آغا خان یونیورسٹی

THE AGA KHAN UNIVERSITY

DEPARTMENT OF PATHOLOGY & LABORATORY MEDICINE

RESIDENT'S MANUAL

2024

Foreword

Pathology is a dynamic field encompassing various subspecialties such as Clinical Chemistry, Haematology, Histopathology, Microbiology and Molecular Pathology. This field has a great role in patient management as it involves diagnostic techniques, advice on patients' management and, where appropriate, provision of bedside patient care. In addition there are a lot of research and training opportunities in this field. The goal of the AKU pathology residency program is to produce knowledgeable, skilled, professional, and competent specialists. This goal is achieved through provision of a comprehensive experience in the identification of abnormalities, an understanding of disease mechanisms and provision of skills. The program moreover has an emphasis on how to teach peers and juniors and how to interact effectively with treating physicians.

The pathology residency-training program at Aga Khan University (AKU) started in 1988 with the induction of two residents and Dr. Rashida Ahmed was the first graduate of this program. The current strength of residents in 2024 is 33 and to date 135 residents have successfully graduated from this program. This program has been highly successful as the passing percentage of FCPS candidates is high. This program is acknowledged both at national and international level. Many of our graduates are placed as faculty at AKU, other teaching hospitals in Pakistan as well as in other countries. So this residency program is not only catering to the needs of AKU but also serving national and international demands.

This program has been very fortunate in having visionary leadership in its initial period. Dr. Naila Kayani (Residency Director, 1993-2000) developed most of the processes that are still applicable and Dr. Ghulam Nabi Kakepoto (Residency Director, 2000-2004) had taken it to the next level. From 2004 to 2015, Dr Imran Siddiqi led this program with greatest efficiency and dedication. In May 2015, Dr Aysha Habib Khan was appointed as an acting program director. Dr. Kauser Jabeen was appointed as Director Pathology Residency Programs in April 2016. Since then each Pathology residency program has their independent directors and associate program directors with the overall insight provided by Director Pathology Residency Programs. Currently, Dr. Romana Idrees is the Director residency programs, appointed in April 2023. A departmental residency committee (DRC) meets regularly and looks after the issues of residents. It has representation from all the sectional directors and coordinators.

Provision of such training is an enormous task and requires an updated training manual. In the preparation of this manual, sectional directors and coordinators played a major role. Other noteworthy mentions are the departmental education faculty and administrative staff. We hope that residents will find this manual very useful and informative in day-to-day work.

Dr. Erum Khan
Professor and Chairperson
Dept. of Pathology & Laboratory Medicine

Dr. Kauser Jabeen
Professor and Vice Chair, Education
Dept. of Pathology & Laboratory Medicine

Dr. Romana Idrees
Associate Professor
Director, Pathology Residency Programs

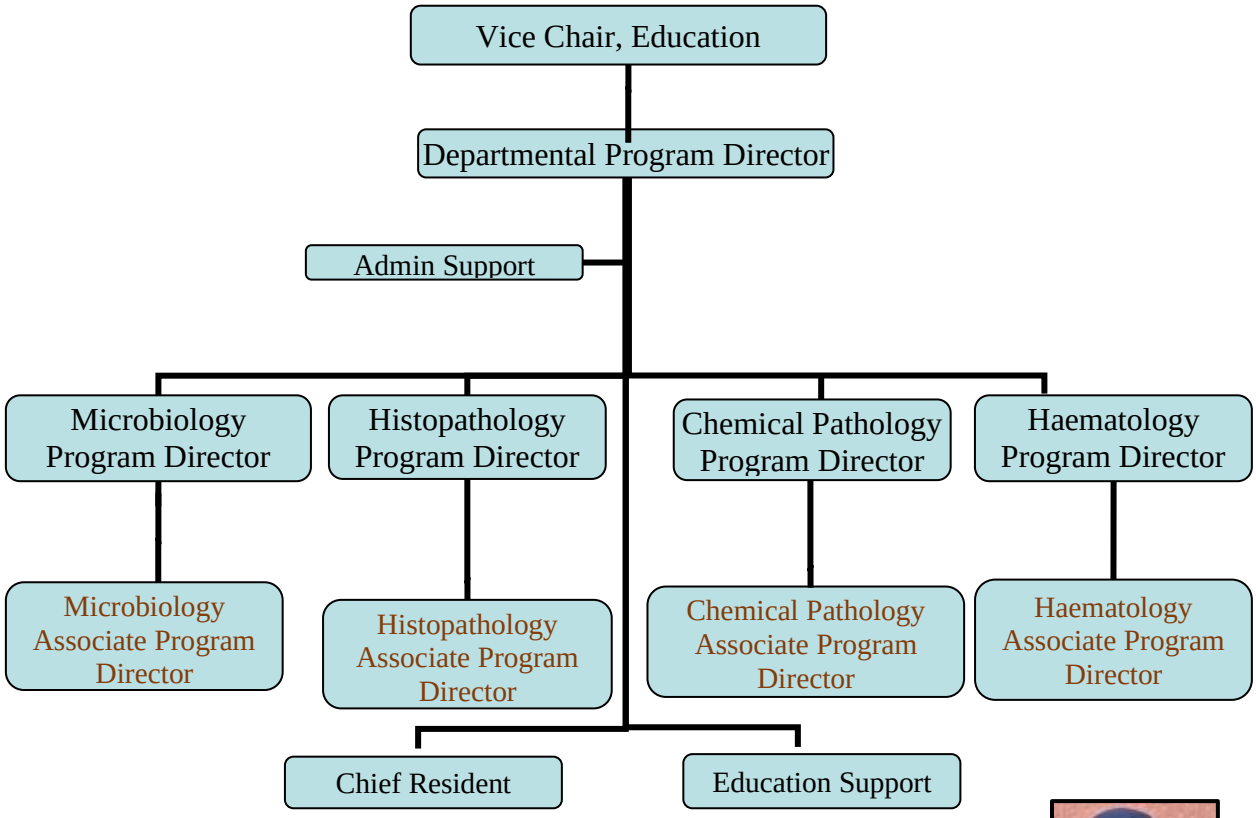
Table of Contents

LIST OF CURRENT FACULTIES

Dr. Erum Khan	Professor & Chair, Dept. of Pathology & Laboratory Medicine
Dr. Kausar Jabeen	Professor & Vice Chair, Education Dept. of Pathology & Laboratory Medicine
Dr. Najia Ghanchi	Associate Professor & Vice Chair, Research Dept. of Pathology & Laboratory Medicine
Histopathology	
Dr. Shahid Pervez	Professor
Dr. Naila Kayani	Professor
Dr. Rashida Ahmed	Professor
Dr. Romana Idrees	Associate Professor, Director Departmental Pathology Residency Programs
Dr. Saira Fatima	Associate Professor
Dr. Nasir Ud Din	Associate Professor
Dr. Aisha Hassan Memon	Assistant Professor
Dr. Mohammad Khurram Minhas	Assistant Professor
Dr. Zeeshanuddin	Assistant Professor
Dr. Syeda Samia Fatima	Assistant Professor
Dr. Sidra Arshad	Assistant Professor
Dr. Muhammad Arif	Lecturer
Dr. Sarosh Moeen	Senior Instructor & Residency Program Director
Dr. Zoonish Ashfaq	Senior Instructor
Dr. Tamana Asghari	Senior Instructor
Dr. Madiha Bilal Qureshi	Faculty
Dr. Hania Naveed	Faculty
Chemical Pathology	
Dr. Imran Siddiqui	Professor
Dr. Aysha Habib Khan	Professor
Dr. Lena Jafri	Associate Professor & Section Head
Dr. Hafsa Majid	Assistant Professor & Residency Program Director
Dr. Sibtain Ahmed	Assistant Professor & Residency Associate Program Director

Haematology & Transfusion Medicine	
Dr. Salman Naseem Adil	Professor
Dr. Bushra Moiz	Professor
Dr. Mohammad Usman Shaikh	Clinical Professor
Dr. Natasha Bahadur Ali	Associate Professor
Dr. Muhammad Shariq	Associate Professor & Section Head
Dr. Muhammad Hasan Hayat	Assistant Professor & Residency Program Director
Dr. Sana Brohi	Faculty
Microbiology	
Dr. Erum Khan	Professor
Dr. Afia Zafar	Professor
Dr. Kauser Jabeen	Professor
Dr. Rumina Hasan	Professor
Dr. Mohammad Asim Beg	Professor
Dr. Seema Irfan	Professor & Residency Program Director
Dr. Sadia Shakoor	Associate Professor
Dr. Najia Bano Ghanchi	Associate Professor
Dr. Imran Ahmed	Assistant Professor
Dr. Syed Muhammad Zeeshan	Assistant Professor & Residency Associate Program Director
Dr. Joveria Farooqi	Assistant Professor & Section Head
Dr. Kiran Iqbal	Assistant Professor
Molecular Pathology	
Dr. Zahra Hasan	Professor
Dr. Tariq Moatter	Professor
Dr. Zeeshan Ansar	Assistant Professor & Section Head
Dr. Asghar Nasir	Assistant Professor
Forensic Medicine	
Dr. Mustafa Aslam	Senior Instructor
Pathology and Lab Medicine & Educational Development	
Dr. Javeria Rehman	Senior Instructor

ADMINISTRATIVE STRUCTURE



Vice Chair, Education Dr. Kausar Jabeen

Department Programs Director Dr. Romana Idrees

Program Directors:

Haematology Dr. Hasan Hayat

Histopathology Dr. Sarosh Moeen

Chemical Pathology	Dr. Hafsa Majid	
Microbiology	Dr. Seema Irfan	

Associate Program Directors:

Haematology	-	
Histopathology	Dr. Madiha Bilal Qureshi	
Chemical Pathology	Dr. Sibtain Ahmed	
Microbiology	Dr. Mohammad Zeeshan	
Molecular Pathology	Dr. Zeeshan Ansar	
Educational Representative	Dr. Javeria Rehman	
Manager	Ms. Shamsha Punjwani	
Chief Resident	Dr. Ali Raza Nasir	
Administrative Staff	Ms. Afshan Sohail	

RESIDENTS' APPRECIATION EVENTS
2023

2022

2021

LIST OF APPROVED CPSP SUPERVISORS

Histopathology	
Dr. Shahid Pervez	Professor
Dr. Naila Kayani	Professor
Dr. Rashida Ahmed	Professor
Dr. Romana Idrees	Associate Professor, Director Departmental Residency Programs
Dr. Saira Fatima	Associate Professor
Dr. Khurram Minhas	Assistant Professor
Chemical Pathology	
Dr. Imran Siddiqui	Professor
Dr. Aysha Habib Khan	Professor
Dr. Lena Jafri	Associate Professor & Section Head
Dr. Hafsa Majid	Assistant Professor & Residency Program Director
Haematology & Transfusion Medicine	
Dr. Salman Naseem Adil	Professor
Dr. Bushra Moiz	Professor
Dr. Natasha Bahadur Ali	Associate Professor
Dr. Usman Shaikh	Clinical Professor
Microbiology	
Dr. Erum Khan	Professor & Chair, Dept. of Pathology & Lab Medicine
Dr. Kauser Jabeen	Professor & Vice Chair, Education
Dr. Afia Zafar	Professor
Dr. Seema Irfan	Professor & Residency Program Director
Dr. Rumina Hasan	Professor
Dr. Syed Muhammad Zeeshan	Assistant Professor

GRADUATES FROM PATHOLOGY
Residency Programme (1991-2023)

Year	Graduates	Sections	Current Status
1991	**Dr. Rashida Ahmed**	Histopathology	Professor, AKU
1992	**Dr. Naveen Faridi**	Histopathology	Histopathologist, LNH
1995	**Dr. Suhail Muzaffar**	Histopathology	Consultant Histopathologist, UK
1996	**Dr. Imran Siddiqui**	Chemical Pathology	Professor, AKU
1996	**Dr. Salman N. Adil**	Hematology	Professor, AKU
1997	**Dr. Erum Khan**	Microbiology	Professor & Chair, Dept. of Pathology & Lab Medicine, AKU
1998	**Dr. Shaheena Ehsanullah**	Hematology	Consultant in Saudi Arabia
1999	**Dr. Khalida Naseem**	Microbiology	Consultant in Canada
1999	**Dr. Gulnaz Khaliq**	Hematology	Head Hematology, Abbasi Shaheed Hospital
1999	**Dr. Shahid Siddiqui**	Histopathology	Consultant Histopathologist, UK
1999	**Dr. Aysha H Khan**	Chemical Pathology	Professor, AKU
2000	**Dr. Usman Shaikh**	Hematology	Clinical Professor, AKU
2000	**Dr. Zubair Ahmed**	Histopathology	Consultant in Oman
2001	**Dr. Maryam Moosa**	Histopathology	Trainee MRCPath, UK
2002	**Dr. Salman Arain**	Hematology	Pathologist, Stat Lab Hyderabad, AKU
2002	**Dr. Fareena Bilwani**	Hematology	Assistant Professor, AKU
2002	**Dr. Khorrum Essa Abullah**	Histopathology	Consultant in UK
2002	**Dr. M. Nadeem Khan**	Histopathology	Consultant in Saudi Arabia
2002	**Dr. Nousheen Yaqoob**	Histopathology	Consultant in Oman
2003	**Dr. Najmus Sehar Azad**	Histopathology	Consultant in Nottingham, UK
2003	**Dr. Seema Irfan**	Microbiology	Professor, AKU
2003	**Dr. Kausar Jabeen**	Microbiology	Professor & Vice Chair, Dept. of Pathology & Lab Medicine, AKU
2003	**Dr. Raihan Sajid**	Hematology	Consultant in Saudi Arabia
2004	**Dr. Rehana Yunus**	Histopathology	USA doing PHD
2004	**Dr. Nasim Sabir**	Microbiology	Consultant in Dubai
2005	**Dr. Hamidullah Shah**	Histopathology	Lady Reading Hospital Peshawar
2005	**Dr. Romana Idress**	Histopathology	Associate Professor, AKU
2005	**Dr. Nazish Gul**	Microbiology	Canada
2005	**Dr. Amna Khurshid**	Histopathology	Associate Professor in LNH

2005	**Dr. Safoorah Khalid**	Hematology	Adelaide, Australia
2005	**Dr. Mahdev Harani**	Hematology	Jamshoro
2006	**Dr. Jawaid Jabbar**	Chemical Pathology	Consultant in Tabba Hospital
2006	**Dr. Kanwal Aftab**	Histopathology	Consultant in UK
2006	**Dr. Fauzia Rauf**	Histopathology	Khyber Medical university, Peshawar
2006	**Dr. Azizun Nisa**	Histopathology	Ziauddin Hospital and University
2006	**Dr. Shireen Mansoor**	Chemical Pathology	Pathologist Stat Lab
2007	**Dr. Aqsa Nasir**	Histopathology	Faculty in USA
2007	**Dr. Ayaz Baig**	Chemical Pathology	Saudia Arabia
2007	**Dr. Aiyesha Humaira**	Hematology	Saudia Arabia
2007	**Dr. Naveen Naz**	Hematology	Saudia Arabia
2007	**Dr. Mohammad Kashif**	Hematology	Saudia Arabia
2007	**Dr. Syed Mohammad Zeeshan**	Microbiology	Assistant Professor, AKU
2008	**Extend residency program up to 5 years**		
2009	**Dr. Khurram Minhas**	Histopathology	Assistant Professor, AKU
2009	**Dr. Zeeshanuddin**	Histopathology	Assistant Professor, AKU
2009	**Dr. Aisha H Memon**	Histopathology	Assistant Professor, AKU
2009	**Dr. Samia Fatima**	Histopathology	Assistant Professor, AKU
2009	**Dr. Nausheen Kamran**	Hematology	Registrar, Sultan Kabus University Oman
2009	**Dr. M Adnan Qureshi**	Hematology	Director Lab, Tabba Heart Institute
2009	**Dr. Sadia Chughtai**	Hematology	-
2010	**Dr. Natasha Ali**	Hematology	Associate Professor, AKU
2010	**Dr. Naima Fasih**	Microbiology	Saudi Arabia
2010	**Dr. Summiya Nizamuddin**	Microbiology	Shaukat Khanum Memorial Hospital Lahore
2010	**Dr. Saba Qaiser**	Microbiology	Consultant in UK
2010	**Dr. Rubina Gulzar**	Histopathology	Dow University of Health Sciences, Karachi
2010	**Dr. Lubna Avesi**	Histopathology	Dow University of Health Sciences, Karachi
2010	**Dr. Huma Arshad**	Histopathology	Consultant in UK.
2010	**Dr. Ruqaiya Shahid**	Histopathology	Dow University of Health Sciences, Karachi
2011	**Dr. Farhan Javed Dar**	Chemical Pathology	Saudia Arabia
2011	**Dr. Sana Rajper**	Microbiology	Liaquat National Hospital
2011	**Dr. Farrukh Ali Khan**	Hematology	Saudi Arabia

2011	**Dr. Saba Hassan Shamim**	Histopathology	Dow University of Health Sciences, Karachi
2011	**Dr. Beena Umar**	Histopathology	Doing anatomic and clinical pathology residency, USA
2011	**Dr. Shazia Mumtaz**	Histopathology	Saudi Arabia
2012	**Dr. Rizwan Bashir**	Histopathology	Saudi Arabia
2012	**Dr. Joveria Farooqi**	Microbiology	Assistant Professor, AKU
2012	**Dr. Sahar Iqbal**	Chemical Pathology	Dow university, Karachi
2012	**Dr. Lena Jafri**	Chemical Pathology	Associate Professor, AKU
2012	**Dr. Syed Sarwar Ali**	Hematology	Wah Cantt. Peshawar
2012	**Dr. Farheen Karim**	Hematology	UK
2013	**Dr. Muhammad Rahil Khan**	Histopathology	Assistant Professor, Bilawal Medical College LUMHS Jamshoro
2013	**Dr. Binish Arif Sultan**	Microbiology	Jinnah Sind Medical University
2013	**Dr. Imran Ahmed**	Microbiology	Assistant Professor, AKU
2013	**Dr. Noreen Sherazi**	Chemical Pathology	Dow Laboratory
2013	**Dr. Anila Rashid**	Hematology	UK
2013	**Dr. Izza Hussain**	Hematology	Indus
2013	**Dr. Muhammad Shariq Shaikh**	Hematology	Associate Professor, AKU
2014	**Dr. Sidra Arshad**	Histopathology	Assistant Professor, AKU
2014	**Dr. Shabneez Malik**	Haematology	Fatimid Foundation from January 1, 2015 as a Consultant hematologist
2014	**Dr. M. Talha Naeem**	Chemical Pathology	Dow University of Health Sciences, Karachi
2014	**Dr. Zeeshan Ansar**	Molecular Pathology Fellowship (2 years Program)	Assistant Professor, AKU
2015	**Dr. Muhammad Usman**	Histopathology	Saudia Arab
2015	**Dr. Sabeehuddin**	Histopathology	Kuwait
2015	**Dr. Haresh Kumar**	Microbiology	Pathologist, Civil Hospital Tharparkar
2015	**Dr. Hafsa Majid**	Chemical Pathology	Assistant Professor, AKU
2015	**Dr. Maria Shafiq**	Haematology	Regional Blood Center Karachi
2015	**Dr. Huma Mansoori**	Haematology	Dow University of Health Sciences, Karachi
2015	**Dr. Mehreen Imran**	Haematology	Dow University of Health Sciences, Karachi
2016	**Dr. Faizan Malik**	Histopathology	Faculty, USA

2016	**Dr. Shabina Sikandar**	Histopathology	Kuwait
2016	**Dr. Faiza Rasheed**	Histopathology	Indus Hospital
2016	**Dr. Anita George**	Histopathology	Dow University of Health Sciences
2016	**Dr. Imran Ahmed Siddiqui**	Hematology	Memon Medical Institute, Karachi
2016	**Dr. Pushpa Bhawan Mal**	Microbiology	Indus Hospital, Karachi
2017	**Dr. Zoonish Ashfaq**	Histopathology	Senior Instructor, AKU
2017	**Dr. Riyasat Ahmed Memon**	Histopathology	LUMHS, Hyderabad
2017	**Dr. Qurratulain Chundriger**	Histopathology	UK
2017	**Dr. Irim Iftikhar**	Microbiology	Chughtai Lab, Consultant
2017	**Dr. Salima Qamar**	Microbiology	-
2017	**Dr. Sibtain Ahmed**	Chemical Pathology	Assistant Professor, AKU
2017	**Dr. Shabnum Ramzan**	Chemical Pathology	Medi Care Hospital
2017	**Dr. Hira Abdul Qadir**	Haematology	Dow University of Health Sciences
2017	**Dr. M. Hasan Safdar Hayat**	Haematology	Assistant Professor, AKU
2018	**Dr. Yusra Riyasat**	Microbiology	Bilawal Medical College
2018	**Dr. Fizza Farooqui**	Microbiology	Kidney Center
2018	**Dr. Nausheen Ferozuddin**	Histopathology	Sindh Lab
2018	**Dr. Madiha Bilal Qureshi**	Histopathology	Faculty, AKU
2018	**Dr. Sarosh Moeen**	Histopathology	Senior Instructor, AKU
2018	**Dr. Nadia Nasir**	Haematology	-
2018	**Dr. Ayesha Abdul Majeed**	Hematology	Dow University of Health Sciences
2019	**Dr. Ummiya Tahir**	Histopathology	-
2019	**Dr. Nazish Sana**	Haematology	Consultant, Patel Hospital
2020	**Dr. Ruhul Quddus**	Haematology	-
2020	**Dr. Kanwal Shafiq**	Haematology	-
2020	**Dr. Safia Moin**	Microbiology	-

2021	**Dr. Tamana Asghari**	Histopathology	Senior Instructor, AKU
2021	**Dr. Anam Ghauri**	Histopathology	Dow Medical University
2021	**Dr. Muhammad Asad Diwan**	Histopathology	Medical Officer, Histopathology, AKU
2021	**Dr. Sana Brohi**	Hematology	-
2021	**Dr. Muhammad Qayyum**	Hematology	-
2021	**Dr. Salima Rattani**	Microbiology	-
2021	**Dr. Syed Bilal Hashmi**	Chemical Pathology	Staff Pathologist, AKU
2022	**Dr. Summaya Zafar**	Histopathology	-
2022	**Dr. Saman Muhammad Amin**	Histopathology	-
2022	**Dr. Manahil Khan**	Histopathology	Consultant, AKU
2022	**Dr. Seher Rasheed**	Hematology	-
2022	**Dr. Qadeer Ahmed**	Hematology	Staff Pathologist, Quetta Lab, AKU
2022	**Dr. Moiz Ahmed Khan**	Microbiology	-
2022	**Dr. Siraj Muneer**	Chemical Pathology	Staff Pathologist, Sukkur Lab, AKU
2023	**Dr. Alka Rani**	Histopathology	-
2023	**Dr. Zaib Un Nisa**	Chemical Pathology	-
2023	**Dr. Hareem Alam**	Hematology	-
2023	**Dr. Jyoti Mohanlal**	Hematology	-

DEPARTMENTAL RESIDENCY COMMITTEE (DRC)

Terms of Reference

1. To provide well-organized training opportunities in the disciplines of chemical pathology, hematology, histopathology, and microbiology.
2. To strengthen and develop educational activities and assessment for residents.
3. To enhance active participation of residents in research activities in the discipline of pathology.
4. To ensure regular evaluation of residents by faculty and faculty by residents.
5. To ensure compliance with University PGME rules and policies.
6. To review program in light of feedback received from internal and external evaluation conducted by PGME.

Committee Membership

The Pathology Program Director, appointed by the departmental Chair, heads the committee. Program directors and coordinators of each discipline i.e. Chemical Pathology, Hematology, Histopathology, and Microbiology are on the committee nominated by Departmental Chair and Section Heads. The Chief Resident at R4 level or above is selected and elected by the DRC and residents for resident representation. Faculty from DED and departmental manager and administrative staff are also members. Vice Chair, Education of the department is also a member of the committee.

Reporting Relationship

The committee reports to the Chair and Vice Chair of the Department of Pathology & Laboratory Medicine and Associate Dean, PGME, AKU.

OVERVIEW OF RESIDENCY PROGRAM IN PATHOLOGY

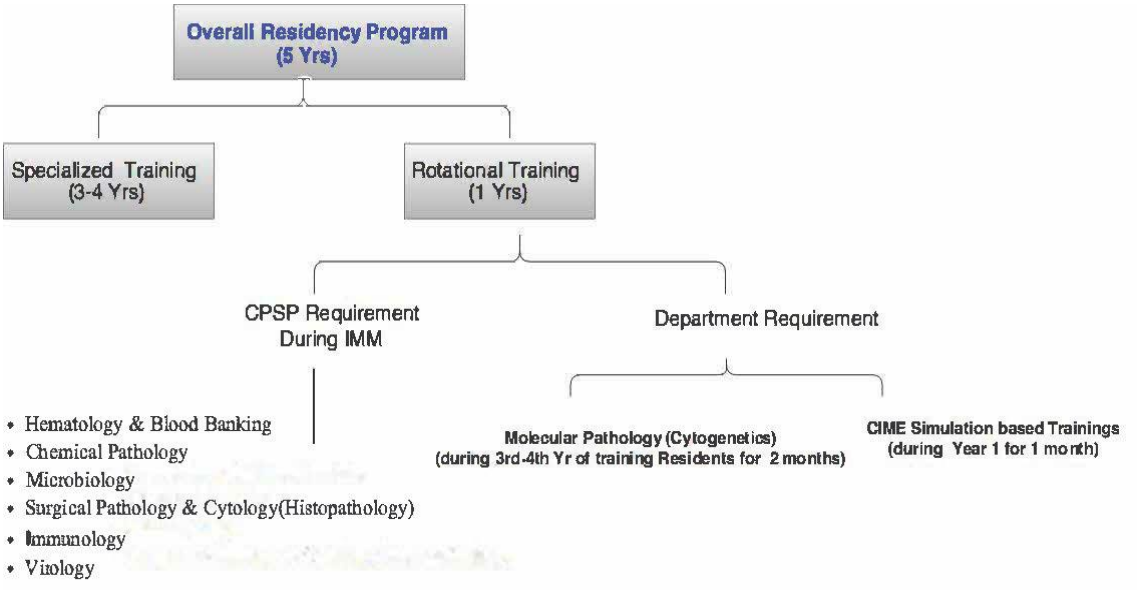
The Aga Khan University, Department of Pathology & Laboratory Medicine provides a 5-year comprehensive training in 4 major disciplines of Pathology including Chemical Pathology, Haematology, Histopathology and Microbiology. FCPS is an exit certification exam conducted by College of Physicians & Surgeons Pakistan (CPSP) and to practice as a competent pathologist. Since August 2016, CPSP has also introduced intermediate module (IMM) and all Pathology residents are expected to attempt this exam at the end of second year of residency.

The PGY-1-2 years includes mandatory rotations in Clinical Microbiology, Chemical Pathology, Hematology and Histopathology. It also includes 2 months rotation in Laboratory Medicine (to learn various laboratory procedures). Residents then become eligible to appear in IMM examination and are expected to pass this exam before moving forward in their further training. Year 3-5 are specialty-based training in which the residents get a detailed insight in their specific disciplines and update them with new technologies and their clinical application. They will also receive core knowledge and skills training in molecular pathology and will learn its application in their respective disciplines. Residents are also required to initiate and complete their mandatory research work as part of the requirement for the eligibility to undertake the IMM and FCPS Part 2 examination. The Pathology curriculum is taught through formal/core lectures, Simulation / Picture Based training, tutorials, journal clubs and scans), workshops, audit meetings and histopathology/cytology teaching sessions are also held in addition to the sessions held by Post Graduate Medical Education Committee (PGME) of AKUH. In addition to these several other teaching/learning strategies (Bench training session, observation of laboratory skills etc.) are used to impart knowledge, skills, and behavior. Residents are encouraged to attend and present their research work at conferences, both at the national and international level. The residents are also required to attend the mandatory workshops arranged by CPSP.

The evaluations and programs are structured around the training specialty requirements as outlined in the CPSP objectives. The residents' progress is closely monitored during the various rotations with graded responsibilities, and by a formal written, practical & oral examination, at least twice a year.

RESIDENCY TRAINING PROGRAM IN PATHOLOGY

Entire Time period of Residency Including the following: (5 Years Rotation)



A daily on-call schedule is followed for performing out-patient procedures. The resident is expected to be available for night call/emergency duties whenever necessary.

Individuals who have completed 24 months of training may be referred to as senior residents. In addition to this, the female residents are on duty for Pap smear on daily basis.

During the first 2 years, the residents will learn the particular discipline in depth and in the later 12 months or last year of residency, be trainee consultants, where they could be expected to do independent reporting. They could also be expected to have greater research and academic commitments and also greater participation in the postgraduate programs of the institution and other areas of the city.

Some programs have specialized rotations in other departments such as Clinical Hematology, Medicine, ID, Infection Control etc.

CPSP Mandatory Workshops

It is mandatory for all trainees to attend the following mandatory CPSP workshops in the first year of training:

1. Introduction to Computer and Internet
2. Research Methodology and Dissertation Writing
3. Communication Skills
4. Basic Life Support (BLS)

Any other workshop may be introduced by the CPSP. In addition, they are also expected to attend workshops recommended by the AKU-PGME and the department.

E-logbook

The CPSP council has made e-logbook mandatory for all residency program trainees inducted from July 2011 onwards. Upon registration with RTMC each trainee is allotted a registration number and a password to log on to the e-logbook on the CPSP website. The trainee is required to enter all work performed and the academic activities undertaken in the e-logbook on a daily basis. The concerned supervisor is required to verify the entries made by the trainee. This system ensures timely entries by the trainee and prompt verification by the supervisor. It also helps in monitoring the progress of trainees and vigilance of supervisors. Workplace based assessment tools like Mini CEX and DOPS have been developed. The trainees are required to undergo these formative assessment tools and make their entries in the e-logbook to document attainment of competence.

Research (Dissertation / Two Papers)

One of the requirements for fellowship training is writing a dissertation or two research papers on a topic related to the field of specialization. Synopsis of the dissertation or approval of two topics for research papers must be submitted for approval to the Research & Evaluation Unit (REU) of CPSP by the end of first year of the Intermediate Module. Since 2024, the residents are preferred to write two research papers. One of these papers should preferably have Molecular techniques.

Mandatory Molecular Rotation

It is mandatory for R3 to complete Molecular Pathology rotation.:

- Molecular Pathology rotation planned in year 3 should be considered as a must pass rotation and it will be essential for residents to obtain ≥55% on continuous evaluation in order to promote to the next level.

- Molecular Pathology component from core curriculum sessions will comprise 10% of the mid-year assessments in Year 1 and 2 and will be mandatory to pass. If the residents are unable to pass it on the first attempt, they will have to remediate and pass in the re-sit.

- To facilitate learning, residents will be provided mandatory reading material in Years 1 and 2 and during the Molecular Pathology rotation.

Core Curriculum Lectures for R1

The core curriculum lectures are designed for (R1s) to enhance knowledge and skills. The residents are required to attend the core curriculum sessions scheduled once a week. The list of core curriculum lectures is mentioned below:

S.No.	Topics
1.	Bone marrow aspirate and trephine: indications contraindications and procedure
2.	Reporting of critical results
3.	Safe laboratory practices and Infection control
4.	Understanding electrochemistry and arterial blood gases (ABG's)
5.	Quality Control and Assurance in a Clinical Laboratory
6.	Basics of immunology (Part-1)
7.	Introduction to Molecular Pathology
8.	Basics of immunology (Part-2)
9.	Introduction to Human Genome, Chromosomes, Classification of Chromosomes
10.	Role of cytopathology
11.	Introduction to Point of Care Testing (POCT) Program
12.	Hepatitis B & C: interpretation of serological and PCR tests
13.	Microbiology specimen collection guidelines
14.	Cell compartments, Nucleus, Cell Division – Stages of Mitosis, Meiosis and Binary fission
15.	Classification of anemia and diagnosis of common hematological disorders
16.	Application of Molecular Diagnostic Technologies
17.	Professionalism at workplace
18.	Structure and replication of DNA and RNA & Genes, Genetic Code, Transcription, Translation and Regulation of Gene expression
19.	Diagnosis of Thalassemia
20.	Diagnostics for single gene disorders by sequencing and MLPA
21.	Introduction to spectral techniques and detection of common analytes
22.	Nature of Genetic Variation, Types of Mutations and Impact of Mutations and Polymorphisms

23.	Judicious usage of blood products
24.	Cytogenetics and FISH for oncological disorders
25.	Biopsy specimen processing in histopathology
26.	Quality Assurance in Histopathology
27.	Immunohistochemistry: techniques and applications
28.	Modes of Inheritance and Genetic Disorders; Autosomal Dominant, Recessive and Sex link Inheritance
29.	Thalassemia by Genetic testing
30.	Diagnosis of bleeding disorders
31.	Therapeutic and donor apheresis: indications and complications
32.	Acute Leukemia
33.	Inborn Metabolic Disorders (IMDs)
34.	Chronic Leukemias
35.	Quick interpretation of clinical data interpretation skills
36.	Genetics of Malignant and Non-Malignant Diseases
37.	Role of laboratory in antimicrobial resistance containment
38.	Sterilization and Disinfection
39.	Chromosomal Microarray for constitutional diseases
40.	Thrombophilia- a brief overview
41.	Bone marrow failure syndromes
42.	Fundamentals of cancer genetics; Cell Cycle deregulation in cancer; DNA damages with repair mechanism and role of its regulating genes
43.	Basics of polymerase chain reactions
44.	Markers for Diagnosis and Risk Stratification of Cardiovascular Diseases
45.	How to prepare for Intermediate Module in Pathology: Assessor’s perspective
46.	Sequencing techniques (sanger and NGS)
47.	Molecular Pathways underlying carcinogenesis
48.	Oncogenic mutations and alteration in receptor action
49.	Molecular diagnosis of Infectious Disease; Bacterial detection, drug resistance & Viral detection

Academic Calendars for Residents

Daily Academic Calendar for Resident 1.pdf

Daily Academic Calendar for Resident 2-5.pdf

Residents Rotation Planner

Residents Rotation Planner - 2024-2025.pdf

Supervisor Feedback Form

The supervisor feedback forms are required to be filled in by supervisors on a quarterly basis by meeting their residents and they will fill in the forms which will help to have better understanding regarding the areas of improvement.

Supervisor Feedback Form - Histopathology.pdf

Supervisor Feedback Form - Chemical Pathology.pdf

Supervisor Feedback form - Haematology.pdf

Supervisor Feedback form - Microbiology.pdf

Longitudinal Themes/Courses

Professionalism Course

Professionalism Course-PDF

Residents as Teachers Course

Residents as Teachers Course-PDF

Leadership Course

CORE COMPETENCIES

History Taking

- take history in routine and difficult situations. (Ex: (1) if, patient's language is different from trainee's language, (2) when confronted with confused and deaf patients etc.)
- formulate differential diagnosis after analysis and synthesis of identified problems.
- perform bench work appropriate to his/her specialty.
- make appropriate diagnosis on the basis of clinical features/ tissue examination/blood film/laboratory date.
- effectively communicate with the patient, hospital staff and others
  show empathy with the patient.

Collection of Biological Specimens

- take consent of the patient for performing venipuncture or other procedures for biological specimen collection.
- ensure patient's safety i.e. collection of correct samples from correct patient.
- maintain records with dates and sign each entry.
- ensure that notes are accessible to all members of the team and patients /relatives (if required)
- use the latest technology for the benefit of patient e.g. fax, email etc.

Time Management

- prioritize tasks (clinical and others) that are to be accomplished.
- plan line of action while keeping realistic expectations of tasks to be completed by self and others.

Decision Making

- analyze and synthesize clinical problems.
- recognize the role of and consult other members of the health care team.
- prioritize tasks according to their significance.

Basic Life Support

- examine and assess a collapsed patient.
- maintain adequate airway.
- perform effective cardiopulmonary resuscitation.
- control self-emotions and enable others to keep calm.

Communication Skills

- use open ended questions for gaining information.
- communicate effectively with patients, taking care of their level of understanding.
- provide information to patients in simple and precise language, avoiding technical terms.
- encourage questions from the patients and their relatives.
- seek help from interpreters where necessary.
- give due respect to patient's privacy and share information when appropriate.
- while counseling gives choices and helps the patient in decision making.

Lifelong Learning

- pursue activities/ programs for professional development.
- understand the role of appraisal and assessment.
- recognize and make full use of learning opportunities.
- try to learn from seniors, colleagues and others.

- demonstrate proficiency in the use of information technology.

Practice Evidence Based Medicine
- show competence in the use of various information sources e.g. Medline, library and internet.
- use evidence to support patient care effectively.
- critically evaluate medical evidence using principles of EBM.

Clinical Audit, Guidelines
- recognize the relevance of audits to benefit patient care.
- participate in clinical audits.
- comprehend the problems and benefits of existing guidelines.
- use local guidelines where applied.
- take care of individual patients' needs when using guidelines.

Ethical and Legal issues
- recognize the importance of Informed consent and practice it in a manner that the patient is able to understand it fully.
- respect the right to confidentiality.
- maintain patients' confidentiality regarding lab data and other information.
- use and share all information with the **physicians only and avoid communicating results with patients.**

Professional Behavior
- show punctuality and regularity.
- demonstrate courtesy and respect towards peers and staff.
- show responsibility in maintaining continuity of care.
- ensure satisfactory completion of delegated tasks by the end of the shift/day with appropriate handover.
- display a nondiscriminatory attitude towards all the patients.
- refrain from giving unnecessary personal comments.
- exercise care in managing inappropriate behavior e.g. aggression, violence, sexual harassment in patients.
- recognize own limitations and accept constructive criticism.
- act as a responsible member of health care team.

Disease Prevention
- identify role of environmental and lifestyle risk factors, such as diet, exercise, social deprivation, occupation, and substance abuse in disease causation.
- comprehend the Epidemiology and screening procedures for risk factors.
- provide support and advice on quitting the use of tobacco/ alcohol.
- assess individual patient's risk factors.

Teaching and Training
- communicate and share information with all members of the health care team.
- adopt learner-centered approach while teaching/training.
- demonstrate willingness, enthusiasm, and patience to teach.
- seek feedback from peers as well as from juniors.
- make best use of all teaching opportunities.
- develop effective presentation skills.

- use multiple audio-visual aids effectively for presentation.

Safe Management while on Call

- recognize medical indications for urgent investigations and therapy.
- identify skills and competencies of other members of the 'on call' team.
- prioritize the tasks to be carried out.
- call for help and refer to the case whenever required.
- effectively interact with other health care professionals.
- keep patients and relatives informed and hand over all the information to the proceeding team staff, safely.

Exit Competencies

At the end of 5 years of Residency program, trainee should be able to:

1. **Medical Expert**
   - Know and apply the basic and clinical sciences appropriate for their discipline.
   - Be updated regarding management of common health problems and life-threatening situations.
   - Gather accurate and relevant information (by history taking, physical examination, diagnostic workup, and use of IT)
   - Synthesize and apply information in the clinical and community setting (by making informed and justifiable decisions about preventive, diagnostic and therapeutic options, and interventions)
   - Perform procedures with proficiency, recognize limitations and respond accordingly, apply principles of patient safety.
   - Provide cost effective, patient-focused care based on the best evidence and promptly following up patients.
   - Counsel and educate (physicians and patients) for promotion of health and prevention of health problems.
   - Manage emergencies/crisis situations with confidence and follow hospital policies for patient care.

2. **Interpersonal and Communication Skills**
   - Communicate (written and verbally) effectively with patients and families across a broad range of socioeconomic and cultural backgrounds.
   - Communicate (written and verbally) effectively with physicians, other health professionals, and health related agencies.
   - Work effectively as a member /leader of health care team or another professional group
   - Maintain comprehensive, timely, and legible medical records.
   - Make effective scientific presentations (using power point and posters).

3. **Professionalism**
   - Demonstrate respect, compassion, and integrity, altruism, accountability, and a commitment to excellence and on-going professional development.

- Demonstrate commitment to ethical principles pertaining to quality of clinical care, confidentiality, informed consent, and business practices.
- Demonstrate responsiveness and sensitivity to patient's culture, religion, age, gender, and disabilities.
- Demonstrate a desire for continued education through professional and personal development activities.

4. Evidence and Practice-based Learning & Improvement

- Analyze practice experiences and identify areas of improvement.
- Locate, appraise, and assimilate evidence from scientific studies related to their own patient's/population's health problems.
- Track down the best evidence with which to answer that question.
- Integrate the evidence with our clinical expertise and our patient's characteristics and values, including application/limitation of the concepts of evidence-based medicine to cost containment issues for individuals and/or populations.
- Obtain and use information from their own population if patients and the large population from which their patients are drawn.

5. Systems-Based Practice

- Work effectively in various health care systems considering cost effectiveness & risk-benefit analysis.
- Coordinate patient care within the various health care systems demonstrating reliability, effective organization & team work ethics.
- Advocate quality patient care & promote optimal patient care systems for prevention of common diseases relevant to their specialty.
- Understand how their patient care and other professional practices affect other health care professionals, the health care organization, and the larger society, and how these elements of the system affect their own practice.
- Acquire management skills required for the running of a pathology laboratory.
- Familiar with health and safety regulations, as applied to the work of the Department of Pathology and Laboratory Medicine.

6. Scholarship

- Recognize the importance of self-assessment and of continuing education.
- Comprehend Research methodology and interpretation of data.
- Ascertain standards of ethical conduct of research.
- Demonstrate willingness to teach others.

EDUCATIONAL GOALS AND PHILOSOPHY

The residency program in Pathology consists of five years of intensive training with the aim of producing pathologists who have sufficient knowledge and experience for "the safe and unsupervised practice of pathology" and are ready to practice as a consultant in the medical multidisciplinary team. Residents completing the program must have the skills to be life-long learners in a rapidly changing medical profession.

GENERAL TRAINING OBJECTIVES

1. Provide supervised training in the basic principles of the generation and interpretation of clinical laboratory data.
2. Interpretation of morphologic abnormalities.
3. Correlate the patho-physiological basis of disease with clinical sciences.
4. Assume responsibilities of a consultant pathologist in a hospital and private practice with emphasis on service, teaching, and research activities.
5. Be well versed in laboratory management.
6. Acquire knowledge of all aspects of laboratory quality management systems and computers, including specimen collection, distribution, reporting and organization of satellite laboratories.
7. Conform to safe laboratory practices.
8. Participate actively in the quality control/quality assurance programs of the Department of Pathology
9. Perform outpatient procedures like bone marrow aspiration, provocative endocrine and dynamic function tests, FNA, arterial blood gases, platelet/plasma pheresis, etc.
10. Perform on call duties under supervision.
11. Visit patient care areas and review charts/ suggestions regarding microbiological investigation and antimicrobial therapy under supervision.
12. Handle complaint under supervision
13. Review quality controls under supervision
14. Participate in investigating and control strategies for hospital infections.
15. Initiate or actively contribute to ongoing departmental research projects.

GENERAL RESPONSIBILITIES OF RESIDENTS

Clinical:

Clinical responsibilities **(under supervision)** of the resident include:

- Giving response to medical staff inquiries or problems (administrative/ consultative).
- Identification of cases requiring input from medical staff or faculty and develop initial plan for further workup.
- Contact with physicians/ patients for history taking and risk assessment.
- Advise physicians regarding the diagnostic workup and treatment.
- Review all results produced by the technical staff.
- Respond to inquiries related to specimen collection and rejection.
- Informing critical results to the physicians according to AKUH policies.
- Perform laboratory procedures within department and their relevant section.
- Develop understanding of quality control and quality assurance.

Academic:

- Play an active part in undergraduate/postgraduate teaching.
- Facilitate junior residents and technologists in research projects.
- Training of junior residents.
- Attend all mandatory academic sessions arranged by PGME and department.
- Keep track of the continuous medical educational activities
- Identify the area of research with guidance from the faculty/supervisors during their first year of residency. ***It is mandatory to complete and submit desired research synopsis at the end of the first year*.**
- Use efficiently computer for literature searches and access to Internet.
- Become proficient in the use of computers for word processing, simple graphics, and data management. They should be able to manipulate simple files containing laboratory data using PC data management packages and EP Info 6.0 package for data analysis.
- Familiar with standards word processor spread sheet, relational database, statistics, and epidemiology software packages.
- Familiar with the basic method of electronic data transfer with local & remote.

Administrative:

- Play a role in the administrative set up of the section and this would include selection of new tests, evaluation, budgeting, equipment selection, and revision of methodologies.
- Use the existing external quality control scheme and the processing of data by these schemes.
- Apply the principles of medical audit.
- Develop audit tool.
- Actively participate in quality control/quality assurance procedures carried out in the section.
- Knowledge of important aspects of laboratory management including budget control, personnel management, and administration.
- Volunteer themselves for the positions of sectional and departmental chief and co-chief residents' positions.

RESEARCH ACTIVITY IN PATHOLOGY

Research forms a cornerstone of all the academic activities at any university. Aga Khan University highly values research output and scholarship amongst its faculty, students, and residents. With other attributes, residency is a time for a trainee to put oneself into learning mode for research methodology. Engaging in research activities under the mentorship of experienced and committed faculty members is expected. Facilitations are available to develop core research competencies administered through a series of lectures and workshops in year 1 and year 2 on biostatistics, bioethics, research ethics, etc. Additionally, opportunities are made available to participate in workshops arranged by the Clinical Epidemiology Unit of Community Health Sciences Department. In addition, a full-time statistician is made available for consultation within the Department of Pathology and Laboratory Medicine for residents to approach for bio-statistical assistance.

Dissertation/Scientific paper writing is an important part of a resident's requirement for CPSP examination. The topic should be identified within three months of entry into the residency program with the goal of having the synopsis approved within the first year of residency. For facilitation, first & second year Residents who would be working under the supervision of faculty are eligible to apply as principal investigator. The project will be critically reviewed by the Departmental Scientific Committee. Due to limited funding, only successful projects will be eligible for Departmental seed money grants. This will enable residents to pursue research, especially in their sub-specialty. The complete policy and application forms are available from the department. Depending on the strength of scientific work, senior residents will be eligible to deliver presentations at national and international level.

As many residents are entering into the program from diverse backgrounds it is important to be very clear on the process of deciding a topic, writing up a synopsis and then proceeding with the research project. It is imperative to have a clear concept that it is the resident's responsibility to approach the mentor, identify and finalize the topic, obtain feedback, perform the required background reading, define the project, and engage in elements of writing up and statistical analysis. Assistance will be provided through the mentor in terms of feedback and guiding them towards relevant resources e.g. lectures, literature search and statistician engaged in the Department of Pathology and Laboratory Medicine. However, the overall responsibility of ensuring that timelines are met lies and remains with the residents.

Resident Research Grant:

The Department of Pathology and Laboratory Medicine inculcates research as part of core training of the residency programme. The university has multiple platforms for grants and funding opportunities. Resident's research grant is an initiative of the department to provide funds to residents in order to support their research work. Proposals are invited every year that go through a vigorous process of review by internal and external reviewers.
The committee comprises of the following members:

Chair

Dr. Najia Ghanchi

Members

Members of Department Residency Committee – DeRC

Analytical and Translational Research Cell

The Department of Pathology and Laboratory Medicine has research support from Analytical and Translational Research Cell (ATRC) team for faculty and residents. This unit assists residents in development of research proposals, study design, data extraction and data transformation. In addition, the department has a full-time statistician who can help residents with data analysis.

Members

Ms. Rabiya Owais	Data Analytics Manager
Dr. Muhammad Abbas Abid	Senior Instructor
Dr. Humaira Shafaq	Senior Instructor
Ms. Ayesha Sadiqa	Research Specialist

INTERMEDIATE MODULE (GENERAL OVERVIEW)

To ensure better training, the CPSP introduced an Intermediate Module Examination in several disciplines. This mid-training assessment strengthens the monitoring and in-training assessment systems by providing trainees with an estimate of mid-training competence. It also serves as a diagnostic tool for trainees and supervisors, provides a curricular link between basic and advanced training, and an opportunity for sampling a wider domain of knowledge and skills.

The Intermediate Module (IMM) examination is mandatory eligibility requirement for all FCPS II examinations as of September 2016.

College of Physicians and Surgeons, Pakistan offer fellowship programs in six specialties of Pathology. The faculties of these specialties and the combined faculty of Pathology have made great efforts to develop a common IMM training program spread over two years as is being practiced in clinical specialties, and a common IMM examination upon completion two years of training.

The Intermediate Module training in Pathology includes one year of training in the chosen specialty and one year duration is earmarked for rotations in all six specialties. This arrangement will allow the residents of any specialty of Pathology to acquire essential competencies of all specialties.

After two years of training in the core competencies of Pathology, the trainees are allowed to continue their training in the chosen specialty, but they must pass the Intermediate Module examination prior to sitting the final FCPS II examination.

ELIGIBILITY REQUIREMENTS

For appearing in Intermediate Module examination a candidate should have:

- Passed FCPS-I in Pathology or has been granted exemption by CPSP.
- Registered with Research and Training Monitoring Cell (RTMC)
- Completed two years of RTMC registered training under an approved supervisor in an institution recognized by the CPSP.
- A certificate of completion of training must be submitted.
- Completed entries in e-logbook along with validation by the supervisor.
- Submitted certificates of attendance of mandatory workshops.
- Approval of synopsis for dissertation OR approval of two topics for research articles from REU CPSP.

EXAMINATION SCHEDULE
The Intermediate Module theory examination will be held twice a year at CPSP.

DURATION
The duration of training for Intermediate Module (IMM) is two years, and residents become eligible to appear in Intermediate Module examination upon completion of IMM training.

First Six Months: Should be spent on the chosen specialty.

Next One Year: Carry out rotations as specified below.

Last Six Months: To be spent in the chosen specialty prior to appearing in IMM examination. Candidates will be eligible to pursue the advanced phase of training (FCPS II) in the chosen specialty after completing IMM training.

Rotations as per CPSP Requirements

- *1st month: Lab rotation (Procedure wise evaluation at the end of first month)*
- *2nd-6th month: Specialty rotation*
- *7th-18th month: Rotations (1st half) + Specialty rotation (2nd half)*
- *19th-24th month: Specialty rotation*

Schedule of Rotations

Discipline	**Duration (weeks)**
Histopathology	10
Chemical Pathology + Immunology	10 + 2
Microbiology + Virology + Immunology	10 + 3 + 1
Hematology + Blood Bank	10 + 6

This time period also includes the assessment to be carried out by every department at the end of the training period.

HISTOPATHOLOGY

IMM Curriculum (Year 1 & II)

Overview:

After the introduction of intermediate module (IMM) by College of Physician and Surgeon Pakistan, pathology training has divided into two main phases. The first phase of two years comprises of core training for IMM and in the next advance phase, 2-3 years training in chosen specialty.

End of year objectives for Primary residents

Histopathology training involves the acquisition of skill and knowledge in gross and microscopic pathology, autopsy pathology and cytology, including fine needle aspiration.

Year One

At the end of year one, every resident should be able to:

Learning Outcomes (Skills)

- Basic Techniques
  1. Biopsy Specimen collection including cytology specimens.
  2. Tissue fixation (Rationale, Types and Techniques)
  3. Gross cutting (Observation-To handle common surgical pathology specimens including importance of slicing large specimens. Salient features to be described as per recommended guidelines).
  4. Tissue processing (Steps and Rationale)
  5. Special precautions for tissue to be sent for (electron microscopy, special biopsies, immunofluorescence etc.)
  6. Decalcification (Methods
  7. Basic Molecular Biology Techniques and FISH testing for Her-2-neu /common solid tumor testing.
  8. Specimen, slides, and block storage protocols.

- Staining
  1. Hematoxylin and Eosin (H&E) staining
  2. Special stains-requirements and principles.
  3. Immuno-histochemical staining-principles (Technique) and common applications.

- Surgical Pathology

  Use International reporting protocols, checklists, and interpret synoptic reporting of common resections (Breast, Gastric, Colon, H&N, Prostate, Urinary Bladder, Uterus & Ovaries) of the list given below:

  1. Head & Neck:
     - Oro-pharyngeal carcinoma
       i. Precursor lesions
       ii. Grading & Staging

2. GIT:
    - Esophagus:
      i. Esophagitis (Reflux/ Herpes / candida)
      ii. Barrett's esophagus with dysplasia
      iii. Carcinoma esophagus

    - Stomach:
      i. Gastritis (Types) H. Pylori infection / gastritis.
      ii. Adenocarcinoma: Grading & Staging

    - Small Intestine / Large Bowel:
      i. Coeliac disease
      ii. Polyps
      iii. IBD
      iv. Adenocarcinoma with Staging and Grading.

    - Appendix:
      i. Acute appendicitis
      ii. Neuroendocrine tumors

    - Gall Bladder:
      i. Cholecystitis
      ii. Carcinoma Gall Bladder

3. Female genital system:
    - Endometrium
    - Normal phases of menstrual cycle
    - Precise dating of endometrial biopsy
    - Polyp/Hyperplasia

➢ Frozen Section:

To have an insight of Principles, steps, indications, and interpretation of frozen section technique, (requirement from surgeon, liaison with surgeon, conveying of report etc.) of the following list:

➢ Cytology including FNA.
1. Ensure adequacy of cervical smear.
2. Perform cervical smear in special circumstances / where required.
3. Take appropriate history and clinical examination of the patients.
4. Perform FNAC followed by smear preparation and assessment of adequacy.
5. Cytology sample collection, preservation in proper fixative.

➢ Quality Control in Histopathology
1. Able to identify optimum processing, H&E staining of the tissue in routine cases.

2. Able to identify common artifacts encountered in routine cases.

- Communication Skills
  1. Develop rapport with laboratory staff.
  2. Communicate effectively with other clinicians and contribute.
     to multi-disciplinary teamwork.
  3. Communicate with patients with empathy and respect.

General Learning Outcomes (summary)

1. Explain principles of general and systemic pathology and cytology.
2. describe accurately all surgical and biopsy material and select appropriate blocks for sections.
3. Identify points during processing at which a specimen is most likely to be contaminated or mislabeled and minimize those risks.
4. Use light microscopy for routine diagnostic purposes in histopathology and cytology.
5. Compose an accurate and concise report, to the requesting clinician, of organs such as gall bladder, appendix, and uterus.
6. Use a diagnostic coding system and apply this consistently.
7. Familiarize oneself with routine hematoxylin and eosin staining.
8. Perform efficiently FNAs on breast lumps, thyroids etc. in at least 75% of the cases.
9. Perform Efficiently skin biopsies under supervision.
10. Photograph lesion to demonstrate gross pathology.
11. Submit synopsis of FCPS Part II dissertation.

Year Two

At the end of year two, every resident should be able to:

1. Expand knowledge of systemic pathology.
2. Request processing of histochemical staining techniques appropriate to the specimen under investigation.
3. Enhance reporting skills and recognize cases in which further laboratory investigation is needed and advise accordingly.
4. Report with competence routine cases from surgical and medical practice.
5. Process, interpret and report frozen section cases under supervision.
6. Conduct a pediatric autopsy under supervision.
7. Handle specimens appropriately in specialties of muscle, nerve pathology, renal biopsies, bone, and joint diseases.
8. Enhance use of microscope to include immunofluorescence microscopy, polarization of sections and photomicrography.
9. Interpret the results of immunohistochemical and histochemical staining techniques, recognize artefacts, and identify false negative and false positive results.
10. Involve in at least 1-2 research projects.
11. Exhibit competence in FNA procedures, skin biopsies and assessment of adequacy of samples.
12. Develop competence in literature search.
13. Enhance level of competence in gynecological and non-gynecological cytology, brush and aspiration cytology.

Histopathology Rotation (1 Year)
Learning objectives for IMM (R1and R2)

S No.	Category	Topics	Knowledge base Trainees should be able to demonstrate their knowledge of or ability to:	Teaching and learning modalities	Assessment
1.	Basic Techniques	1.1 Biopsy Specimen collection	• various biopsy types and collection instructions/methods	Core lecture, self-learning	BCQ's
		1.2 Tissue fixation	• principle and importance of tissue fixation • common fixatives and their usage	Core lecture, self-learning, supervised case sign-out	BCQ's
		1.3 Gross examination and tissue sampling	• correctly identify patient details relevant to each specimen • correctly orientate specimens. • open fresh specimens • concept of inking excision margins • basic guidelines for tissue sampling of common surgical specimens • special handling of specimen for decalcification - Immunofluorescence - Muscle biopsies • Electron Microscopy • Specimen, slides, and block storage protocols	Direct observation of process and supervised surgical cut-off)	BCQ's, TOACS
		1.4 Tissue processing	• Tissue processing steps and rationale • common specimen processing protocols used in the department	Core lecture, direct observation of process	BCQ's
2.	Staining	2.1 H&E stain	• basic principle of H & E stain	Direct observation of process, self-learning	BCQ's
		2.2 Special stains (PAS, trichrome, GMS, AFB, Fite, Masson fontana etc)	• basic principle of common histochemical stains and indication of their usage	Self-learning	BCQ's, TOACS
		2.3 Immunohistochemical	• IHC staining principle and technique. • basic immunohistochemical	Core lecture, supervised case sign-out	BCQ's, TOACS

		staining, requirements, and principles	markers for major tissue and tumor types • interpretation of a basic panel of immunohistochemical markers on an undifferentiated tumor		
3.	Surgical pathology	3.1. Histopathological diagnoses of common Bacterial, Protozoal, Fungal, Viral & Parasitic Infections.	• identify common bacterial, fungal, protozoal, viral, and parasitic infections. Examples: Helicobacter pylori, Candida, Aspergillus, Herpes, Cytomegalovirus, Ameoba, helminths etc	Supervised case sign-out, Self-learning	BCQ's, SAQ's, TOACS
		3.2. Cancer reporting protocols and checklist	• Collage of American pathologist (CAP) cancer reporting protocols for - Head and neck tumors - Breast - Gastrointestinal tract - Female genital tract - Male genital tract - Urinary system	Supervised case sign-out	BCQ's, SAQ's, TOACS
		3.3. Common Benign, Pre-malignant and malignant lesions of (Head and neck, Breast, Gastrointestinal trac, Female genital tract, Male genital tract and urinary system).	• Etiology pathogenesis diagnosis of: **Head & Neck:** • Oro-pharyngeal carcinoma • Precursor lesions **Breast:** • Fibroadenoma • Phlloydes tumor • Ductal and lobular carcinoma in situ • Invasive ductal and lobular carcinoma **Lung:** • Adenocarcinoma • Squamous cell carcinoma • Small cell arcinoma • Metastatic carcinoma **GIT:** **Esophagus**: • Esophagitis (Reflux/ Herpes / candida)	Self-learning, Supervised case sign-out	BCQ's, SAQ's, TOACS

			• Barrett's esophagus with dysplasia • Carcinoma esophagus **Stomach:** • Gastritis (Types) H. Pylori infection / gastritis. • Adenocarcinoma **Small Intestine / Large Bowel**: • Coeliac disease • Polyps • Inflammatory bowel disease • Adenocarcinoma **Appendix:** • Acute appendicitis • Neuroendocrine tumors **Gall Bladder**: • Cholecystitis • Carcinoma Gall Bladder **Liver and pancreas:** • Hepatocellular carcinoma • Pancreatic adenocarcinoma **Female genital system**: • Endometrium; Normal phases of menstrual cycle • Polyp/Hyperplasia • Endometrial cancer **Hematolymphoid tumors** • Hodgkin's disease • Common B cell and T cell non-Hodgkin's lymphomas **Skin cancer:** • Squamous cell carcinoma • Basal cell carcinoma • Malignant melanoma		
		3.4 Cancer grading and Staging	Principles of cancer grading and staging	self-learning and Supervised sign-outs	BCQ's, SAQ's

		3.5 Cancer epidemiology and Role of Population based, Pathology based & Hospital based Cancer Registries	• Concept, importance and functioning of cancer registries	Core lecture	BCQ's
4.	Frozen Section		• Principles, Steps, indications, and interpretation of frozen section technique, (requirement from surgeon, liaison with surgeon, conveying of report etc.)	Direct observation of process under supervision, supervised case sign-out.	BCQ's, SAQ's, TOACS
5.	Cytopathology	5.1 Cervical Cytopathology	• The pathogenesis of cervical carcinoma • The process by which cervical screening prevents the development of cervical carcinoma. • Technique and slide preparation of a PAP smear. • Recognize normal cellular components in cervical specimens. • The principles of assessing adequacy of a cervical specimen • Basic reporting categories (Bethesda system of reporting cervical cytology)	Self-learning, Direct observation of procedure, supervised screening of selected cases.	BCQ's, SAQ's, TOACS
		5.2 Non cervical cytology	• Perform FNAC followed by smear preparation and assessment of adequacy.	Hands on supervised teaching/learning	BCQ's, SAQ's, TOACS
6.	Quality Control in Histopathology		• Common Policies and procedure of Quality control	Direct observation of process during rotation through different sections, Core lecture	BCQ's, SAQ's

End of year objectives for Minor Rotating Residents Yr. 1 and 2 (3 Months):

During the four months rotation through histopathology, the residents will be required to follow the underlying protocol.

1. Observe gross cut up, frozen sections, fine needle aspiration (FNA) and other laboratory routine for the first two weeks.
2. Perform supervised gross cut up of limited number of small biopsies (such as endometrial curetting, appendix, gall bladder, tonsils, hernial sac, hemorrhoids, GI biopsies) from 3-5th week.
3. Perform supervised reporting small biopsies (four cases per day) of selected cases daily, from week 6-10 of rotation.
4. Perform supervised screening of limited number of cytology (Gynecological and non-gynecological) cases for the last 2 weeks of rotation (week 10-12)
5. Attend all sectional and departmental academic meetings during rotation period.

Histopathology Rotation (10 WEEKS)
Learning objectives for IMM (R1and R2)

S#	Category	Topics	Knowledge base Trainees should be able to demonstrate their knowledge of or ability to:	Teaching and learning modalities	Assessment
1	Basic Techniques	1.4 Biopsy Specimen collection	• various biopsy types and collection instructions/methods	core lecture, self-learning	BCQ's
		1.5 Tissue fixation	• principle and importance of tissue fixation • common fixatives and their usage	core lecture, self-learning, supervised case sign-out	BCQ's
		1.6 Gross examination and tissue sampling	• correctly identify patient details relevant to each specimen • correctly orientate specimens. • open fresh specimens • concept of inking excision margins • basic guidelines for tissue sampling of common surgical specimens • special handling of specimen for • decalcification - Immunofluorescence - Muscle biopsies • Electron Microscopy	direct observation of process and supervised surgical cut-off)	BCQ's TOACS
		1.4 Tissue processing	• Tissue processing steps and rationale • common specimen processing protocols used in the department.	core lecture, direct observation of process	BCQ's
2	Staining	2.1 H&E stain	• basic principle of H & E stain	direct observation of process, self-learning	BCQ's
		2.2 Special stains (PAS, trichrome, GMS, AFB, Fite, Masson Fontana etc.)	• basic principle of common histochemical stains and indication of their usage	self-learning	BCQ's, TOACS
		2.3 Immunohistochemical staining, requirements, and principles	• IHC staining principle and technique. • basic immunohistochemical markers for major tissue and tumor types • interpretation of a basic panel of immunohistochemical markers on an undifferentiated tumor	core lecture, supervised case sign-out	BCQ's, TOACS
3.	Surgical pathology	3.1. Histopathological diagnoses of common Bacterial, Protozoal, Fungal, Viral & Parasitic Infections.	• identify common bacterial, fungal, protozoal, viral, and parasitic infections. Examples: Helicobacter pylori, Candida, Aspergillus, Herpes, Cytomegalovirus, Ameoba, helminths etc.	supervised case sign-out, self-learning	BCQ's, SAQ's, TOACS

		3.2. Common Benign, Pre-malignant and malignant lesions of all organs particularly of top 10 cancers in Males & Females.	• etiology/pathogenesis/diagnosis of: **Head & Neck:** • Oro-pharyngeal carcinoma • Precursor lesions **Breast:** • Fibroadenoma • Phlloydes tumor • Ductal and lobular carcinoma in situ • Invasive ductal and lobular carcinoma **Lung:** • Adenocarcinoma • Squamous cell carcinoma • Small cell carcinoma • Metastatic carcinoma **GIT:** **Esophagus**: • Esophagitis (Reflux/ Herpes / candida) • Barrett's esophagus with dysplasia • Carcinoma esophagus **Stomach:** • Gastritis (Types) H. Pylori infection / gastritis. • Adenocarcinoma **Small Intestine / Large Bowel**: • Coeliac disease • Polyps • Inflammatory bowel disease • Adenocarcinoma **Appendix:** • Acute appendicitis • Neuroendocrine tumors **Gall Bladder**: • Cholecystitis • Carcinoma Gall Bladder **Liver and pancreas:** • Hepatocellular carcinoma • Pancreatic adenocarcinoma **Female genital system**: • Endometrium; Normal phases of menstrual cycle • Polyp/Hyperplasia • Endometrial cancer **Hematolymphoid tumors** • Hodgkin's disease • Common B cell and T cell non-Hodgkin's lymphomas **Skin cancer:**	self-learning, supervised case sign-out	BCQ's, SAQ's, TOACS

			• Squamous cell carcinoma • Basal cell carcinoma • Malignant melanoma		
		3.3 Cancer grading and Staging	Principles of cancer grading and staging	self-learning and Supervised sign-outs	BCQ's, SAQ's
		3.4 Cancer epidemiology and Role of Population based, Pathology based & Hospital based Cancer Registries	• Concept, importance and functioning of cancer registries	Core lecture	BCQ's
4	Frozen Section		• Principles, Steps, indications, and interpretation of frozen section technique, (requirement from surgeon, liaison with surgeon, conveying of report etc.)	Direct observation of process under supervision	BCQ's, SAQ's, TOACS
5	Cytopathology	5.1 Cervical Cytopathology - Cervical screening	• The pathogenesis of cervical carcinoma • The process by which cervical screening prevents the development of cervical carcinoma. • Technique and slide preparation of a PAP smear. • Recognize normal cellular components in cervical specimens. • The principles of assessing adequacy of a cervical specimen • Basic reporting categories (Bethesda system of reporting cervical cytology)	Self-learning, Direct observation of procedure, supervised screening of selected cases.	BCQ's, SAQ's, TOACS
		- Non cervical cytology	• Perform FNAC followed by smear preparation and assessment of adequacy.	Hands on supervised teaching/learning	BCQ's, SAQ's, TOACS
6	Quality Control in Histopathology		• Common Policies and procedure of Quality control	Direct observation of process during rotation through different sections, Core lecture	BCQ's, SAQ's

HISTOPATHOLOGY

Year Three

At the end of year three, every resident should be able to:

1. Report under supervision with full competence, routine surgical specimens including neoplastic and non-neoplastic pathology of soft tissue, gastroenterology, pulmonology, gynecology, urinary tract pathology, dermatopathology, etc. along with frozen section cases.
2. Identify cases which require referral for second opinion and know which individuals or centers have the appropriate expertise.
3. Identify and treat appropriately, material requiring further investigation by specialized techniques whether these are locally available or not.
4. Participate in research activities.
5. Prepare appropriate visual aids for clinico-pathologic meetings (gross specimen, photographs) and present these.
6. Extend knowledge and skills in gynecologic and non-gynecological cytology, brush and aspiration cytology. Develop full competence in reporting routine material.
7. Begin to participate in undergraduate teaching.

Year Four

At the end of year four, every resident should be able to:

1. Develop an interest in a sub-specialty or field to a level of being able to act as a local expert.
2. Show competence in reporting gynecological, non-gynecological and aspiration cytology.
3. Address issues on etiology, pathogenesis, and pathology of disease without preparation.
4. Explain the values and limitations of histopathological investigation and convey the degree of certainty pertaining to a particular problem.
5. Submit/publish 2 research projects in peer reviewed journals.
6. Involve actively in undergraduate teaching.

Year Five

At the end of year five, every resident should be able to:

1. Appear in / cleared FCPS Part II examination.
2. Develop a sub-specialty or field to a level of being able to ultimately act as a local expert.
3. Show Competence in reporting gynecological, non-gynecological and aspiration cytology.
4. Supervise junior residents.
5. Advice regarding the value and limitation of histopathological investigations with awareness of one's limitations including frozen sections.
6. Perform / analyze a quality control review of sections.
7. Must have submitted / published research projects in peer reviewed journals.
8. Must have submitted at least one research grant.
9. Involve actively in undergraduate teaching.
10. Involve in teaching / training of junior residents and technologist.

Teaching and learning modalities in Histopathology:

1. **Routine work:** the most important learning experience will be day-to-day work. Histopathology trainees are amongst the most closely supervised groups in postgraduate medical training. This close supervision allows frequent short episodes of teaching.

2. **Departmental teaching sessions:** Tuesday slide seminars (topic based), Wednesday journal clubs and slide sessions and cytology sessions are intended for residents to cover various topics and present them.

3. **Multidisciplinary team meetings (MDTs):** attendance at and contribution to MDTs and clinicopathological conferences offers the opportunity for trainees to develop an understanding of clinical management and appreciate the impact of histopathological diagnosis on patient care. The MDT is also an important arena for the development of inter-professional communication skills.

4. **Self-study:** histopathology departments have a wide range of reference textbooks and journals (both hard copies and online) available. These allow trainees to 'read around' routine cases that they are reporting.

5. **Regional, National, and International scientific meetings and training courses:** These are valuable learning opportunities for trainees to participate and present their scientific work.

Schedule of learning and teaching activities/meetings in Histopathology - Interdepartmental and intradepartmental:

1. **Weekly academic activities**
   - Tuesday unknown slide sessions
   - Wednesday Journal clubs/Slide seminars
2. **Bimonthly Cytology sessions**
3. **Formal Lectures**
4. **Multidisciplinary meeting**
   - General Tumor board – Fridays (weekly)
   - Head and neck tumor board – Mondays (weekly)
   - Breast tumor board – Tuesdays (weekly)
   - Adult neuro - Oncology tumor board (Weekly)
   - Gynecology tumor board – Tuesdays (Fortnightly)
   - Urology tumor board – (Fortnightly)
   - Retinoblastoma tumor board – (Fortnightly)
   - Pediatric Oncology tumor board – Wednesdays (Monthly)
   - Orthopedic tumor board – Wednesdays (Monthly)
   - Endocrine tumor board – Thursdays (Monthly)
   - Lymphoma/Leukemia tumor board – Mondays (Monthly)

Learning Resources

The resources listed below are not compulsory nor do they necessarily cover all the anatomical pathology that a trainee should know and information for examination may come from books, especially in the sub-specialty regions of anatomical pathology, and journals outside this list.
Suggested textbooks (the latest editions)

1. **Surgical pathology:**
   - Rosai and Ackerman's Surgical Pathology (10th ed) Mosby.
   - Sternberg's Diagnostic Surgical Pathology (5th ed) Wolters Kluwer
   - Silverberg S, DeLellis R, Frable W, LiVolsi V and Wick M (2005) Silverberg's Principles and Practice of Surgical Pathology and Cytopathology. Churchill Livingstone.
   - Any other textbooks related to Anatomical/Surgical/Autopsy pathology.

2. **Cytopathology:**
   - DeMay RM (ed): The Art & Science of Cytopathology, American Society for Clinical Pathology Press, Chicago.
   - Atkinson B (2003) Atlas of Diagnostic Cytopathology. 2nd Edition. WB Saunders, Philadelphia.,
   - Cibas ES and Ducatman BS (2009) Cytology: Diagnostic Principles and Clinical Correlates (3rd ed) Saunders

Journals:

This is a very limited list and trainees should seek the advice of their supervisor as to the appropriateness of each level of training. General medical background:

- Histopathology
- American journal of surgical pathology
- Human Pathology
- Seminars in diagnostic pathology
- Acta Cytologica

Other Learning Resources

- AFIP Series of Fascicles/Tumor Atlases
- WHO Tumor Atlases
- Numerous useful web sites: Trainees should seek the advice of their supervisor as to appropriateness at each level of training.

Residents Competency List
Section of Histopathology

The level of competence to be achieved each year at our training program is specified according to the key, as follows:

Level of Supervision:

1. **Observe:** The trainees will only observe the procedure or patient care activity.
2. **Assist:** The trainee shall assist with the procedure, or the patient care activity as directed by the credentialed medical staff.
3. **Direct Supervision:** The supervising medical staff is physically present during the procedure with the postgraduate medical trainee and the patient. The supervisor is physically present in OR/SDC/Procedure Room premises.
4. **Indirect Supervision:**
    - **a.** With Direct Supervision Immediately Available: The supervising medical staff is physically present on the hospital premises and is immediately available to provide direct supervision.
    - **b.** With Direct Supervision Available: The supervising medical staff is not physically present on the hospital premises but is immediately available / accessible by means of telephonic and / or electronic modalities to provide direct supervision.
      In case it is not possible for the supervising medical staff to reach the premises in order to provide direct supervision, it will be his responsibility to ensure the direct supervision of the procedure by another credentialed medical staff.
    - **c.** Oversight: The supervising medical staff will review the procedure / patient care activity with documented feedback in the patient's medical record, provided after care is delivered.

S#	COMPETENCIES	R 1 *	R 2	R 3	R 4	R5
	CLINICAL / LAB ASSESSMENT					
1.	History Taking**	4c	4c	4c	4c	4c
2.	Physical examination**	4c	4c	4c	4c	4c
3.	Clinical Judgment**	1-4b	4b	4b	4c	4c
4.	Resolving patient queries**	1-4b	4b	4b	4c	4c
5.	Proper advice to patient / physician**	1-4b	4b	4b	4c	4c
6.	Interpreting routine laboratory test results**	1-4b	4b	4b	4c	4c
	LABORATORY PROCEDURES					
	Histopathology					
1.	Fine Needle Aspiration Cytology **	1-4a	4a	4a	4a	4a
2.	Gynecological Cytology [(a)]**	1-4a(9-5pm) 4b (5-11 pm)	4a (9-5pm) 4b (5-11pm)	4a (9-5pm) 4b (5-11pm)	4a (9-5pm) 4b (5-11pm)	4a (9-5pm) 4b (5-11pm)
3.	Skin Biopsy**	1-4a	4a	4a	4a	4a

4.	Buccal Scraping for Barr Body**	1-4a	4a	4a	4a	4a
5.	Nipple Secretion**	1-4a	4a	4a	4a	4a
6.	Scraping (Mouth, Pharynx, Buccal)**	1-4a	4a	4a	4a	4a
	Reporting and Sign-out of Test results					
7.	Reporting of surgical pathology cases	1-3	3	3	3	3
8.	Reporting of Cytopathology cases	1-3	3	3	3	3
9.	Frozen section reporting	1-3	3	3	3	3
10.	Immunofluorescence studies reporting (skin and renal biopsies)	1-3	3	3	3	3
11.	Predictive marker reporting	1-3	3	3	3	3
12.	ANA profile reporting	1-3	3	3	3	3

**** All R-1 spend an initial two months in the main laboratory after induction into the residency Program/clinical laboratories.***
***** Timings 4a 9.00 – 5.00 pm and 4b On-call timings.***
The competencies are determined by the Residency Director/Coordinator and/or nominee (at the end of initial two months of training) after assessing the theoretical and practical knowledge.

(a) Applicable to female residents only

MICROBIOLOGY

IMM Curriculum (Year 1 & II)

Microbiology resident will complete their training as follows:

- **First two months (Jan-Feb)** - Half day for Lab Procedures & half day in Microbiology section. *See Annexure 1*
- **Four Months (March-June)** : Full day in microbiology section
- **Next twelve months (July-June)**: half day rotation in other subsections of pathology (hematology, chemical pathology, histopathology – 4 months each) according to the schedule planned by Chief Resident.
- **Last six months (July-Dec)**: Full day in microbiology section.
- **IMM Exam by CPSP**

Core Contents for training in microbiology:

1. **Laboratory safety:**
   Basic bio-safety requirements include correct laboratory dress and laboratory hygiene.
   Disposal of specimens and contaminated articles (e.g. Inoculating loops, pipettes) at the laboratory bench, the dangers of aerosols and the procedures for the dealing with spillages
   Local procedures for the safe transport of specimens or cultures and with national and international postal and packaging regulations for such material
   Current requirements and recommendations of the Hazards to Health (COSHH) and WHO / CDC recommendations for specific diseases e.g. viral hepatitis HIV, prion disease, hemorrhagic fevers
   The principles and operation of microbiological safety cabinets and the procedures for their decontamination and monitoring of air flow.

2. **Microscope**
   Principles of light, dark ground, phase contrast and fluorescent microscopy and be able to set up a light microscope with dark ground and phase contrast facilities.

3. **Staining techniques**
   Routine staining techniques including fluorescent dyes, familiar with the appearance of stained preparations and be able to recognize artifacts and their possible origin.

4. **Handling of specimen:**
   Specimen type, of the optimal methods for collection, transport (including transport media), storage, identification and documentation, requirements for high-risk specimens.

5. **Identification of organisms**
   Organisms including bacteria, parasites, fungi & viruses.
   Microbial structure, physiology, and genetics.

Microbial taxonomy, classification and typing methods.
Host defense mechanism, immune system, and immunity to infection.
Microbial pathogenicity
Epidemiology of infectious diseases – their surveillance and control
Antimicrobial agents, their mode of action and mechanisms of microbial resistance
Immunological aspects of infectious diseases
Staining procedure
Biochemical tests

6. **Culture Methods**

Diversity of microbial metabolism
Selective, enriching, and inhibitory media available for general and specialized use in medical and environment laboratories.
Physical growth requirements of micro-organisms including atmosphere and optimal temperature and growth kinetics of solid phase and broth cultures.
Preparation of media in common use and understanding internal quality control.
Be able to process all common specimens, recognize potential pathogens from a mixture of colonies on culture plates, and separate such colonies in order to achieve the pure growth necessary for further work.
Principles behind multipoint identification technology.

7. **Antimicrobial investigations**

Procedure for bacterial Identification includes stereotyping and all other typing schemes both phenotypic and genotypic.
Procedure for antibiotic sensitivities of an isolate using the common techniques of disc testing and break points and principles behind multipoint sensitivity technology.
Perform and interpret MIC and MBC tests as appropriate.

8. **Mycology**

Procedure for biological samples processing, identification for fungi.
Clinical management of patients with fungal infection.

9. **Parasitology**

Procedure for biological samples processing, identification for parasites.
Clinical management of patients with parasitic infection.

10. **Virology**

Basic diagnostic virology, methodology for identification, interpretation of results, both for clinical and infection control purpose
Virology policies in relation to health care workers, pregnancy, transplantation, and immunization

11. **Environmental microbiology**

Environmental microbiology of hospital including food, water, milk, and air

Examination of common types of food, water and milk for total counts, specific organisms' detection, and special tests.

12. Anti-microbial investigations

Perform Antimicrobial assays using biological/automated techniques.
Understanding of Antimicrobial assays and their relationship to the therapeutic and toxic effects on a patient be able to advise on dosage regimens accordingly.

13. Emerging techniques

Molecular technologies are available in medical microbiology.

14. Sterilization and disinfection

Principles and uses of sterilization and disinfection procedures for the preparation of media and instruments and for microbiological waste disposal.

Objectives for IMM Year 1:					
By the end of 1st year students are expected to apply concepts of general Microbiology in practical application as laid down in the following objectives					
NOTE: Objectives shall cover by students using to all teaching methods on respective topics					
Topics	**Objectives**	**Teaching Methods**	**Facilitator**	**Teaching venue**	**Assessment Tools**
Basic structure and morphology of microorganisms	1. Relate morphology and structure of microorganisms with their staining and biochemical properties	Self-study & Hands-on & bench-side teaching	Hands-on & bench-side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:** SAQ, MCQ, **Skill: TOACS:** 1.Gram stain, 2.Kinyoun and auramine stains 3.Partial acid-fast stain
Classification & identification of microorganisms	1. Relate structural and biochemical properties of microorganisms that enable identification and classification of microorganisms	Self-study & Hands-on & bench-side teaching	Hands-on & bench-side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:** SAQ, MCQ, **Skill: TOACS:** 1. oxidase test, 2. coagulase test, 3. catalase test, 4. String test (3%KOH), 5. Performing conventional biochemical tests for GNB and GPC and result interpretation, 6. Setting API 20E, 20NE
Bacterial growth & physiology, normal habitat, and normal flora of human body	1. Relate use of different culture media/environment for isolation and identification of microorganisms with their physiology and growth properties 2. Understand the normal flora (NF) of human body and clinical conditions in which NF shows virulence	Self-study & Hands-on & bench-side teaching	Hands-on & bench-side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:** SAQ, MCQ, **Skill: TOACS:** 1. Setting up anaerobic Jar, 2. Placement of Culture and identification media on their recommended environmental condition. 3. Differentiation of normal commensal from the pathogenic organisms
Sterilization and disinfection	1. Relate principles of sterilization & disinfection methods used with the bacterial life cycle. 2. Identify types of autoclaves and different methods of sterilization and disinfection used in clinical laboratories	Core curriculum lecture & Hands-on & bench-side teaching	Core curriculum lecture by Faculty	**decide according to the availability of venue**	**Knowledge:**
			Hands-on & bench-side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	SAQ, MCQ

Antimicrobial agents	1. Classify common types of antimicrobial agents with their site of action 2. List of organisms covered by each group of antimicrobial agents	Self-study & Hands-on & bench-side teaching	Hands-on & bench-side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:** SAQ, MCQ, **Skill: TOACS:** 1. Inoculum preparation (McFarland standard), 2.Zone of Inhibition measurement and MIC reading, 3. Result interpretation of D-test, cefoxitin screening 4. Interpretation of pneumococci susceptibility to penicillin by oxacillin disc
Bacterial genetics and molecular microbiology	1. Relate different mechanisms of gene regulation with bacterial properties such as acquisition of antimicrobial resistance and altered phenotypic properties 2. Relate basic DNA and RNA structure with different amplification methods used in diagnostic microbiology 3. Identify different techniques available for post-amplification analysis in diagnostic microbiology 4. Identify role of gene sequencing in diagnostic microbiology	Self-study & Core curriculum lectures	Core curriculum lecture by Faculty	**Decide according to the availability of venue**	**Knowledge** SAQ,MCQ
Virus-cell interaction	1. Relate structure & biochemical properties with viral classification 2. Relate virus-cell interaction with the pathogenesis of the disease 3. Classify common types of antiviral agents with their site of action 4. Common spectrum of viruses covered by each group of antiviral agents 5. Identify different components of immune system activation in response to viral diseases	Self-study and Core curriculum lectures Visit to molecular pathology laboratory	Core curriculum lecture by Faculty	**decide according to the availability of venue**	**Knowledge** SAQ, MCQ,

	6. Relate role of host immune system with viral pathology (immunopathology)				
Immunology	1. Relate concepts of antigen-antibody specificity with the principles of serological assays commonly performed in microbiology laboratory 2. Relate role of innate and acquired immune system in clinical manifestation of infectious diseases (role of biochemical mediators in disease manifestation) 3. Relate principles of different hypersensitivity reactions with their clinical presentation	Self-study, Core curriculum lectures & Hands-on & bench-side teaching	Core-curriculum lecture by Faculty	**decide according to the availability of venue**	**Knowledge** SAQ, MCQ,
			bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Skill: TOACS:** 1. Salmonella, Shigella and Vibrio serology from colony 2. Performing & interpretation of ASOT from clinical sample
Laboratory biosafety	1. Identify common sources of safety hazards in diagnostic microbiology laboratory 2. Classify types of biosafety level laboratories with the risk level of organisms 3. Relate biological agents with their risk classification and requirement of personal protective equipment 4. Successfully demonstrate spill management 5. Relate use of sharps in clinical laboratory with risk of acquiring blood borne pathogens 6. Demonstrate safe handling & processing of microbiology specimen in clinical laboratory 7. Relate use of different biological	Core curriculum lecture & Hands-on & bench-side teaching	Core-curriculum lecture by Faculty	**decide according to the availability of venue**	**Knowledge:**
			Hands-on & bench-side teaching and saftey drill by Faculty\Senior Resident\senior technologist\sectional safety officer	Microbiology laboratory	SAQ, MCQ, **Skill: TOACS:** 1.Clinical Sample handling. 2. Use of PPE and Spill handling in clinical laboratory.

	safety cabinets with the risk level of organisms				

Objectives for IMM Year 2:

By the end of 2nd year students are expected to apply syndromic approach according to the organ system as laid down in the following objectives					
Topics	**Objectives**	**Teaching Methods**	**Facilitator**	**Teaching venue**	**Assessment Tools**
Learning outcome: Knowledge and application					
Meningitis and Encephalitis	Resident should be able to: 1. list causative organisms (viruses, bacteria, mycobacteria, fungi, parasites) of meningitis & encephalitis 2. relate pathogenesis of **community acquired** meningitis with the causative organism 3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of ***Streptococcus pneumoniae, Listeria monocytogenes, Neisseria meningitides, Haemophilus influenza, HSV -1 , Enterovirus, Cryptococcus neoformans, C. gattii*** **and** ***Naegleria fowleri*** Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews, Microbiology forum 4. propagate and identify the causative BACTERIAL agents using basic physiological and biochemical properties in laboratory 5. identify common diagnostic modalities used for the management of patient with acute community acquired meningitis		bench side teaching by Faculty\Senior Resident\senior technologist Tutorial by Faculty Journal Club by Faculty Journal scan by Faculty\Senior Resident Clinical case review by Faculty\ Senior resident Microbiology Forum	Microbiology laboratory Resident Area Microbiology meeting area Microbiology meeting area Microbiology meeting area Pathology Seminar Room	**Knowledge:** SAQ, MCQ, **Skill: TOACS:** 1. CSF Sample processing & media selection for culture and grams stains 2. Setting up direct suceptibility testing 3. CSF cell count on neubauer chamber 4. Gram stain result interpretation and susceptibility testing advice 5.Colony identification of Streptococcus pneumoniae, Listeria monocytogenes, Neisseria meningitides, Haemophilus influenza
Learning outcome: Knowledge and application					
Skin & soft tissue infections	Resident should be able to: 1. list causative organisms (bacteria, fungi) of skin and soft tissue infections 2. relate pathogenesis of skin & soft tissue infections with the causative organisms	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews	bench side teaching by Faculty \Senior Resident\senior	Microbiology laboratory	**Knowledge:** SAQ, MCQ, **Skill: TOACS:**

			technologist		
	3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of ***Staphylococcus aureus, Streptococcus pyogenes, pseudomonas aeruginosa*** **and dermatophytes**		Tutorial by Faculty Journal Club by Faculty Microbiology Forum Microbiology Forum Clinical case review by Faculty \ Senior resident	Resident Area Microbiology meeting area Microbiology meeting area Pathology Seminar Room Pathology Seminar Room Microbiology meeting area	1. Skin & soft tissue sample processing and media selection 2. Scotch tape preparation for dermatophytes. 3. Setting up conventional biochemical tests for Staphylococcus identification and result interpretations. 4. BHS grp A and B colony morphology identification, Lancefield grouping and identification of tests other than grouping for identification of above streptococcus species 5.Colony identification of Staphylococcus aureus, Streptococcus pyogenes and pseudomonas aeruginosa, dermatophytes
	4. propagate and identify the causative agents using basic physiological and biochemical properties in laboratory				
	5. identify common diagnostic modalities used for the management of patient with skin and soft tissue infection				
Learning outcome: Knowledge and application					
Urogenital infections	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews	bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:**
	1. list causative organisms (viruses, bacteria, mycobacteria, fungi, parasites) of urinary and genital tract infections				SAQ, MCQ,
	2. relate pathogenesis of urinary and genital tract infections with the causative organisms				**Skill: TOACS:**
	3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of **Enterobacteriace family, *Enterococcus* spp., *Streptococcus agalactiae, Neisseria gonorrhoeae,* & HSV-2**		Tutorial by Faculty	Resident Area	1. sample processing and media selection for urine and genital specimens 2. Gram stain reading and interpretation of urethral swab and High Vaginal Swab 3. Nugent scoring for Bacterial vaginosis and interpretaion. 4. Urine culture colony count and interpretation according to different loop volume

	4. describe diagnostic criteria used **for bacterial vaginosis**		Journal Club by Faculty	Microbiology meeting area	5. setting up API NH 6. Identification of Clue cells in gram smear. 7. Colony identification of Enterobacteriace family, Enterococcus spp., Streptococcus agalactiae & Neisseria gonorrhoea 8.Microscopic identification of RBC, WBC, Crystal, and Cast
	5. interpret findings of **urinalysis**		Journal scan by Faculty\Senior Resident	Microbiology meeting area	
	6. propagate and identify the causative agents using basic physiological and biochemical properties in laboratory		Clinical case review by Faculty\ Senior resident Microbiology Forum	Microbiology meeting area Pathology Seminar Room	
	7. set up and interpret API (analytic profile index) for identification of Gram-negative rods				
	8. identify common diagnostic modalities used for the management of patient with urinary and genital tract infection				
Gastrointestinal infections	**Learning outcome: Knowledge and application**				
	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews	bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:**
	1. list causative organisms (viruses, bacteria, parasites,fungus) of GI infections				
	2. relate pathogenesis of non-inflammatory diarrhea, inflammatory enteritis, and enteric fever with the common causative organisms				SAQ
	3. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of ***Salmonella, Shigella, Campylobacter, Vibrio, Aeromonas, Helicobacter pylori, Clostridium difficile, Entamoeba, Giardia, Rota, and adeno virus***		Tutorial by Faculty	Resident Area	**Skill: TOACS:**
	-AND pathogenesis of organisms associated with **food poisoning**				

	4. Propagate and identify the causative agents using basic physiological and biochemical properties in laboratory 5. Identify common diagnostic modalities used for the management of patient non-inflammatory diarrhea, inflammatory enteritis, and enteric fever 6. Microscopic identification of ova and enteric parasites **(Protozoa – *Entamoeba histolytica, Entamoeba coli, Iodamoeba butschlii, Endolimax nana, Giardia intestinalis*) (Nematodes – Ascaris lumbricoides, Enterobius vermicularis)**		Journal Club by Faculty Journal scan by Faculty\Senior Resident Microbiology Forum Clinical case review by Faculty\ Senior resident	Microbiology meeting area Microbiology meeting area Pathology Seminar Room Microbiology meeting area	1. Sample processing and media selection for GI specimens 2. Ova and Parasite identification, 3. Stool analysis by concentration method, 4. setting Jar for Campylobacter, 5. Colony identification of Salmonella, Shigella, Campylobacter, Vibrio, Aeromonas
Respiratory tract infection	**Learning outcome: Knowledge and application**				
	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews	bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:**
	1. list causative organisms (viruses, bacteria, mycobacteria, fungi) of upper and lower **Community Acquired** respiratory tract infections				
	2. Relate pathogenesis and common causative organism of **UPPER RESPIRATORY TRACT INFECTIONS** including **acute pharyngitis, sinusitis** and **mastoiditis, otitis media** and **otitis interna**				SAQ
	3. Relate pathogenesis and common causative organisms of acute pneumonia with the common causative organisms in different age groups.		Tutorial by Faculty	Resident Area	**TOACS: Skill**
	4. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis,		Journal Club by Faculty	Microbiology meeting area	1. Sample processing and media selection for respiratory specimens

	disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of **BHS; A-G, Streptococcus pneumoniae, Hemophilus spp, Moraxella spp, Chlamydia trachomatis, Mycoplasma, Corynebacterium diphtheriae, Bordetella pertussis, RSV and Influenza virus** 5. Propagate and identify the BACTERIAL causative agents using basic physiological and biochemical properties in laboratory 6. Identify common diagnostic modalities used for the management **acute pharyngitis, sinusitis** and **mastoiditis, otitis media** and **otitis interna and acute pneumonia** 7. Basic laboratory diagnostic procedure and principal (Staining, culture and identification) of commonly isolated **Mold and Mycobacterium**		Journal scan by Faculty\Senior Resident Clinical case review by Faculty\ Senior resident Microbiology Forum	Microbiology meeting area Pathology Seminar Room	2. Acceptability criteria for respiratory specimens 3. Lancefield grouping, 4. Identification tests and their interpretation for Streptococcus pneumoniae, Hemophilus spp, Moraxella spp, 5. Gram stain interpretation for quality of smear 6. colony identification of BHS; A-G, Streptococcus pneumoniae, Hemophilus spp, Moraxella spp, Corynebacterium diphtheriae 7. Observation of BSL-lll safety measures 8. Digestion and decontamination of sample 9. Smear preparation, Kinyoun & fluorescent staining and Microscopic observation and interpretation 10. Culture media used for isolation MTB MTB - Culture and susceptibility reading and interpretation. 11. Identification of MTB

Endovascular infections, sepsis, and PUO	**Learning outcome: Knowledge and application**				
	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan,			**Knowledge:**
	1. list causative organisms of endovascular infections (bacteria and fungi), PUO and malaria		Self-study	Self-study	SAQ
	2. Relate pathogenesis of endocarditis and intravascular infections with the common causative organisms		bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**TOACS: Skill**

	3. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of **Streptococcus viridans, Coagulase negative Staphylococcus and Candida species**	Clinical case reviews	Tutorial by Faculty	Resident Area	1. Processing of central line tip and their result interpretation 2. Processing and media selection for blood culture 3. Penicillin E-test MIC reading and interpretation 4. colony identification of Streptococcus viridans, Coagulase negative Staphylococcus and Common Candida species on BiGGY agar and CMT
	4. Propagate and identify the causative agents using basic physiological and biochemical properties in laboratory		Journal Club by Faculty	Microbiology meeting area	
	5. Identify common diagnostic modalities used for the management of endovascular infections, PUO and malaria (including rapid diagnostic tests for malaria)		Journal scan by Faculty\Senior Resident	Microbiology meeting area	
	6.Principle of Continuous blood culture monitoring system		Clinical case review by Faculty\ Senior resident	Microbiology meeting area	
			Microbiology Forum	Pathology Seminar Room	

Infectious serology	**Learning outcome: Knowledge and application**				
	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews	bench side teaching by Faculty\Senior Resident\senior technologist	Microbiology laboratory	**Knowledge:**
	1. Principle of Serological testing				SAQ
	2. Precipitation and agglutination reactions				**TOACS: Skill**
	3. Enzyme immunoassays and its type		Tutorial by Faculty	Resident Area	1. Performing and interpretation of C.difficile, Rota and adeno virus serological tests 2. Dengue serology and their result interpretation, 3. Result interpretation of Syphilis serology (RPR, TPHA,FTA), HBV, HCV,CCHF, Chikungunya
	4. Following Serological diagnosis technique:		Journal Club by Faculty	Microbiology meeting area	
	o ICT e.g. Dengue NS 1 Antigen		Journal scan by Faculty\Senior Resident	Microbiology meeting area	
	o Elisa e.g. *H. pylori* antibody, *E. histolytica* antibody		Clinical case review by Faculty\ Senior resident	Microbiology meeting area	
	o IHA e.g. TPHA				
	o Agglutination e.g. Giardia antigen and ASOT				

	5. Serological diagnosis of non-culturable microorganisms Treponema pallidium, legionella pneumophila, HBV, HCV,HIV		Microbiology Forum	Pathology Seminar Room	

Objectives for IMM ------ (Residents Rotating in Microbiology Section)

NOTE: Objectives shall cover by students using to all teaching methods on respective topics

Topics	Objectives	Teaching Methods	Associated Skills to Learn	Bench	Assessment Tools
Classification & identification of microorganisms	1. Relate structural and biochemical properties of microorganisms that enable identification and classification of microorganisms	Self-study & Hands-on & bench-side teaching	1. oxidase test, 2. coagulase test, 3. catalase test, 4. String test (3%KOH) and result interpretation 5. Performing conventional biochemical tests for GNB and GPC and result interpretation, 6. Setting API 20E, 20NE	Bacteriology	MCQ
Bacterial growth & physiology, normal habitat and normal flora of human body	1. Relate use of different culture media/environment for isolation and identification of microorganisms with their physiology and growth properties	Self-study & Hands-on & bench-side teaching	1. Setting up anaerobic Jar,		MCQ
	2. Understand the normal flora (NF) of human body and clinical conditions in which NF shows virulence		2. Placement of Culture and identification media in their recommended environmental condition, 3. Differentiation of normal commensal from the pathogenic organisms.	Bacteriology Mycology	
Antimicrobial agents	1. Classify common types of antimicrobial agents with their site of action	Self-study & Hands-on &	1. Inoculum preparation (McFarland standard),		MCQ

	2. List of organisms covered by each group of antimicrobial agents	bench-side teaching	2. Zone of Inhibition measurement and MIC reading, 3. Result interpretation of D-test, cefoxitin screening 4. Interpretation of pneumococci susceptibility to penicillin by oxacillin disc	Bacteriology Mycology	
Virus-cell interaction	1. Relate structure & biochemical properties with viral classification 2. Relate virus-cell interaction with the pathogenesis of the disease 3. Classify common types of antiviral agents with their site of action 4. Common spectrum of viruses covered by each group of antiviral agents 5. Identify different components of immune system activation in response to viral diseases 6. Relate role of host immune system with viral pathology (immunopathology)	Self-study and Core curriculum lectures			MCQ
Immunology	1. Relate concepts of antigen-antibody specificity with the principles of serological assays commonly performed in microbiology laboratory 2. Relate role of innate and acquired immune system in clinical manifestation of infectious diseases (role of biochemical mediators in disease manifestation) 3. Relate principles of different hypersensitivity reactions with their clinical presentation	Self-study, Core curriculum lectures & Hands-on & bench-side teaching	1. Salmonella, Shigella and Vibrio serology from colony, 2. Performing & result interpretation of ASOT from clinical sample.	Bacteriology Serology	MCQ
Laboratory biosafety	1. Identify common sources of safety hazards in diagnostic microbiology laboratory	Core curriculum lecture &	1. Handling Spill management	Bacteriology	MCQ

	2. Classify types of biosafety level laboratories with the risk level of organisms	Hands-on & bench-side teaching	2. Types of disinfectants used in laboratory and their preparation		
	3. Relate biological agents with their risk classification and requirement of personal protective equipment		3. Procedure of disposal of patients' sample, culture plates		
	4. Successfully demonstrate spill management		4. Use of PPE		
	5. Relate use of sharps in clinical laboratory with risk of acquiring blood borne pathogens				
	6. Demonstrate safe handling & processing of microbiology specimen in clinical laboratory				
	7. Relate use of different biological safety cabinets with the risk level of organisms				
Meningitis and Encephalitis	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews, Microbiology forum	1. CSF Sample processing & media selection for culture and grams stains	Processing	MCQ
	1. list causative organisms (viruses, bacteria, mycobacteria, fungi, parasites) of meningitis & encephalitis		2. Setting up direct susceptibility testing		
	2. relate pathogenesis of **community acquired** meningitis with the causative organism		3. CSF Sample processing for culture and grams stains.		
	3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of *Streptococcus pneumoniae, Listeria monocytogenes, Neisseria meningitides, Haemophilus influenza, HSV -1 , Enteroviru, Naegleria fowleri*		4. Gram stain result interpretation and susceptibility testing advice	Bacteriology	
	4. propagate and identify the causative BACTERIAL agents using basic physiological and biochemical properties in laboratory		5. Colony identification of Streptococcus pneumoniae, Listeria monocytogenes, Neisseria meningitides,		

	5. identify common diagnostic modalities used for the management of patient with acute community acquired meningitis		Haemophilus influenza,		
Skin & soft tissue infections	Resident should be able to:	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews, Microbiology forum	1. Skin & soft tissue sample processing and media selection	Bacteriology	MCQ
	1. list causative organisms (bacteria, fungi) of skin and soft tissue infections		2. Scotch tape preparation for dermatophytes.	Mycology	
	2. relate pathogenesis of skin & soft tissue infections with the causative organisms		3. Setting up conventional biochemical tests for Staphylococcus identification and result interpretations.		
	3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of ***Staphylococcus aureus, Streptococcus pyogenes*** **and** ***pseudomonas aeruginosa, dermatophytes***		4. BHS grp A and B colony morphology identification, Lancefield grouping and identification of tests other than grouping for identification of above streptococcus species		
	4. propagate and identify the causative agents using basic physiological and biochemical properties in laboratory		5. Colony identification of Staphylococcus aureus, Streptococcus pyogenes and pseudomonas aeruginosa, dermatophytes		
	5. identify common diagnostic modalities used for the management of patient with skin and soft tissue infection				

Cogenital infections	Resident should be able to: 1. list causative organisms (viruses, bacteria, mycobacteria, fungi, parasites) of urinary and genital tract infections 2. relate pathogenesis of urinary and genital tract infections with the causative organisms 3. describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of **Enterobacteriace family, *Enterococcus* spp., *Streptococcus agalactiae, Neisseria gonorrhoeae,* & HSV-2** 4. describe diagnostic criteria used **for bacterial vaginosis** 5. interpret findings of **urinalysis** 6. propagate and identify the causative agents using basic physiological and biochemical properties in laboratory 7. set up and interpret API (analytic profile index) for identification of Gram negative rods 8. identify common diagnostic modalities used for the management of patient with urinary and genital tract infection	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews, Microbiology forum	1. Sample processing and media selection for urine and genital specimens 2. Gram stain reading and interpretation of urethral swab and High Vaginal Swab 3. Nugent scoring for Bacterial vaginosis and interpretaion. 4. Urine culture colony count and interpretation according to different loop volume 5. Setting up API NH 6. Identification of Clue cells in gram smear. 7. Colony identification of Enterobacteriace family, Enterococcus spp., Streptococcus agalactiae & Neisseria gonorrhoeae 8. Microscopic identification of RBC, WBC, Crystal and Cast	Bacteriology	MCQ
Gastrointestinal infections	**Resident should be able to:** 1. list causative organisms (viruses, bacteria, parasites,fungus) of GI infections 2. relate pathogenesis of non-inflammatory diarrhea, inflammatory enteritis and	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal	1. Sample processing and media selection for GI specimens 2. Ova and Parasite identification, 3. Stool analysis by concentration method, 4. setting Jar for Campylobacter,	Bacteriology Parasitology	MCQ

	enteric fever with the common causative organisms 3. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy and mechanism of drug resistance) of **Salmonella**, **Shigella**, **Campylobacter**, **Vibrio**, **Aeromonas**, **Helicobacter pylori**, **Clostridium difficle**, **Entamoeba**, **Giardia**, rota and adeno virus -AND pathogenesis of organisms associated with **food poisoning** 4. Propagate and identify the causative agents using basic physiological and biochemical properties in laboratory 5. Identify common diagnostic modalities used for the management of patient non-inflammatory diarrhea, inflammatory enteritis and enteric fever 6. Microscopic identification of ova and enteric parasites **(Protozoa – *Entamoeba histolytica, Entamoeba coli, Iodamoeba butschlii, Endolimax nana, Giardia intestinalis*) (Nematodes – Ascaris lumbricoides, Enterobius vermicularis)**	scan, Clinical case reviews, Microbiology forum	5. colony identification of common enteric bacteria 6. Colony identification of Salmonella, Shigella, Campylobacter, Vibrio, Aeromonas		
Respiratory tract infection	**Resident should be able to:** 1. list causative organisms (viruses, bacteria, mycobacteria, fungi) of upper and lower **Community Acquired** respiratory tract infections 2. Relate pathogenesis and common causative organism of **UPPER RESPIRATORY TRACT INFECTIONS** including **acute pharyngitis,**	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case	1. Sample processing and media selection for respiratory specimens 2. Acceptability criteria for respiratory specimens 3. Lancefield grouping, 4. Identification tests and their interpretation for Streptococcus	Bacteriology	MCQ

	sinusitis and **mastoiditis, otitis media** and **otitis internal** 3. Relate pathogenesis and common causative organism of acute pneumonia with the common causative organisms in different age groups. 4. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of **BHS; A-G, Streptococcus pneumoniae, Hemophilus spp, Moraxella spp, Chlamydia trachomatis, Mycoplasma, Corynebacterium diphtheriae, Bordetella pertussis, RSV and Influenza virus** 5. Propagate and identify the BACTERIAL causative agents using basic physiological and biochemical properties in laboratory 6. Identify common diagnostic modalities used for the management **acute pharyngitis, sinusitis** and **mastoiditis, otitis media** and **otitis interna and acute pneumonia** 7. Basic laboratory diagnostic procedure and principal (Staining, culture and identification) of commonly isolated **Mold and Mycobacterium**	reviews, Microbiology forum	pneumoniae, Hemophilus spp, Moraxella spp, 5. Gram stain interpretation for quality of smear 6. colony identification of BHS; A-G, Streptococcus pneumoniae, Hemophilus spp, Moraxella spp, Corynebacterium diphtheriae 7. Observation of BSL-lll safety measures 8. Digestion and decontamination of sample 9. Smear preparation, Kinyoun & fluorescent staining and Microscopic observation and interpretation 10. Culture media used for isolation MTB MTB - Culture and susceptibility reading and interpretation. 11. Identification of MTB		
Endovascular infections, sepsis, and PUO	**Resident should be able to:** 1. list causative organisms of endovascular infections (bacteria and fungi), PUO and malaria 2. Relate pathogenesis of endocarditis and intravascular	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan,	1. Processing of central line tip and their result interpretation, 2. Processing and media selection for blood culture 3. Penicillin E-test MIC reading and interpretation	Bacteriology Mycology	MCQ

	infections with the common causative organisms	Clinical case reviews, Microbiology forum			
	3. Describe in detail the microbiology (habitat, morphology, virulence factors, pathogenesis, disease, laboratory diagnostic features, preventive measures, antimicrobial therapy, and mechanism of drug resistance) of **Streptococcus viridans, Coagulase negative Staphylococcus and Candida species**		4. colony identification of Streptococcus viridans, Coagulase negative Staphylococcus and Common Candida species on BiGGY agar and CMT		
	4. Propagate and identify the causative agents using basic physiological and biochemical properties in laboratory				
	5. Identify common diagnostic modalities used for the management of endovascular infections, PUO and malaria (including rapid diagnostic tests for malaria)				
	6.Principle of Continuous blood culture monitoring system				
Infectious serology	**Resident should be able to:**	Hands-on & bench-side teaching, tutorial, Self-study, Journal club, Journal scan, Clinical case reviews, Microbiology forum	1. Performing and interpretation of C.difficile, Rota and adeno virus serological tests 2. Dengue serology and their result interpretation, 3. Result interpretation of Syphilis serology (RPR, TPHA,FTA) 4.Result interpretation of HBV, HCV,CCHF, Chikungunya.	Serology	MCQ
	1. Principle of Serological testing				
	2. Precipitation and agglutination reactions				
	3. Enzyme immunoassays and its type				
	4. Following Serological diagnosis technique:				
	o ICT e.g. Dengue NS 1 Antigen				
	o Elisa e.g. *H. pylori* antibody, *E. histolytica* antibody				
	o IHA e.g. TPHA				
	o Agglutination e.g. Giardia antigen and ASOT				
	5. Serological diagnosis of non-culturable microorganisms Treponema pallidium, legionella pneumophila, HBV, HCV,HIV				

Objectives:

For first two years (For IMM):

- Completion and submission of synopsis of dissertation or research papers.
- Learning outcomes – Knowledge

At the end of year 2 training resident should be able to:

- Understand Organization of the clinical microbiology laboratory, quality assurance
- Implement Safety in microbiology laboratory.
- Laboratory strategy in the diagnosis of infective syndromes
- Specimen collection, transport, culture containers and classification of media
- Culture of bacteria, fungus, and mycobacterium
- Staining principles in bacteriology, mycology, mycobacteriology, and parasites (enteric and blood).
- Tests for the identification of bacteria, fungus, and mycobacterium
- Principles of different antimicrobial susceptibility testing methods.
- Some serological techniques for microbial and viral infections
- Nucleic acid technique
- Classification, cell wall structure and virulence factors associated with most common bacteria, fungus, parasites, and viruses causing human infections.

- Learning outcomes – Skills
  - Sample processing methods and techniques (quantitative and semi-quantitative).
  - Culture plates streaking methods.
  - Handling and usage of binocular compounds, fluorescence microscopy and other instruments use in microbiology.
  - Different staining methods and their principles in Bacteriology, mycology, and mycobacteriology.
  - Colony morphology identification of bacteria on different plates.
  - Interpretation of semi-quantitative and quantitative growth
  - Biochemical test and their interpretations for the most common bacteria and fungus causing infections in humans.
  - Communication with primary physician and patient's history taking.

List of Bacteria, Parasites and Viruses for Year 1 and 2 (For IMM)

Bacteria:

- Gram positive cocci; Staphylococci; Coagulase positive as well as negative, Streptococci including Streptococcus pneumoniae and enterococcus.
- Gram positive bacilli; Corynebacteria and Bacillus.
- Gram negative cocci; Neisseria meningitidis, Neisseria gonorrhoea, and Moraxella
- Gram negative bacilli; Pathogenic vibrios, Campylobacter sp., Helicobacter sp., Enterobacteriaceae, Pseudomonas species, Acenitobacter sp., Salmonella, Shigella, Haemophilus sp., Brucella sp., Yersinia sp., and Legionella.
- Spirochetes.; Treponema sp., Leptospira and Borellia
- Anaerobic bacteria; Clostridia and anaerobic gram negative rods.
- Mycobacteria; M. tuberculosis, M. leprae, atypical mycobacteria
- Nocardia and Actinomycetes.

Parasites:

- Amoeba sp., Plasmodia sp.,Leishmania sp.,Toxoplasma gondii,Pneumocystis carinii, Trichomonas, Helminths

Mycology:

- Candida sp., Aspergillus sp., Agents of mycetoma, Cryptococcus neoformans, Histoplasma capsulatum, Dermatophytes, Agents of Mucormycosis

Virology:

- Basic classification of viruses, Major DNA and RNA viruses

During the four months rotation through Microbiology the residents will be required to know about:

1. Names and test principles performed in different subsections of microbiology. (Bacteriology, Mycology, Mycobacteriology, Serology, Food QC, Urine analysis and Parasitology)
2. The Principles *of Good Microbiology Practices*.
3. Proper specimen collection procedures for different microbiology tests. (blood cx, sputum cx, urine cx, wound swab, throat swab)
4. Identification protocols and disease spectrum for the following key organisms:
   Streptococcus *pneumonia*
   a. Haemophilus *influenza/parainfluenzae*
   b. Staphylococcus *aureus* (Methicillin Sensitive and Methicillin Resistant)
   c. Escherichia *coli*
   d. Pseudomonas *aeruginosa*
   e. Salmonella *typhi/paratyphi*
   f. Vibrio *cholera*
   g. Neisseria species (*Gonorrhea, Meningitidis)*
   h. Candida *species (albican vs. nonalbican)*
   i. Filamentous mold (Aspergillus)
5. Biosafety levels and their working requirement including personnel protective equipment (PPE)
6. Types of biosafety cabinets. How to work in a biosafety cabinet?
7. Types of staining and its principles. Hands on experience. (Gram's, Kinyoun, partial acid fast, Calcofluor, Lactophenol cotton blue, KOH, India ink)
8. Classifying culture media on the basis of different principles. Details of the following culture media:
   a. CLED
   b. MacConkey Agar
   c. Sheep Blood Agar
   d. Chocolate Agar
   e. Mueller Hinton Agar
9. Principles and usage of common biochemical tests for identification of microorganisms:

a. API (Analytical profile index)
b. SIM (Sulphide-Indole-Motility)
c. Urea
d. Triple Sugar Iron (TSI)
e. Citrate
f. Coagulase
g. Catalase
h. Bile Esculin hydrolysis
i. Optochin susceptibility

10. Principles and methods of antimicrobial susceptibility testing (AST) (Disc Diffusion and MIC)
11. Interpretation of microbiology culture and serology results.
12. Common Gastrointestinal parasites, diagnostic forms, and life cycle.
13. Urine detail reports, interpretation of biochemical and microscopic parameters correlating with different clinical conditions.
14. Basic classification of fungus.
15. Gross and microscopic description of clinically common types of fungus (candida and filamentous molds).
16. Germ tube test (performance and interpretation).
17. Reading and Interpretation of Kinyoun stains.
18. Procedures and principles of handling microbiological waste.

All rotating residents will be evaluated at the end of rotation and will be assessing themselves during the rotation according to the level of competence achieved in both procedural and construal skills. Level of competence will be graded as 1-4 by the supervisor; levels are incrementally added on one another. A resident can only achieve level 2 if level 1 has previously been satisfactorily achieved.
LEVEL 1: Able to observe only.
LEVEL 2: Able to understand the basics behind the procedure.
LEVEL 3: Able to perform the procedure under observation.
LEVEL 4: Able to perform procedures independently.
LEVEL 5: Able to supervise procedures.
During the rotation, 01 journal club presentation and 02 journal scan presentation is mandatory.
It will be the resident's responsibility to submit the presentation papers/ generic topics to the department at the end of the rotation.

Rotation Schedule:

Week 1& 2:
Join the Phase 1 student rotation. All residents will have to submit a signed phase 1 rotation sheet. All bench sessions must be signed by the facilitators for residents to quality for week 3 activities.

Week 3-6: Core Skills:
Procedural skill

- Manual Gram stain (any specimen)
- Kinyoun stain

- Differentiation b\w lactose fermenting and non-lactose fermenting on CLED & MAC
- Differentiation b\w beta hemolytic and alpha hemolytic colonies on blood agar
- Measuring Zone of inhibition on different susceptibility plates
- Culture inoculation (Streak plate method)
- ICT Malaria
- Urinalysis
- Stool D/R

<u>Week 6-10</u>: Construal skills:

Construal skill

- Bacteremia
- (Interpretation of blood culture gram stains on BLCS bench)
- Meningitis
- (Interpretation of CSF D\R, microscopy, and culture on Wound CS bench)
- Pneumonia
- (Interpretation of Sputum and respiratory specimen, gram stain and culture on NTS-X bench)
- UTI
- (Interpretation of urinalysis and urine culture on urine CS bench)
- Infectious Diarrhea
- (Stool DR interpretation and Stool culture on Stool CS bench)

<u>Week 11:</u> Tuberculosis

Safety rules:

- Please save the same N-95 respirator mask throughout the week and observe all BSL-3 protocol strictly.
- All residents will only achieve observer status. The resident will also assist the TB bench staff in smear and culture informing under supervision of the TB bench resident.
- However, essential core knowledge of the following will be assessed at the end of rotation.
    - Principle of AFB staining
    - Ziehl-Neelsen, Kinyoun and Auramine-rhodamine staining

<u>Week 12</u>: Mycology and End of rotation evaluation

As above, for mycology, the residents will also only achieve observer status and have the same responsibilities as for the TB bench. However, essential core knowledge of the following will be assessed at the end of rotation.

- Principle of KOH and Lactophenol cotton blue smear.

End –of-rotation evaluation: Please contact the faculty (Dr. Mohammad Zeeshan, or other designated faculty in her absence) for evaluation.

1. Theory exam (SAQ/MCQ)
2. Bench Skill
3. Viva

MICROBIOLOGY

Year Three: At the end of year 3 resident should be able to:

- Extend the knowledge of basic bacteriology, parasitology, mycology, virology, immunology, molecular biology, and antimicrobials.
- Recognized and identified the major parasites present in stool samples (see list below).
- Recognize and identify major fungal pathogens. Understand the principles of mycology in clinical practice (see list below).
- Understand the basics of virology, in particular blood borne pathogens.
- Recognize less common bacterial pathogens not covered in year one and two.
- For each pathogen the residents must understand:
  - Pathogenesis and role in disease causation
  - Diagnostic tests are available with their limitations. Residents must be familiar with the tests performed at AKUH. If the bacteria can be cultured, the resident must know how to culture and specify them.
  - Treatment available
  - Mode of transmission, preventive measures including vaccination if any.
- Recognize and identify more unusual parasites (including arthropods) and fungal pathogens not covered in years 1 and 2. For each, the residents must know:
- Pathogenesis and role in disease causation
- Diagnostic tests are available with their limitations. Residents must be familiar with the tests performed at AKUH. The residents must be able to recognize the important parasites.
- Treatment available
- Mode of transmission, preventive measures including vaccination if any.
- Understand the principles and limitations of the antimicrobial testing systems and be familiar with the CLSI guidelines for antimicrobial sensitivity testing. They should be able to perform all the antimicrobial sensitivity methods being conducted at AKUH, including MICs, and begin to report and advise on appropriate antimicrobial usage under supervision.
- Towards the latter part of the year, residents should start to review antimicrobials, pharmacokinetics, mode of action, resistance, importance of serum drug levels and antibiotic stewardship.
- Apply this knowledge to a more detailed understanding of clinical microbiology.
- Be introduced to the principles of infection control, bio-risk management (biosafety & biosecurity); especially infection control & bio-risk management in the laboratories. Current requirements and recommendations of the Hazards to Health (COSHH) and WHO / CDC recommendations for specific diseases e.g. Viral hepatitis HIV, prion disease, haemorrhagic fevers.
- Extend the knowledge & skills of the principles of molecular techniques in microbiology. The residents should acquire knowledge of the application of molecular techniques to the diagnosis of infectious diseases. They should be able to perform molecular techniques for detection of microbial DNA in a clinical sample. Their knowledge should be extended to include principles of genetic and phenotypic strain differentiation of bacteria, and the use of sequencing for molecular epidemiology.

- Take a more active role in advice on usage of antimicrobials and in management of infections in the wards.
- Be actively involved in infection control problems in and around the Hospital.
- Initiate the research project based on approved synopsis for final submission of dissertation/scientific paper.
- Prepare data from the laboratory for publication and submit it to a peer-reviewed journal. Present data at internal and local meetings.

Year Four: At the end of year 4 resident should be able to :

- Recognize and identify more unusual parasites (including arthropods) and fungal pathogens not covered in the first three years.
- The resident should continue to perform routine duties, actively participate in the solution of ongoing infection control problems and quality control issues.
- Complete research project. Report results at a local forum. Continue to be involved in clinical microbiology management and reporting.
- Continue to be involved in at least one ongoing research project of the laboratory.

Year Five: At the end of year 5 resident should be able to :

- Publish data from the project in a peer-reviewed journal.
- The resident should continue to perform routine duties, but other time should be spent in specializing in aspects of microbiology, infectious diseases, and public health, developing particular interests and expert.
- Year 5 residents are expected to attempt and successfully complete FCPS-II exam.
- Expected to take lead in specialized component of interest in Microbiology (mycology, parasitology, etc.).
- By the end of program, trainees would be expected to advise on diagnosis, treatment, and prevention of the following clinical problems:
    - Infection in the community.
    - Hospital-acquired infection and infection control and prevention.
    - Infection in immunocompromised patients including HIV, transplantation, and neutropenia.
    - Infection in critical care and sepsis
    - Outbreaks of infection in hospital and the community
    - Infection in the returning traveler
    - Food and water borne infection.
    - Sexually transmitted diseases
    - Occupationally acquired disease.
    - Pediatric infection
    - Infection in pregnancy

- **Infection control in hospital & community**
    - Local infection problems, including outbreaks of infection and their management.
    - Working of infection control meeting including local and regional infection control committees

- Areas of hospital and community health that required infection control policies.
- Close working with the infection control nurse both in the day-to-day duties and in the education of those involved with infection control issues.
- Participation in visits to clinical and non-clinical areas to advise on infection control. These should include kitchen inspections, especially those conducted by environmental health officers. Relationships should be developed with key personnel in the CSSD pharmacy and laundry.
- Understanding of the principles of patient's isolation and their application
- Familiar with any document relevant to infection such as reports of committees of inquiry. Also knowledge of any existing working party recommendations (e.g. MRSA, Shigella, Clostridium Difficile)
- Have had some experience of communicable control in the community working with DHO or concerned health officers.
- Have worked closely with the infection control nurse both in the day-to-day duties and in the education of those involved with infection control issues.
- Participation in visits to clinical and non-clinical areas to advise on infection control. These should include kitchen inspections, especially those conducted by environmental health officers. Relationships should be developed with key personnel in the CSSD pharmacy and laundry.
- Understanding of the principles of patient's isolation and their application
- Familiarity with any document relevant to infection such as reports of committees of inquiry. Also knowledge of any existing working party recommendations (e.g. MRSA, Shigella, Clostridium Difficile)
- Experience of communicable control in the community working with DHO or concerned health officers.

- **Epidemiology & Statistics**
  - Construction of basic data collection questionnaires using appropriate software packages
  - Management of community and breach of infection
  - Selection & performance of appropriate basic statistical analysis including t.tests, chi-square tests and regression and correlation.

- **Data handling**
  - Familiarity with standards word processor spread sheet, relational database, statistics, and epidemiology software packages.
  - Familiarity with the basic method of electronic data transfer with local & remote computer system
- **Quality Control**
  - Understanding of quality control and quality assurance
  - Understanding of the existing external quality control scheme and the processing of data by these schemes

- **Medical Audit**
  - Principles of medical audit
  - Be able to design and execute lab audits and generate regular audit reports. In addition extra effort and input is expected on day-to-day quality control issues of the section.

- **Management**
  - Knowledge of important aspects of laboratory management including budget control, personnel management, and administration.

Schedule of learning and teaching activities/meetings in Microbiology

1 **Weekly**

- Journal Scan
- Journal Club (1 AACME credit hour)
- Combined Clinical Conference

2 **Monthly**

- ID-CPC (Infectious Diseases Clinico-pathological Conference)
- Microbiology Forum

Learning resources:

This is neither an exhaustive nor mandatory list of the resources/references available. Residents are encouraged to read from various resources.

- Clinical Microbiology Procedures Handbook, ASM Press
- Manual of Clinical Microbiology, ASM Press
- Color Atlas of Medical Bacteriology, ASM Press
- Koneman's Color Atlas and Textbook of Diagnostic Microbiology
- Principles and Practice of Infectious Diseases (Mandell, Douglas & Bennett)
- Medical Bacteriology—a practical approach (Hawkey and Lewis)
- Atlas of Tropical Medicine & parasitology (Wallace Peters)
- Atlas of Clinical Fungi (G.S. deHoog)

Journals:

- Journal of Clinical Microbiology
- Clinical Infectious Diseases
- Journal of Hospital Infection
- Antimicrobial Agents and Chemotherapy
- New England Journal of Medicine
- Lancet Infectious Diseases
- Journal of Antimicrobial Chemotherapy
- Clinical Microbiology Reviews
- European Journal of Clinical Microbiology and Infectious Diseases
- Journal of Pakistan Medical Association
- Journal of College of Physicians & Surgeons Pakistan

HEMATOLOGY & BLOOD BANKING

End of year objectives

The following objectives should be achieved by the respective year.

Year One

At the end of year one, every resident should be able to:

Routine Haematology:

Learning Outcomes (Knowledge)

- Define hematopoiesis.
- Discuss aetiology, pathophysiology, clinical features, and laboratory investigations of:
    1. Iron Deficiency anaemia
    2. Megaloblastic anaemia

Learning Outcomes (Skills)

1. Prepare and stain blood films.
2. Identify abnormalities of red cell, white cell, and platelet morphology
3. Perform reticulocyte staining and reticulocyte count.
4. Perform WBC count and DLC.
5. Perform RBC count.
6. Perform and interpret Platelet count.
7. Perform Hematocrit
8. Interpret all CBC parameters.
9. Ensure quality control in routine hematology.

Hemoglobin Studies:

Learning Outcomes (Knowledge)

- Discuss aetiology, pathophysiology, clinical features, and laboratory investigations of:
    1. Genetic defects of hemoglobin
    2. Hemolytic anaemia

Learning Outcomes (Skills)

1. Perform hemoglobin electrophoresis and interpret the common findings.
2. Interpret the results of screening tests for Glucose 6 Phosphate
3. Dehydrogenase deficiency
4. Perform and interpret sickling test.
5. Perform and interpret hemoglobin A2 estimation.
6. Perform and interpret hemoglobin F estimation.
7. Identify abnormal hemoglobin.

Coagulation Studies:

Learning Outcomes (Knowledge)

- Discuss the aetiology, pathophysiology, clinical features and laboratory investigations of:

1. Coagulation disorders
2. Thrombophilia
3. Platelet disorders

Learning Outcomes (Skills)

- Perform and interpret following tests:
  1. Bleeding time
  2. Prothrombin time
  3. Activated Partial Thromboplastin Time
  4. Thrombin Time
  5. Fibrinogen level
  6. D dimers and Fibrinogen Degradation Products
  7. Mixing studies
  8. Factor assays
  9. Platelet function studies
  10. Urea lysis test
  11. Thrombophilia screening

Bone Marrow Pathology:

Learning Outcomes (Knowledge)

- Discuss the aetiology, pathophysiology, clinical features, and laboratory investigations of:
  1. Aplastic Anaemia
  2. Acute leukemias
  3. Myeloproliferative disorders
  4. Myelodysplasia
  5. Hodgkin Lymphoma
  6. Non-Hodgkin Lymphoma
  7. Chronic lymphocytic leukemia
  8. Plasma cell disorders

Learning Outcomes (Skills)

- Perform bone marrow aspiration and trephine biopsy with preliminary reporting.
- Perform and draw inference on cytochemical stains.

Transfusion Medicine:

Learning Outcomes (Knowledge)

1. Methodology and specificity/sensitivity of infectious disease markers
2. Types of blood donors and strategies to recruit voluntary blood donors.
3. Immunoglobulin structure and genetic basis for antibody diversity
4. Red cell alloantibodies and autoantibodies
5. Factors influencing antigen antibody reactions.

6. Natural and acquired antibodies.
7. Mechanisms of red cell sensitization
8. Mechanisms of red cell destruction – complement activation, intravascular and extravascular destruction.
9. Biochemistry, genetic inheritance, immunogenicity, and clinical significance of Carbohydrate (Lewis, P, I/i) and Protein (Kell, Kidd, Duffy, MNS and others) red cell antigens
10. Disease associations with the null phenotypes of ABO, Rh and Kell
11. Serologic testing by different formats – Tube, gel, solid phase, and microplates
12. Indications, reagents and methods of Weak D testing, antibody screening and identification, cross matching, enhancement techniques, adsorption/elution techniques, Donath Landsteiner test and antibody titration tests
13. Platelet refractoriness
14. Quality assurance of blood components
15. Quality assurance of blood grouping sera and Coomb's sera
16. Clinical, viral, and serological course of HBV, HCV, HIV infections
17. Malaria and syphilis carrier state in blood donors
18. Call back blood donors and lookback investigations.

Learning Outcomes (Skills)

1. Management of complications of blood transfusion
2. Identification of red cell antibodies by serologic specificity, isotype, and thermal amplitude
3. Preparation of blood components from whole blood
4. Use of blood product anticoagulants and preservatives
5. Proper storage of blood components as per their storage temperatures and shelf lives
6. Pooling of platelet concentrates and plasma thawing.
7. Use of pediatric blood bags, sterile connecting devices, irradiation of red cell and platelet concentrates, leucodepleted blood products and leucocyte concentrate.
8. Disposal of blood components
9. Quarantine of blood donor samples
10. Investigation of transfusion related infections
11. Investigation of transfusion reactions
12. Perform bacterial cultures.
13. Quality control of blood products
14. Quality control of blood grouping and Coomb's antisera

Benchwork Skills:

Learning Outcomes (Skills)

- Use and maintain following laboratory instruments:
  1. Centrifuge
  2. Waterbath
  3. Analytical Balance
  4. Adjustable pipette
  5. Automated hematology analyzers
  6. Microscope
  7. Spectrophotometer
  8. Cytocentrifuge
  9. Automated coagulation analyzer
  10. Platelet aggregometer
  11. Gel electrophoresis

HAEMATOLOGY (10 WEEKS)

Learning Outcomes (Knowledge)
At the end of rotation resident should be able to link the basic concept, principles, classification, pathophysiology to the clinical scenarios of the following diseases:

- **Basic Haematology**
    - Hemopoiesis
    - Anaemia
    - Leukemias/Lymphomas
    - Coagulation disorders
    - Thrombophilia
    - Platelet disorders
    - Blood transfusion
    - Stem cell transplantation

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Learning Outcomes (Skills)
At the end of the rotation residents should be able to:

- **Procedure and Interpretation of Hematological Analytes**
    - CBC using automated hematology analyzer
    - Preparation and staining of blood films
    - Reticylocyte staining and reticulocyte count
    - Manual blood counts
    - Quality control in routine hematology
    - Bone marrow aspiration and trephine biopsy
    - Screening tests for G6PD deficiency
    - Sickling test
    - Coagulation studies
    - Hb Studies
    - Platelets
    - Reticulocytes
    - MCV
    - MCH
    - TRBC
    - RDW
    - PT
    - PTTK
    - Hb A
    - HbA2
    - HbF
    - D-Dimers

- Fibrinogen

● **Quality Control in Hematology**

- Calculation of mean, SD and CV
- Application of tests of significance
- Plotting of LJ charts of Quality Control
- Application of Westgard Rules

BLOOD TRANSFUSION (6 WEEKS)

Learning Outcomes (Skills)

- Components preparation
- Forward and reverse grouping and cross match
- Coombs test

1. Acquire competence in:
   - History taking, physical examination, ordering investigation and lab data interpretation.
   - Collection of blood samples for hematological test
   - Hb estimation with calibration and quality control.
   - Preparation and staining of blood films.
   - Preparation of various stock solutions and stains.
   - Use of nuebar chamber and the following counts.
     - Total RBC count
     - TLC count
     - Platelet count
   - Determination of PCV (microhaematocrit).
   - Calculation of absolute values.
   - Estimation of ESR by various methods.
   - Bleeding time and whole blood coagulation time.
   - Selection and registration of blood donors.
   - Bleeding disorders.
   - Anticoagulants are used in blood banking.
   - ABO grouping tile and tube methods.
   - RhD grouping.

2. Perform independently:

   - Bone marrow aspiration under supervision.
   - Use of Electronic Cell Counters Principles, calibration and quality assurance.
   - Morphology of peripheral film.
   - Supravital stains and their preparation
   - Reticulocyte count including
   - Preparation staining of thick and thin films for malarial parasite.
   - Identification and calculation of parasite index
   - Staining of bone marrow films

- Reporting of Bone marrow aspiration under supervision
- LAP scoring
- Test for G6PD deficiency
- Sickling test
- Prothrombin time and INR
- APPT
- Thrombin Time (TT)
- Fibrinogen level
- Coomb's test (Direct and indirect)
- Du testing
- Compatibility testing
- Screening of blood donors for TTD
    - Manual (Malarial parasite, VDRL)
    - Automation (HBV, HCV, HIV)

3. Preparation of blood components
    - Packed red blood cells.
    - Platelets
    - Fresh frozen plasma
    - Cryoprecipitate

Year Two

The resident at the end of this year should be able to interpret and report (under supervision):

1. Bone marrow and bone trephine slides
2. Special cytochemical stains (Sudan Black B and PAS)
3. Results of osmotic fragility, hemoglobin electrophoresis and platelet function testing under supervision.

Hematology & Transfusion Medicine Rotation
Duration: First 6 Months

Objectives	Knowledge	Duration (Weeks)	Lab skills	Attitude/behavior	Teaching & Learning strategies*	Assessment**
Discuss principle, working and maintenance of hematology analyzer and apply principles of QC	Explain principle of automated analyzer Explain Internal and external QC and apply this information for routine hematology tests	3	Observe the working of hematology analyzer. Prepare a stained thick & thin blood film manually and automation. Prepare a slide for reticulocyte count. Interpret LJ chart	Discuss the protocol for informing critical results. Demonstrate the biosafety rules	A c h l	a b c
Common types of anemia.	**Explain etiology, pathophysiology, clinical features, and laboratory investigations of:** Iron Deficiency anemia and Megaloblastic anemia Anemia of chronic disease	3	**<u>Observe and interpret.</u>** Microscope handling and maintenance. Perform differential WBC count. Manual RBC, WBC, and platelet count. ESR	Discuss the protocol for informing critical results. Demonstrate the biosafety rules.	A C F G I	B E G
Malaria	Explain stages and species of Malarial Parasite	2	**<u>Perform and interpret:</u>** Thick and thin films Species and stages of MP Calculate parasitemia	Discuss the protocol for informing critical results. Demonstrate the biosafety rules	A C F G I	B E G
Hemolytic anemias Hemoglobinopathies	Explain etiology, pathophysiology, clinical features, and laboratory investigations of: Thalassemia Sickle cell anemia G6PDanemia,	3	**<u>Observe and interpret:</u>** Reticulocyte count. Hemoglobin electrophoresis/HPLC G6PD Assay Sickling Test Sickle solubility test	-----	A C F G I	B E G

Bleeding Disorders	Explain etiology, pathophysiology, and laboratory investigations of : Hemophilia Von Willebrand disease ITP. Laboratory investigations of inherited bleeding disorders.	3	**<u>Observe and interpret.</u>** Bleeding time PT APTT Mixing studies Factor Assay	Discuss the protocol for informing critical results. Demonstrate the biosafety rules.	A C F G I	B E G
Thrombophilia	Explain the etiology, pathophysiology, and laboratory diagnosis of: Inherited thrombophilias	2	-------	-------	I	B G
Donor recruitment and donor screening	Donor recruitment Types of blood donors Strategies to recruit voluntary blood donors	3	History taking, physical examination & registration of blood donors.	Know: Donor counseling Donor acceptance and rejection criteria.	A c l	G
Component preparation and storage	Handling of collected blood. Screening of blood for common infectious diseases Proper storage of blood components as per their storage temperatures and shelf lives.	3	----------	Demonstrate biosafety rules. Counseling of donors positive for infectious diseases.	A C F G	B G
Blood grouping	Explain different red cell antigens. Indications of weak D testing.	2	Perform and interpret: Forward grouping Reverse grouping Rh grouping	---------	A C F G H	A C G

Hematology & Transfusion Medicine Rotation
Duration: Last 6 Months

Objectives	Knowledge	Duration (Weeks)	Lab skills	Attitude/behavior	Teaching & Learning strategies*	Assessment**
Acute leukemias	Explain the etiology, pathophysiology, and laboratory diagnosis of: Acute lymphoblastic leukemia Acute myeloid leukemia	4	Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy. Interpret peripheral blood film findings. Observe special cytochemical stains	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G
Chronic leukemias	Explain the etiology and laboratory diagnosis of: Chronic myeloid leukemia Chronic lymphocytic leukemia	6	Take proper patient history. Perform clinical examination. Interpret peripheral blood film findings. Perform Bone marrow aspirate and biopsy.	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G
Lymphomas	Explain the etiology, pathophysiology explains etiology, pathophysiology, and laboratory diagnosis of: Hodgkin's lymphoma Non-Hodgkin's lymphoma	6	Take proper patient history. Perform clinical examination. Interpret peripheral blood film findings. Perform Bone marrow aspirate and biopsy.	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G

			Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy			
Blood grouping	Explain different red cell antigens. Indications of weak D testing.	2	Perform and interpret: Forward grouping Reverse grouping Rh grouping	---------	A C F G H	A C G
Cross matching	Know the process and stages of cross matching	3	Perform cross matching	----------	A C F G H	A C G
Quality Control	Know the basic quality control of: Anti-sera Coombs' reagent	3	Perform quality control of: Anti-sera Coombs' Reagent	Importance of quality control in clinical lab/ transfusion medicine	A C F G H	A C G

Specific Teaching/ learning Strategies*

a. Day-to-day bench work observer ship
b. EBM session
c. Interaction with technologists and ancillary staff regarding patient needs
d. Interactive lectures
e. Journal clubs
f. Observation of laboratory methods
g. Observation of, assisting and discussion with senior techs and residents
h. Practical bench work
i. Reflection and self-assessment
j. Research Forum
k. Rounds (Teaching, Grand, Work)
l. Self-study

Assessment Methods:**

a. Informal evaluation by technologist
b. MCQs/SEQ
c. Practical exam
d. Presentation in meetings
e. Procedure or case logs
f. Research papers
g. Viva

HEMATOLOGY & BLOOD BANKING

Year Three

At the end of year three, every resident should be able to perform:

1. Osmotic fragility test.
2. Glycerol lysis test.
3. Autohemolysis test.
4. Preparation of hemolysate.
5. Hb Electrophoresis and estimation of normal and abnormal hemoglobin.
6. Heat instability test.
7. Tests for Paroxysmal Nocturnal Hemoglobinuria.
8. Mixing studies for coagulation abnormalities.
9. Investigation of Lupus anticoagulant.
10. Rh phenotyping.
11. Emergency grouping and crossmatch.
12. Investigation of a transfusion reaction.
13. Tests for immune hemolytic anemias.
14. Quality control in blood banking.
15. Quality control in Haematology.
16. Urea solubility test.

Year Four

At the end of year one, every resident should be able to:

1. Perform & interpret.
    - Clotting factor assays
    - Platelet function tests.
    - Qualitative / quantitative assays of FDPs / D-dimers.
    - Plasma heparin assay.
    - Euglobin lysis time.
    - Radio nucleotides in hematology and radiation protection.
    - Measurement of red cell mass.
    - Measurement of blood volume.
    - Estimation of iron absorption.
    - Estimation of red cell life span.
    - Tests for splenic function.
    - Antibody screening and identification.
    - Anti-body titration.
    - Investigation of HDN.
    - Enzyme treatment of red cell and their use
    - Variants of ABO system.
    - Variants of Rh system.
    - Typing for other blood groups

2. Get introduced to techniques in cytogenetics, molecular biology, and flow cytometry Studies in familial thrombophilias, Protein C, Protein S, Antirhombin Ill, APC Resistance.

Year Five

1. By the end of year five every resident should be able to:
   - Be confident enough to suggest independent clinical decisions for hematology consults.
   - Practice good laboratory management including utilization of resources, staffing and quality control in hematology, coagulation, and blood bank.
   - Report peripheral blood films, bone marrow and bone trephine sections and all other hematological tests independently.
   - Teach undergraduate students, postgraduate trainees, technologists, and other laboratory personnel.
   - Participate in the administrative activities of the department such as hiring of staff, purchase of equipment, sectional meeting and making sectional Rota of residents.
   - Assist in the organization of workshops/CMEs/seminars.

2. Every resident by the end of year 5 should have:
   - Should have preferably applied for at least one research grant.
   - Should have participated in at least one clinical audit in the blood bank, coagulation, outpatient, etc.
   - Should participate regularly in local (Annual symposia of medical colleges and hospitals), institutional and / or national (PAP, PSH) level.
   - Should be able to liaise with junior residents, technologists, faculty, and other laboratory personnel.
   - Have appeared and preferably passed FCPS part II exam.

By the end of one month rotation, the Resident will be able to understand the following:

Routine Hematology:

- Collection of blood samples for hematological test.
- Hb estimation with calibration and quality control.
- Preparation and staining of blood films.
- Use of Neubar chamber and the following counts.
  - Total RBC count
  - TLC count
  - Platelet count
- Determination of PCV (microhaematocrit).
- Estimation of ESR by various methods.
- Staining of bone marrow films
- Osmotic fragility test
- Test of G6PD deficiency
- Hb Electrophoresis
  - Hb A2 estimation

    - Hb F estimation
- Quality control in Hematology
- Morphology of blood film in common hematology disorders
- Bone marrow biopsy procedure (minimum 10 should be observed and done under supervision)

Coagulation:

- Bleeding time and whole blood coagulation time
- Prothrombin time and INR
- APTT
- Factor Assay
- Platelet function studies

Blood Bank:

- Selection and registration of blood donors
- Anticoagulants are used in blood banking.
- Preparation of blood components
- ABO grouping (tile and tube methods)
- RhD grouping.
- Coombs test (Direct and Indirect)
- Du testing
- Compatibility testing
- Screening of blood donors for TTD
    - Manual (MP, VDRL)
    - Automation (HBC, HCV, and HIV)

<u>Teaching and learning modalities in Hematology:</u>

1) **Topic discussion:** These sessions are held weekly, and a topic chosen by the residents is discussed with a faculty member in the form of a presentation or small group tutorial. Assignments on the discussed topic are also given to consolidate the gained knowledge.

2) **Case discussion:** Residents present four to five interesting case histories followed by discussing an aspect of the case. This is done fortnightly and one case each is presented on a topic of blood bank, coagulation, malignant and non-malignant haematology.

3) **Microscopy sessions:** considered as “bread and butter” of haematology, the resident is exposed most to this area of Heamatology residency that covers examination of blood smears for routine hematology, hemoglobin electrophoresis, reporting of bone marrow and trephine specimens.

4) **Hematology consults**: Residents rotate through consultation service once in four weeks. Initial assessment and treatment plan is first advised by the resident followed by discussion and review of the plan and patient with the faculty. The consultation service is an important aspect of the training program where clinical problems are presented as "unknowns", and patient management decisions are taken on short notice. Regular provision of constructive criticism by faculty to trainees regarding their techniques of knowledge and skill delivery of care and documentation of delivery of care is provided.

5) **Bench work supervision:** Direct supervision is provided to the resident by senior technologist during bench work in Haematology, Coagulation and Transfusion Medicine. The resident is directly contributing to patient care, but all results are reviewed and verified by the senior technologist/faculty member before release of results. Feedback on bench work is provided on a daily basis to the resident.

6) **Outpatient services:** The Haematology/Oncology outpatient unit accommodates 8,000-9,000 patient visits per year. The outpatient experience exposes the resident to the day-to-day and long-term management of patients with hematological diseases. The number of weekly half-day clinic sessions varies from one to two times per week. The resident manages outpatients as his office practice in conjunction with the attending. By doing so, the resident manages all aspects of patient care, including social, economic, and ethical issues related to our specialty.

7) **Article scan/journal club:** Highly useful learning modality in various aspects of scientific education and research programs. These meetings contribute to keep the residents and faculty updated on recent issues, emerging trends, and newer treatment strategies in Haematology. The resident selects two to three articles which are reviewed by a faculty member before the final presentation on critical appraisal.

8) **Scientific meetings and Continuing professional development courses:** Residents attend a variety of conferences at National and international level. These are designed to provide exposure to cutting edge research in Hematology, Thrombosis & Haemostasis and Transfusion Medicine. Residents are required to make an Oral and/or poster presentation for participation.

Schedule of learning and teaching activities/meetings in Haeamtology:

1) **Weekly**
   - Topic discussion – Every Monday (Prof. Mohammad Khurshid)
   - Departmental consultation meeting – Every Wednesday (Haematology faculty)
   - Guidelines/case discussion – Every Friday (Haematology faculty)
2) **Activities within the hospital**
   - Oncology grand round – Monthly
   - Medicine Grand round – Weekly
   - Leukemia/Lymphoma Tumor board – Monthly

- Pediatric Journal Club – Once every two months
- Morbidity & Mortality Meeting – Once every two months

Learning Resources

Various textbooks are available within the section and hospital library enabling the resident to use as reference as well as use them as standard textbooks. These include:

1. **Haematology**
   - Postgraduate Haematology by A. Victor Hoffbrand, 6th Edition
   - William's Haematology, 8th Edition
   - Dacie and Lewis practical Haematology, 10th edition

2. **Transfusion Medicine**
   - AABB (American Association of Blood Banks) Technical manual, 18th Edition
   - Blood transfusion in Clinical Medicine by Mollison's 11th edition.

3. **Thrombosis & Haemostasis:**
   - Dacie and Lewis practical Haematology, 10th edition
   - Postgraduate Haematology by A. Victor Hoffbrand, 6th Edition

Journals:

1. British Journal of Haematology
2. Vox Sanguinis
3. Blood
4. Seminars in Haematology

Other Learning Resources

1. www.practical-hemostasis.com
2. www.bloodmed.com
3. www.ihaematology.com

Please note that the resources listed above serve as a guide and may not necessarily cover all aspects of Haematology. Also, self-education is an essential part of the residency program. Proper use of journals, texts and other materials will improve patient care and facilitate the overall educational experience.

Blood bank rotation
Duration: 6 weeks

Objectives	Knowledge	Duration (Weeks)	Lab skills	Attitude/behavior	Teaching & Learning strategies*	Assessment**
Donor recruitment and donor screening	Donor recruitment Types of blood donors Strategies to recruit voluntary blood donors	1	History taking, physical examination & registration of blood donors.	Know: Donor counseling Donor acceptance and rejection criteria.	A c l	G
Component preparation and storage	Handling of collected blood. Screening of blood for common infectious diseases Proper storage of blood components as per their storage temperatures and shelf lives.	1	----------	Demonstrate biosafety rules. Counseling of donors positive for infectious diseases.	A C F G	B G
Blood grouping	Explain different red cell antigens. Indications of weak D testing.	1 week	Perform and interpret: Forward grouping Reverse grouping Rh grouping	---------	A C F G H	A C G
Cross matching	Know the process and stages of cross matching	1 Week	Perform cross matching	----------	A C F G H	A C G
Quality Control	Know the basic quality control of: Anti-sera Coombs' reagent	1 week	Perform quality control of: Anti-sera Coombs' Reagent	Importance of quality control in clinical lab/ transfusion medicine	A C F G H	A C G
Self-assessment in		1 week				

Transfusion Medicine						

Specific Teaching/ learning Strategies*

a. Day-to-day bench work observer ship
b. EBM session
c. Interaction with technologists and ancillary staff regarding patient needs
d. Interactive lectures
e. Journal clubs
f. Observation of laboratory methods
g. Observation of, assisting and discussion with senior techs and residents
h. Practical bench work
i. Reflection and self-assessment
j. Research Forum
k. Rounds (Teaching, Grand, Work)
l. Self-study

Assessment Methods:**

m. Informal evaluation by technologist
n. MCQs/SEQ
o. Practical exam
p. Presentation in meetings
q. Procedure or case logs
r. Research papers
s. Viva

Hematology rotation
Duration: 10 weeks

Objectives	Knowledge	Duration (Weeks)	Lab skills	Attitude/behavior	Teaching & Learning strategies *	Assessment**
Discuss principle, working and maintenance of hematology analyzer and apply principles of QC	Explain principle of automated analyzer Explain Internal and external QC and apply this information for routine hematology tests	1	Observe the working of hematology analyzer. Prepare a stained thick & thin blood film manually and automation. Prepare a slide for reticulocyte count. Interpret LJ chart	Discuss the protocol for informing critical results. Demonstrate the biosafety rules	A c h l	a b c
Common types of anemia.	**Explain etiology, pathophysiology, clinical features, and laboratory investigations of:** Iron Deficiency anemia and Megaloblastic anemia Anemia of chronic disease	1	**<u>Observe and interpret.</u>** Microscope handling and maintenance. Perform differential WBC count. Manual RBC, WBC, and platelet count. ESR	Discuss the protocol for informing critical results. Demonstrate the biosafety rules.	A C F G I	B E G
Malaria	Explain stages and species of Malarial Parasite	1 week	**<u>Perform and interpret:</u>** Thick and thin films Species and stages of MP Calculate parasitemia	Discuss the protocol for informing critical results. Demonstrate the biosafety rules	A C F G I	B E G
Hemolytic anemias Hemoglobinopathies	Explain etiology, pathophysiology, clinical features and laboratory investigations of:	1 week	**<u>Observe and interpret:</u>** Reticulocyte count.	-----	A C F G I	B E G

	Thalassemia Sickle cell anemia G6PDanemia,		Hemoglobin electrophoresis/HPLC G6PD Assay Sickling Test Sickle solubility test			
Bleeding Disorders	Explain etiology, pathophysiology, and laboratory investigations of : Hemophilia Von Willebrand disease ITP. Laboratory investigations of inherited bleeding disorders.	1	**Observe and interpret.** Bleeding time PT APTT Mixing studies Factor Assay	Discuss the protocol for informing critical results. Demonstrate the biosafety rules.	A C F G I	B E G
Thrombophilia	Explain the etiology, pathophysiology, and laboratory diagnosis of: Inherited thrombophilias	1	-------	-------	I	B G
Acute leukemias	Explain the etiology, pathophysiology, and laboratory diagnosis of: Acute lymphoblastic leukemia Acute myeloid leukemia	1	Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy. Observe special cytochemical stains	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G

Chronic leukemias	Explain the etiology and laboratory diagnosis of: Chronic myeloid leukemia Chronic lymphocytic leukemia	1	Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy.	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G
Lymphomas	Explain the etiology, pathophysiology explains etiology, pathophysiology, and laboratory diagnosis of: Hodgkin's lymphoma Non-Hodgkin's lymphoma	1	Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy. Take proper patient history. Perform clinical examination. Perform Bone marrow aspirate and biopsy	Taking informed consent before procedure. Know appropriate counseling. Maintain privacy of the patient	A C F G I	B E G
Self-assessment in Hematology & Coagulation		1				
Stem cell transplant						

Specific Teaching/ learning Strategies*

a. Day-to-day bench work observer ship
b. EBM session
c. Interaction with technologists and ancillary staff regarding patient needs
d. Interactive lectures
e. Journal clubs
f. Observation of laboratory methods
g. Observation of, assisting and discussion with senior techs and residents
h. Practical bench work
i. Reflection and self-assessment

j. Research Forum
k. Rounds (Teaching, Grand, Work)
l. Self-study

Assessment Methods:**

m. Informal evaluation by technologist
n. MCQs/SEQ
o. Practical exam
p. Presentation in meetings
q. Procedure or case logs
r. Research papers
s. Viva

CHEMICAL PATHOLOGY

Learning Outcomes (Knowledge) for Rotation in Chemical Pathology

- Pathophysiology of Routine Chemical Pathology including following topics:
    1. Diabetes Mellitus and Hypoglycaemia
    2. Electrolytes and Acid Base Disorders
    3. Liver Function Tests
    4. Renal Function Tests
    5. Cardiac biomarkers
    6. Lipid Disorders
    7. Iron Disorders
    8. Disorders of Bones

- Pathophysiology of Endocrinology and Miscellaneous including following topics:
    1. Thyroid Disorders
    2. Adrenal Disorders
    3. Pituitary Disorders
    4. Tumor Markers
    5. Pediatric Metabolic Disorders

- Lab Management including following topics:
    1. Quality Control
    2. Quality Assurance
    3. EBLM
    4. Pre-analytical variables
    5. Sample Collection
    6. Lab Safety
    7. Inventory management
    8. Communication skills with lab staff, patients, administration, and vendors
    9. Implementation of policies and SOPs on the above-mentioned subjects Learning

Learning Outcomes (Skills)

- Analytical Techniques and Instrumentation including following topics:
  1. Optical Techniques
  2. Electrochemistry
  3. Electrophoresis
  4. Lab Automation
- Use and maintenance of :
  1. Centrifuge
  2. Waterbath
  3. Analytical Balance
  4. Adjustable pipette
  5. Automated chemistry analyzers
  6. Spectrophotometer

- Methods of detection of Common Analytes:
  1. Glucose
  2. Urea
  3. Bilirubin
  4. ALT
  5. Alkaline Phosphatase
  6. Albumin
  7. Calcium
  8. Cholesterol
  9. Urea
  10. Creatinine
  11. Others
  12. Calculations of various lab tests

Teaching/learning strategy: Rotation in Chemical Pathology is a self-directed adult learning which is systemically organized in the form of week-by-week structured bench rotations. The rotation is facilitated by the bench technologists, Chemical pathology residents assigned on each bench and the faculty.

Weekly Evaluation: At the end of every week rotating resident is evaluated and shortcomings informed for further reading/observation by senior resident/coordinator Clinical chemistry.

Assessment strategy: An end of the rotation summative assessment (viva and a written) is taken. Results are shared with the rotating resident and the parent section.

Evaluation and Feedback: Each rotating resident is evaluated on the basis of attendance, participation in the meetings, presentation, and assessment by Director residency at the end of the residency program.

Year Three

At the end of year three, every resident should be able to:

1. Discuss the technology and design of biochemistry analyzers and appreciate their limitations and benefits.
2. Advise on the appropriate use and interpretation of the results of the laboratory investigations in screening for disease, to establish diagnosis, to monitor progress and treatment.
3. Practice internal medicine for 6 months
4. Participate in outpatient endocrinology clinics and ward rounds.
5. Spend sufficient time in direct patient care to obtain the experience required to take responsibility for the clinical care of patients at consultant level. Trainees should assist in outpatient clinics for the following:
    - Lipid disorders
    - Diabetes mellitus
    - Endocrinology
    - Metabolic disorders
    - Osteoporosis and other bone/connective tissue disorders
    - Renal calculi
    - Gynecological endocrinology

6. Provide a differential diagnosis, order necessary tests and takes part in patient management at the end of year three.
7. Interpret reports of biochemical genetics laboratory
8. Explain the principles of nucleic acid analyses, including PCR, Southern blotting, quantitative RTPCR, agarose gel electrophoresis, DNA sequencing.
9. Demonstrate advanced lab QC practices.
10. Assist and interpret lab tests method validation.
11. Attend and participate in multidisciplinary meetings.
12. Know and understand the audit cycle, data sources and data confidentiality.
13. Publish at least two articles in indexed journal or approval of dissertation.

Year Four

At the end of year four, every resident should be able to:

1. Continue to perform routine duties and take part in administrative issues.
2. Recognize significant metabolic pattern of various diseases, determine the clinical significance of laboratory investigations, correlate with clinical findings and recent literature, make recommendations for additional testing.
3. Design and demonstrate method validation procedures.

4. Develop interest in any sub-specialty of metabolic medicine, design and execute any research project.
5. Participate in teaching of junior residents.
6. Liaison with clinical colleagues
7. Take FCPS part II theory at the end of year IV.

Year Five

At the end of year five, every resident should be able to:

1. Attempt preferably cleared FCPS Part II exam.
2. Report independently and take part in administrative issues.
3. Participate in quality control/quality assurance activities of the section.
4. Participate in presentations at National and /or International level.
5. Complete research projects initiated during residency and sent for publication.
6. Teach medical students, junior residents, and technologists.
7. Develop an interest in a sub-specialty or field to a level of being able to act as a local expert.
8. Undertake analytically and clinically based research and/or development projects.

Teaching and learning modalities in Chemical Pathology:

1. **Routine work:** the most important learning experience will be day-to-day work. You will be expected to perform daily workload in the chemistry laboratory with moderate to minimum supervision. This includes, but is not limited to:
    - Appropriate use of computer (LIS) functions
    - Daily preventive maintenance
    - Daily quality control procedures
    - Routine workload including manual procedures when applicable.
    - Daily quality assurance procedures
    - Calling critical values to appropriate personnel
    - Daily sign-outs and reporting under supervision of faculty.

2. **Departmental teaching sessions:**
    - Monday 8:00 am – 9:00am: Medicine Grand Round
    - Wednesday 2:00-3:00 pm: Clinical case discussion
    - Friday 9:30 am – 10:30 am: Journal Club (1 AACME credit hour)

3. **Multidisciplinary team meetings (MDTs):** attendance at and contribution to the following multidisciplinary meetings once a month, offers the opportunity for trainees to develop an understanding of clinical management and diagnosis of various disorders of inborn error of metabolism and metabolic bone diseases:
    - BGL CME: last Friday of every month
    - Metabolic Bone Group Forum: first Tuesday of every month

4. **Self-study:** The Section of Chemical Pathology has a wide range of reference textbooks and journals (both hard copies and online) available. These allow trainees to 'read around' routine cases that they are reporting.

5. **Regional, National, and International scientific meetings and training courses:** These are valuable learning opportunities for trainees to participate and present their scientific work in these annual national and international meetings.
    - Annually Pakistan Association of Pathologists Conference
    - Annually Pakistan Society of Chemical Pathology Conference
    - International Federation of Clinical Chemistry
    - American Association of Clinical Chemistry
    - International Osteoporosis Foundation Meeting

Schedule of learning and teaching activities/meetings in Chemical Pathology

1. **Weekly**

– Medicine Grand Round - Mondays
– Clinical case discussion – Wednesdays
– Journal Club (1 AACME credit hour) Fridays

2. **Monthly**

– Metabolic Bone Group Forum - First Tuesday of every month
– BGL CME - Last Friday of every month

Learning resources:

References available in Section for residents:

- Clinical Chemistry theory, analysis, correlation. Lawrence A Kaplan.
- A primer of Chemical Pathology. Walmsley (New).
- Tietz is fundamental to clinical chemistry. Carl A Burtis Edward R Ashwood,

Journals:

- Clinical Chemistry
- Journal of Association of Clinical Biochemistry
- JCPSP
- JIMD – Journal of Inherited Metabolic Disorders

Assessment Strategies:

In the Section of Clinical Chemistry formative and summative assessment is done.
Formative assessment includes continuous evaluation and workplace-based assessment while summative assessment is done twice yearly, Mid-year and annual theory and practical examinations.

WORKPLACE BASED ASSESSMENT (WBA)

The principle of Workplace-based assessment (WBA) is to assess trainees on work that they are actually doing and that, as far as possible, the assessment is integrated into their day-to-day work. The WBA forms an important part of assessing the competency of trainees and ensuring that they are making satisfactory progress in pathology. *WBA for Pathology programs is in progress.*

RESIDENT COMPETENCY LIST

Resident Competency List 2018.pdf

INTERNATIONAL PATIENT SAFETY GOALS IPSG

1. **Identify Patients Correctly:**
   - Use two identifiers **(patient's name & MR#)** to identify patients prior to any treatment / procedure and before serving restricted diet to patient.

2. **Improve effective communication:**
   - Follow **read back** procedure for all 'Telephonic Orders' and 'Critical Test Results'. Document all Telephonic Orders and Critical Test Results on designated form. Telephonic Orders are countersigned by a physician within 24 hours.
   - Follow **handover process** i.e. SBAR technique (Situation – Background – Assessment and Recommendation) to provide complete and accurate information about a patient's clinical status, during handover of patient to other staff.

3. **Improve safety of high-alert medications:**

   - Following has been designated as high- alert medications: Concentrated Electrolytes, Anticoagulants, Insulin (IV & SC), Neuromuscular Blocking Agents, Chemotherapeutic Drugs, Narcotics high potency, Look-Alike/Sound-Alike Medications (LASA).
   - Store, Label, dispense and administer high alert medication as per policy.

4. **Ensure correct-site, correct-procedure, correct-patient surgery:**
   - Site marking and time out should be done for all procedures that involve cutting, removing, altering, or insertion of diagnostic/therapeutic scopes.
   - Operative/procedure site is only marked by the person performing the procedure. Involve patient in site marking.
   - Use a checklist or other process to document, before the procedure, that the informed consent is appropriate to the procedure; that the correct site, correct procedure, and correct patient are identified; and that all documents and medical technology needed are on hand, correct, and functional.
   - The full team conducts and documents a time-out procedure in the area in which the surgery/invasive procedure is performed, just before starting a surgical/invasive procedure.

5. **Reduce the risk of health care-associated infections:**

   - Follow hand hygiene guidelines. Remember 5 moments of Hand Hygiene: before touching a patient, before clean / aseptic procedure, after body fluid exposure, after touching a patient, after touching patient surroundings.

6. **Reduce the risk of patient harm resulting from falls:**

   - Assess all patients for fall risk and reassess when indicated by change in condition. Implement measures to reduce fall risk.

Web links

https://one.aku.edu/PK/mc/pgme/Pages/home.aspx
https://one.aku.edu/pk/akuh/qps/Pages/home.aspx
http://intranet/pgme/

RESEARCH PORTAL

Residents are required to upload their research activities on the Research Portal using your **AKU login/password.**

Research Portal for PG Trainees

IN-TRAINING EVALUATION DURING RESIDENCY

The program directors and coordinators with the sectional faculty are responsible for the residents' bi-yearly evaluation. A standardized evaluation form is available online for Residents and Faculty.

Each resident will be evaluated throughout his/her rotation in individual disciplines by the consultant in charge. Evaluation will be based on:

1. Medical Knowledge
2. Patient Care
3. Interpersonal and Communication Skills
4. Professionalism
5. Practice Based Learning & Improvement
6. System Based Practice
7. Scholarship
8. Participated and compliant with following programs (JCIA Standard MPE.6)
9. Case Logs
10. Work hours
11. Narrative Feedback

SUPERVISION DURING TRAINING PERIOD

Residents will be closely supervised by the senior faculty and graded responsibilities accordingly.

Student Supervision Policy.pdf

GRIEVANCE POLICY

PGME Grievance Policy.pdf

DISCIPLINARY POLICY

PGME Disciplinary Policy.pdf

ASSESSMENT AND PROMOTION POLICY

Policy for Assessment and Promotion of Residents.pdf

PGY 1 Trainee Evaluation form.pdf

Evaluation of Residency Program.pdf

Faculty Assessment Form.pdf

EXAMINATION CRITERIA

Years 1-5
Refer to PGME policy below, the summary of examination schedule is:

Policy for Assessment and Promotion of Residents.pdf

No.	Assessment	Date
1	* Mid-term Exam (Theory, viva and practical)	July
2	Continuous assessment	Jan-June
3	Continuous assessment	July – Sep
4	Continuous assessment	Oct – Dec
5	* PGME Annual exam (Theory)	Oct

RESIDENTS PROMOTION CRITERIA

Refer to Promotion policy below and a summary of Promotion criteria is given below. The residents' Promotion is based on following five criteria:

Policy for Assessment and Promotion of Residents.pdf

Components	Details/ examples	Passing criteria
Continuous Assessment	PGME evaluation form on One45	**55% scores**
End of Year Examinations	Annual PGME Written Exams	**Pass at given level**
In-house/ In- service/ programme assessments	Clinical: TOACS/OSCE/Viva, Written Tests/ITER	**55% scores**
	WPBA: (MiniCEX/ DOPS/ OSATS)*	**Sign off ***
Academic Sessions	**Attendance:** • PGME Lecture & Workshops • Dept. /sect. Academic Session such as Core Curriculum, tutorials	**75% Attendance mandatory**
	Presentations: Journal Clubs, M&M/ Radiology/ Oncology/ Tumor board/ Patient Care/ Quality Care Meetings, Grand Rounds, etc.	**Presentation(s) mandatory as per the programme requirement**
Research	**Conference Attendance, Conference Presentations, Publications, Research Project**	**Complete at given level**

CHIEF RESIDENT SELECTION

The Chief resident selection process was reviewed in 2017 and now the selection criteria include nominations from sections as well as self-nomination from residents' level 3-5. Then selected residents are elected by voting from all residents and DRC members. Top 2-3 candidates may be interviewed for final selection.

LEAVE POLICY

PGME Earned Leave Policy for Residents and Fellows.pdf

PGME Policy for sick leave for residents and fellows.pdf

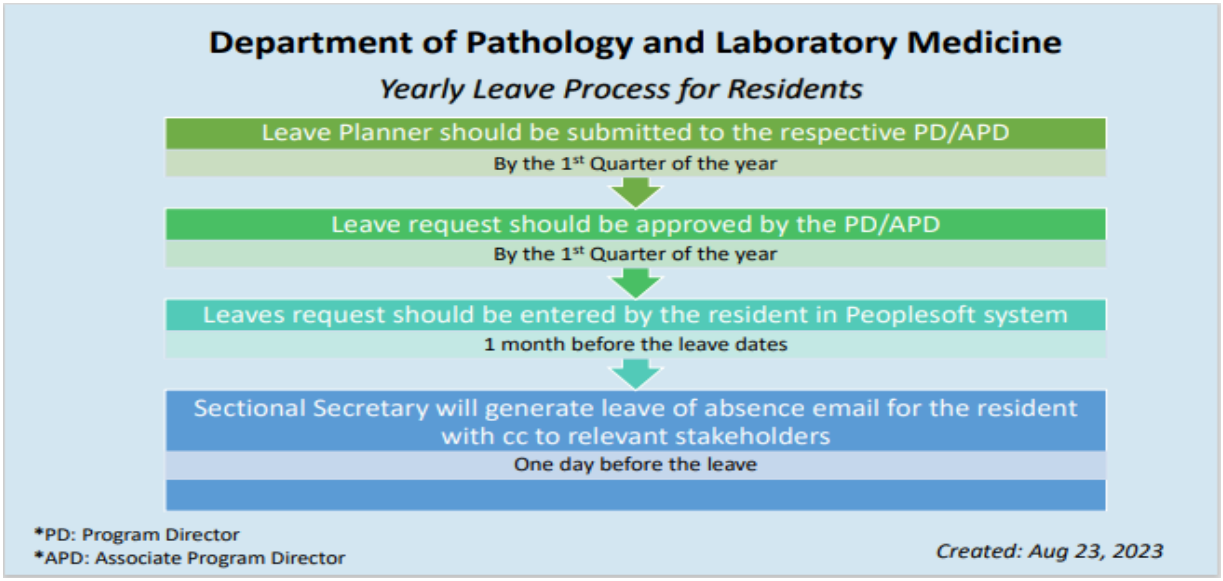
PGME Policy for Maternity leave for residents and fellows.pdf

Earned Leave/Sick leave – Departmental Guidelines:

Please refer to the leave policies (for Residents) of earned & sick leaves above; however the following protocol shall be observed by all the residents in case of earned application processing:

- All the residents shall fill in the leave planner form and submit it to the Chief Resident at the start of each academic year.
- Leave will be granted on a higher need basis and only one resident from each section will be allowed to go on leave at one time (sectional discretion).
- Sick leave entitlement is 15 calendar days per annum. This leave can be accumulated up to a maximum of 30 calendar days.
- Earned leave entitlement is 23 working days per annum and is admissible after 6 months of service. Earned leave balance may be carried forward to the next calendar year up to a maximum of 05 working days.
- The residents should fill in the Leave form and submit it to the sectional secretary after approval from the chief resident.
- The forms shall bear the signature/approval of Sectional Chief Resident and Sectional Coordinator for Residency.
- The forms should be submitted/applied via Peoplesoft system and should be informed to the Departmental Administrative Officer at least 15 days prior to leave.
- Link: AKU Peoplesoft

DEPARTMENTAL LEAVE PROCESS



TIMEOUT POLICY

Residents should fill in the timeout form properly before performing the following procedures.

1. Bone marrow aspirate/ Trephine
2. Fine needle aspiration cytology
3. Skin Biopsy

Link: Timeout Policy

BEST RESIDENT CRITERIA

The Outstanding Resident of the Year Award recognizes and honors medical residents whose combination of clinical promise, leadership, ability to think outside the box, and commitment to their patients and the profession separates them from others.

Criteria		Breakup
Training/Education (18%)	PGME activities – mandatory core lectures and workshops – (should have at least 95% attendance to be eligible)	4.50%
	Other non-mandatory workshops and/or CMEs	4.50%
	Educational Meetings (Sectional / Departmental / Institutional) – Documentary Evidence required	4.50%
	Presentations in Educational Meetings - Documentary Evidence required	4.50%
Teaching (7%)	**Departmental teaching by the resident - Documentary Evidence required**	7%
Research (10%)	**Departmental Seed Money Grant**	2%
	Publication in Peer Reviewed Journal	4%
	Presentations (Institutional / National)	2%
	Presentations (International)	2%
Leadership and Admin (5%)	**Chief resident**	3%
	Sectional chief resident	2%
Continuous Assessment (35%)	Cumulative 5-year Faculty evaluation (Records with PGME)	35%
Examination (15%)	**Mid-Year Assessment (5 years)**	7.5%
	End of Year Assessment (5 years)	7.5%
FCPS (10%)	**FCPS part II (Pass result should be available at the time of assessment – 3% for clearing written exam only)**	10%
Total		100%

One45 System

One45; Educational Management Software was identified by the Medical College in a quest for technology-based solutions for curricular/educational management of its various academic programs. One45 is attuned to the unique needs of medical curriculum planners, teachers, and administrators. It provides easy to use solutions for curriculum management, scheduling, performance evaluation, grades, and logbooks. This will automate:

- Scheduling of clinical rotations by chief residents (PGME) and admin staff (UGME)
- Performance evaluation form send-out and tracking of response rates.
- Mapping curricular objectives to teaching/learning sessions providing the capability to report vertically and horizontally (for example, sequencing of patient safety-related objectives within an academic year and across years)
- Academic sessions uploaded.
- Identify low performance by students/ residents in difficulty.
- Provide access to academic advisors/mentors to specified student data.

Software can be accessed through https://aku.one45.com/ using your **AKU login/password.**

Orientation sessions have been provided to the faculty members and sessions for resident orientation were also conducted.
To view your respective workflows in the system, please see the Faculty, Resident and Student **training reference videos** posted on the **AKU One45 login page** (Just click on the link https://aku.one45.com/).

For optimal standardization, please ensure that one45 is the only e-portal/mechanism used to complete performance evaluations.

Contact/Help numbers:

Contact Person: in case you need assistance is:
Pathology: Shamsha Punjwani Ext: 4547, Nasheed Irshad Ext: 1927, Faisal Nadeem Ext: 4380, Noshaba Hameed Ext:1641, Ajuba Amin Ext: 4511, Afshan Sohail Ext:4532.

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Regards,

Director Residency
Department of Pathology & Laboratory Medicine