations for Part I Examination**

The examination will be taken at the end of the second year. In order to qualify for the examination, the trainee should have satisfactorily completed the pathology rotations. The examination will consist of:

**Component 1:** Multiple Choice Questions (MCQs)

**Component 2:** Short Answer Questions (SAQs)

**Component 3:** Practical consisting of: 15 H & E stained Histopathology slides, 10 cytopathology slides (5 gynaecology, 5 non- gynaecology) **Component 4:** Autopsy examination

### **8.4 Regulations for Part II Examination**

The Part II M. Med examination will be taken at the end of the fourth academic year. The candidate's dissertation should be subject to review as per guidelines of the respective training institutions. This shall be a prerequisite to sitting the Part II exam, but will be mandatory for award of the fellowship.

The candidate shall be allowed to sit the Examination only if the continuous in-training evaluation is satisfactory.

The examination will consist of the following parts:

**Component 1:** Multiple Choice Questions (MCQs)

**Component 2:** Short Answer Questions (SAQs )

**Component 3:** Practical consisting of: 20 H & E histopathology slides (more complex than Part I cases and inclusive of ancillary test interpretation), 10 cytology slides (5 gynae and 5 non-gynae)

**Component 4:** Autopsy examination

**Component 5:** Viva

### **8.5 Assessment of Project Report**

The candidate's project report will be subject to review as per guidelines of the respective training institutions.

## APPENDICES

### Instruction to Evaluator

When assessing competence at the end of each attachment and/or year of training, should use the following guide. Summaries will be used as the basis of the Record of In-training Assessment (RITA) performed six monthly.

<b>OBJECTIVE</b>	<b>GRADE A SATISFACTORY (Above 50%)</b>	<b>GRADE B NEEDS MORE TRAINING (Between 45 - 50%)</b>	<b>GRADE C UNSATISFACTORY OR NOT DONE ( Below 45% )</b>
<b>Knowledge (Clinical and core)</b>	Consistently demonstrates knowledge and understanding written and practical assessments 50% and above Consistently and safely	Some gaps in knowledge OR some exposure but requires more written and practical assessment 45 – 50% Has difficulty at times OR	Major deficiencies in knowledge OR not yet had opportunity to gain knowledge written and practical assessment below 45 % Major difficulty OR not
<b>Skills</b>	demonstrates appropriate skills	requires more training and experience	yet had sufficient training.

<b>Attitude and performance (generic skills)</b>	Consistently willing and/or able without supervision	Requires to pay more attention to specific areas, needs occasional supervision	Consistently unable, unaware of limitations, needs frequent/continuous supervision
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**TRAINEE EVALUATION FORM**

<p><b>Trainee Evaluation Form</b>  Name of trainee:  Signature of Trainee:    Date:    Name of supervisor:    Date:  Date of attachment:    From:                      To:    Year of training  (Please circle) 1    2    3    4    5    6</p>			
<b>KNOWLEDGE OF SUBJECT</b>	<b>A=satisfactory</b>	<b>B=Needs more Training</b>	<b>C=Not Satisfactory</b>
1	Written assessments		
2	Practical assessments		
3	Clinical examination		
<b>COMMUNICATION AND ATTITUDES</b>			
4	Verbal Communication with patients, relatives staff and others		



5	Written case notes, letters and reports		
<b>SUPERVISION OF JUNIOR STAFF</b>			
6	Supervision of junior staff		
<b>COMPUTING AND USE OF LIBRARY</b>			
7	Word processing		
8	Data bases		
9	Graphics		
10	Statistical tests		
11	Use of library and film		
12	Technology		
<b>ETHICAL AND LEGAL ISSUES</b>			
13	Ethical issues affecting		
14	Patients, families and communities		
15	Legal procedures		

## INDICATIVE RESOURCES

### **SURGICAL PATHOLOGY**

1. Rosai: Ackerman's surgical Pathology, 2004 edition
2. Kumar and Robbins: Pathologic basis of disease, 6th edition
3. J.R. Anderson: MUIR'S textbook of Pathology, 14th edition.
4. Surgical Pathology – Sternberg, 2004 edition.
5. Stocker JT, Dehner LP (Eds): Pediatric Pathology, 2nd Ed., Lippincott-Williams & Wilkins, Philadelphia, 2001
6. Burger PC, Scheithauer BW, Vogel FS: Surgical Pathology of the Nervous System and Its Coverings, Edition 4, WB Saunders, Philadelphia, 2002
7. Underwood JCE: Introduction to Biopsy Interpretation & Surgical Pathology, 2nd Edition, Springer-Verlag, New York, 1987.
8. Hruban RH, Westra WH, Phelps TH, Isacson C: Surgical Pathology Dissection: An Illustrated Guide. Springer-Verlag, New York, 1996.
9. Lester SC: Manual of Surgical Pathology, Churchill-Livingstone, NY, 2001
10. Dabbs DJ: Diagnostic Immunohistochemistry, Churchill-Livingstone, New York, 2002.
11. Dickersin GR: Diagnostic Electron Microscopy: A Text-Atlas, IgCOPECSA-Shoin, New York, 1998
12. WHO. World Health Organization.
13. International Histological Classification of Tumours – the whole series.

### **CYTOPATHOLOGY**

1. Diagnostic cytology – Leopold Koss
2. Comprehensive cytology – Marluce Bibbo

3. Atkinson B (Ed): Atlas of Diagnostic Cytopathology, WB Saunders, Philadelphia, 2nd Edition, 2003.
4. Cibas ES and Ducatman BS: Cytology: Diagnostic Principles and Clinical Correlates, WB Saunders, Edinburgh, 2nd Edition, 2003
5. DeMay RM: Practical Principles of Cytopathology, ASCP Press, Chicago, 1999.
6. DeMay RM: The Art & Science of Cytopathology, ASCP Press, Chicago, 1996.
7. McKee GT: Cytopathology, Mosby-Wolfe, London, 1997.
8. Ramzy I (Ed): Clinical Cytopathology & Aspiration Biopsy: Fundamental Principles & Practice, 2nd Edition, Appleton & Lange, Norwalk, CT, 2000.

### **FORENSIC PATHOLOGY**

1. Knight B (Ed): Simpson's Forensic Medicine, 11th Ed., Edward Arnold, London, 1997.
2. Bronstein DA: Law for the Expert Witness, Lewis Publishers, Boca Raton, FL, 1993.

### **AUTOPSY PATHOLOGY**

1. Rutty GN: Essentials of Autopsy Practice, Springer-Verlag, New York, 2002.
2. Ludwig J: Handbook of Autopsy Practice, 3rd Ed., Humana Press, Wotawa, NJ, 2002.
3. Prayson R: Neuropathology Review, Human Press, Wotawa, NJ, 2001.

### **IMMUNOLOGY**

1. Janeway's Trevers: Immunobiology, 2004 edition.

### **MOLECULAR PATHOLOGY**

1. Ross DW: Introduction to Molecular Medicine, Springer-Verlag, New York, 2002.
2. Tsongalis GJ, Coleman WB: Molecular Diagnostics. A training & Study Guide. AACC Press, Washington, DC, 2002.
3. Leonard DGB: Diagnostic Molecular Pathology. W.B. Saunders, Philadelphia, 2003.
4. Gospodarowicz MK, et al. (Eds): Prognostic Factors in Cancer (2nd Ed.), Wiley-Liss, and New York, 2001.
5. Erlandson RA: Diagnostic Transmission Electron Microscopy of Tumours, Raven Press, New York, 1994.
6. Vogelstein B, Kinzler KW: The Genetic Basis of Human Cancer, McGraw-Hill, New York, 1998.

### **LABORATORY MANAGEMENT**

1. Bozzo P: Cost-Effective Laboratory Management, Lippincott-Williams & Wilkins, Philadelphia, 1998.

### **JOURNALS FOR ANATOMICAL PATHOLOGY**

1. Histopathology
2. American Journal of Surgical Pathology
3. Mod. Pathology
4. Applied Immunohistochemistry
5. Human Pathology
6. Cancer
7. Journal of Clinical oncology
8. Cell Biology
9. Arch pathol. Lab Med.
10. American Journal of Clinical Pathology
11. Diagnostic molecular Pathology
12. Diagnostic cytopathology
13. Ultrastructural Pathology
14. American Journal of Kidney disease.