Chemical Pathology Postgraduate Training in Malaysia

GUIDE FOR APPLICANTS

VERSION 1, 2022

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Preface

What is this Document

The purpose of this document is to serve as a guide for prospective applicants by providing the following information:

1. Overview of the Chemical Pathology postgraduate specialty
2. Outline of the Chemical Pathology postgraduate training programme in Malaysia
3. Entry requirements
4. Application and entry process

The National Postgraduate Medical Curriculum

The National Postgraduate Medical Curriculum (NPMC), for Pathology, is part of the NPMC Project which is intended to cover the development of curricula for all clinical medical specialists in Malaysia. The development of the Curricula for Pathology is the joint and collaborative effort of the institutional members of the Jawatankuasa Bersama Sarjana Perubatan – Patologi (JBSP-Patologi) which is the National Conjoint Specialty Committee overseeing Pathology, appointed by Jawatankuasa Bersama Ijazah Lanjutan Perubatan (JBILP). JBSP-Patologi comprises of members from all the universities offering the Master of Pathology (MPath) programmes, the Ministry of Health (MOH) and College of Pathologists, Academy of Medicine Malaysia (CPath-AMM).

The training of mono-discipline Pathology specialists will be consolidated, and separate curricula will be developed for the disciplines of Anatomical Pathology, Haematology, Chemical Pathology, Medical Microbiology and Forensic Pathology.

The Curriculum for Chemical Pathology

The NPMC for Chemical Pathology is intended to be applicable to the training of diagnostic Chemical Pathologists in Malaysia, for all postgraduate programmes however named. It serves as the guide for all university programmes (e.g., MPath), and the training centres involved in the delivery of these programmes. This will be the common curriculum for training in Chemical Pathology to ensure that training is consistent and competency based, and meets the standards required by the respective national bodies and the National Specialist Register (NSR).

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Introduction

Purpose of this Guide

The purpose of this guide is to inform prospective applicants seeking a career in Chemical Pathology. It summarises the key aspects of the Chemical Pathology curriculum (entry requirements, process, training structure, assessments, some documentation and exit criteria), and provides a guide as to how to prepare and proceed with the application.

What is Chemical Pathology

Chemical Pathology is a challenging specialty at the forefront of patient diagnostics that includes detecting changes in a wide range of substances in blood and body fluids in association with many diseases. It is a medical discipline devoted to obtain, explore and employ clinical and laboratory knowledge in holistic patient care. This comprises of the validation of test results and advising clinicians on their interpretation and any further appropriate investigations to be performed if necessary.

The Role of a Chemical Pathologist

One of the main tasks of Chemical Pathologists includes the direction and supervision of a laboratory department in a hospital or health service centre, where the role involves bridging the gap between rapidly developing laboratory technology and the growing knowledge of the characteristics of diseases. For this reason, knowledge on information systems and data analysis is of paramount importance to maintain quality in the laboratory. Apart from clinical duties, Chemical Pathologists also work closely with scientific and technical staff in the supervision and management of the laboratory.

Size of the Specialty

As of June 2022, there are a total of 892 pathologists registered on the NSR of which 91 are listed under Chemical Pathology with five under Chemical Pathology (Metabolic Medicine). Some pathologists are registered for both General Pathology and their respective specialty therefore there is a potential overlap in numbers. The projected number of Chemical Pathologists required by 2030 for MOH, the main stakeholder, is 142. This number may change with the country's increased need for new hospitals. Furthermore, the increase in the numbers of teaching hospitals, private hospitals and laboratories and Ministry of Defence hospitals will also increase the demand for Chemical Pathologists. In recent years, the evaluation of new technology, particularly the use of molecular biology techniques in diagnostic tests and the development of new tests, has significantly expanded the scope and pivotal roles of Chemical Pathologists, further contributing to the increased demand. Considering that Chemical Pathology is arguably the broadest discipline in the field of Pathology, with particular emphasis on metabolic diseases, it is apparent that there is a major shortfall of Chemical Pathologists in Malaysia, especially when compared to countries such as Australia and the United Kingdom.

Unique Features of Chemical Pathology

Chemical Pathology incorporates both laboratory and clinical medicine with many opportunities to participate in clinical research. As this specialty covers broad disciplines in medicine, the varied range of laboratory investigations and the clinical problems encountered are also diverse, and continue to provide interesting challenges to pathologists. It is a profession most suited to medical doctors with an inclination for scientific detail, test-based investigation of disease and objective reporting. In today's era of precision and personalised medicine, the Chemical Pathologist plays a key role not only in precise diagnosis, but also in the provision of prognostic and predictive information crucial for making treatment choices.

Chemical Pathology has many other unique roles in medical practice. It is the traditional gate-keeper of the healthcare service through providing objective data on disease patterns, resource utilisation and financing to inform clinical audit and policy decisions. Being the custodian of patient sample archives, the Chemical Pathologist has strong roles in research and the total quality management of the laboratory.

Why choose Chemical Pathology as a Career?

As a Chemical Pathologist you will be amongst the few who will be immersed in / have the opportunity for:

- a close collaboration with many clinical disciplines in your daily work
- a fast-developing field of medicine with rapidly progressing knowledge that integrates laboratory and clinical medicine
- use of cutting-edge and rapidly developing technologies
- learning many new skills including audits, quality management, financing
- research on the vast amount of archived case material in Chemical Pathology

A Chemical Pathologist's day is primarily dedicated to clinical liaison, which includes advising clinicians on the right tests to investigate a specific disease, how to interpret the results and follow up, and how analytical interference may affect the results. Their pertinent role is at the laboratory interface, between the analytical and clinical aspects. While the test analysis in Chemical Pathology may seem largely automated, Chemical Pathologists play key roles and offer insights that computers cannot in the validation and interpretation of test results. The Chemical Pathologist is responsible for the total quality assurance of the laboratory as well as ensuring test method selection, reference interval setting and reporting methodology are correct as these decisions can affect patient management.

It might be challenging to fully define a Chemical Pathologist's role because this specialty encompasses such a wide range of clinical and investigative domains. The daily experience is frequently unpredictable, and one never knows what clinical issue will come up. Because of this, it is a discipline that continues to offer challenges and intrigue. Additionally, Chemical Pathology establishes a foundation for a further career in a large range of subspecialties while retaining a sound fundamental basis.

1. The Chemical Pathology Programme

Training Pathways

Currently, the MPath (Chemical Pathology) of the Ministry of Higher Education (MOHE) is the main pathway for training. It is a postgraduate clinical coursework programme which involves supervised competency-based training in diagnostic Chemical Pathology for a duration of a minimum of FOUR (4) years and a maximum of SEVEN (7) years.

Alternative (parallel) pathways of training such as for the Fellow of the Royal College of Pathologists, United Kingdom (FRCPath) or the Fellow of the Royal College of Pathologists of Australasia (FRCPA) have not been formalised with institutional training providers, although individual arrangements may be made on an adhoc basis. These may require additional year(s) of training and can be carried out in laboratories accredited for training by the respective Royal Colleges in Malaysia. Notable, the MPath programme currently provides training that is recognised towards the FRCPath and the MPath degree is accepted by the FRCPA as providing exemption from the Basic Pathological Science paper and Part 1 FRCPA examination.

Stages of Training

The programme of study is divided into 2 stages, Stages 1 and 2.

Stage 1 is ONE (1) year in duration. In summary, the trainee will attend an Orientation/ Induction programme, undergo a one-month Foundation posting rotation to each of the other major specialties of Pathology, namely: Haematology, Medical Microbiology and Anatomical Pathology, to familiarise themselves with the workings of these other specialties of Pathology. The trainee will undergo supervised competency-based training in Chemical Pathology for the remainder of Stage 1. At the end of Stage 1, the trainee who has satisfactorily completed training will sit for an examination in Chemical Pathology (Part I Examination).

Stage 2 is THREE (3) years in duration during which the trainee will undergo supervised competency-based training in Chemical Pathology with the aim of progressing to Level 5 competence. Some subspecialty areas will be introduced at this stage, including inherited metabolic diseases, toxicology and therapeutic drug monitoring, endocrinology, genomics, metabolomics and proteomics.

In Stage 2, the trainee will also be introduced to research methodology, data analysis and writing a research report. With the guidance of the supervisors (Educational/Clinical/ Research), the trainee will plan and undertake a research project and write up a research report. To facilitate the understanding of research methodology, all training universities will conduct a research methodology course which all trainees are required to attend. After satisfactory completion of training in Stage 2, the trainee sits the Final (exit) examination.

Training will be carried out in centres which are accredited for this purpose (Appendix 1).

2. Entry Requirements

Applicants to the postgraduate training programme must meet the requirements detailed below both in terms of the entry as well as the funding criteria as appropriate.

Applicants funded by the MOH, and applying to university programmes must meet both the MOH and university requirements to be considered for an entrance evaluation.

Self-funded applicants only need to meet the requirements of the programme and institution to which they apply.

Applicants generally fall into the following groups:

1. MOH sponsored.
2. Non-MOH, government sponsored (e.g., Ministry of Defence).
3. Other sponsored trainees (e.g., sponsored by university or private institutions).
4. Private – self funded trainees.
5. International - non-Malaysian foreign trainees who may be self-funded or sponsored by a variety of agencies or government.

Essential Criteria

Candidates who wish to pursue postgraduate training in Chemical Pathology have to meet the following requirements:

Component	Entry Requirement	Evidence
Medical Degree registrable with Malaysian Medical Council (MMC)	**Mandatory**	Original certificate
Full Registration with MMC	**Mandatory**	Certificate of registration
Clinical Experience	**Mandatory** 3 years of clinical experience after attainment of the basic medical degree, comprising of: a. satisfactory completion of housemanship, and b. post-housemanship clinical experience of at least 1-year duration.	Authorised service record
Valid Annual Practising Certificate (APC)	**Mandatory**	Certificate
Clinical Skills and Knowledge as per Entry Essential Learning Activities (ELA)	**Mandatory**	Demonstrate relevant knowledge, skill and attitude of entry ELAs Letters of reference
Entrance Evaluation	**Mandatory**	Satisfactory performance
Additional requirements for International Candidates		
Good Standing	**Mandatory**	Letter of Good Standing from Medical Council of country of current practice

Component	Entry Requirement	Evidence
Temporary Practice Certificate (TPC) or APC from MMC	**Mandatory**	Certificate
Clinical or laboratory attachment for a minimum of 3 months before joining the Pathology training programme	**Mandatory**	Satisfactory supervisor's report
Proficiency in written and spoken English language (if basic degree is from an institution of higher learning where the medium of instruction for that degree is not the English language)	**Mandatory**	Test of English as a Foreign Language (TOEFL) or other relevant transcripts which meets requirements of training university

Important:

1. Any falsification of documents will result in the application being rejected and the applicant will be reported to the MMC.
2. Any adverse reports such as an investigation by the MMC must be declared to the Selection Committee.

Entry Essential Learning Activities (ELAs)

Entry ELAs are clinical activities that prospective trainees should be able to perform in a trustworthy manner by the time they enter postgraduate training in Chemical Pathology. The Entry ELAs have been selected to represent the typical and basic day-to-day work in Chemical Pathology. They indicate the knowledge, skills and attitudes that the trainees need to be aware of when carrying out the tasks and responsibilities. They also serve as learning opportunities for prospective trainees when they are tasked to undertake the activities and then receive feedback regarding their performance.

All prospective applicants are required to fulfil the following entry level ELAs prior to entry into Chemical Pathology training:

ELA 1	Sample collection (pre-analytical variables)
ELA 2	Laboratory investigation in a patient with suspected liver dysfunction
ELA 3	Laboratory investigation in a patient with suspected renal disease
ELA 4	Diagnosis of diabetes mellitus (DM) and the complications of DM

*The list of entry ELAs is not exhaustive and may be updated according to programme requirements.

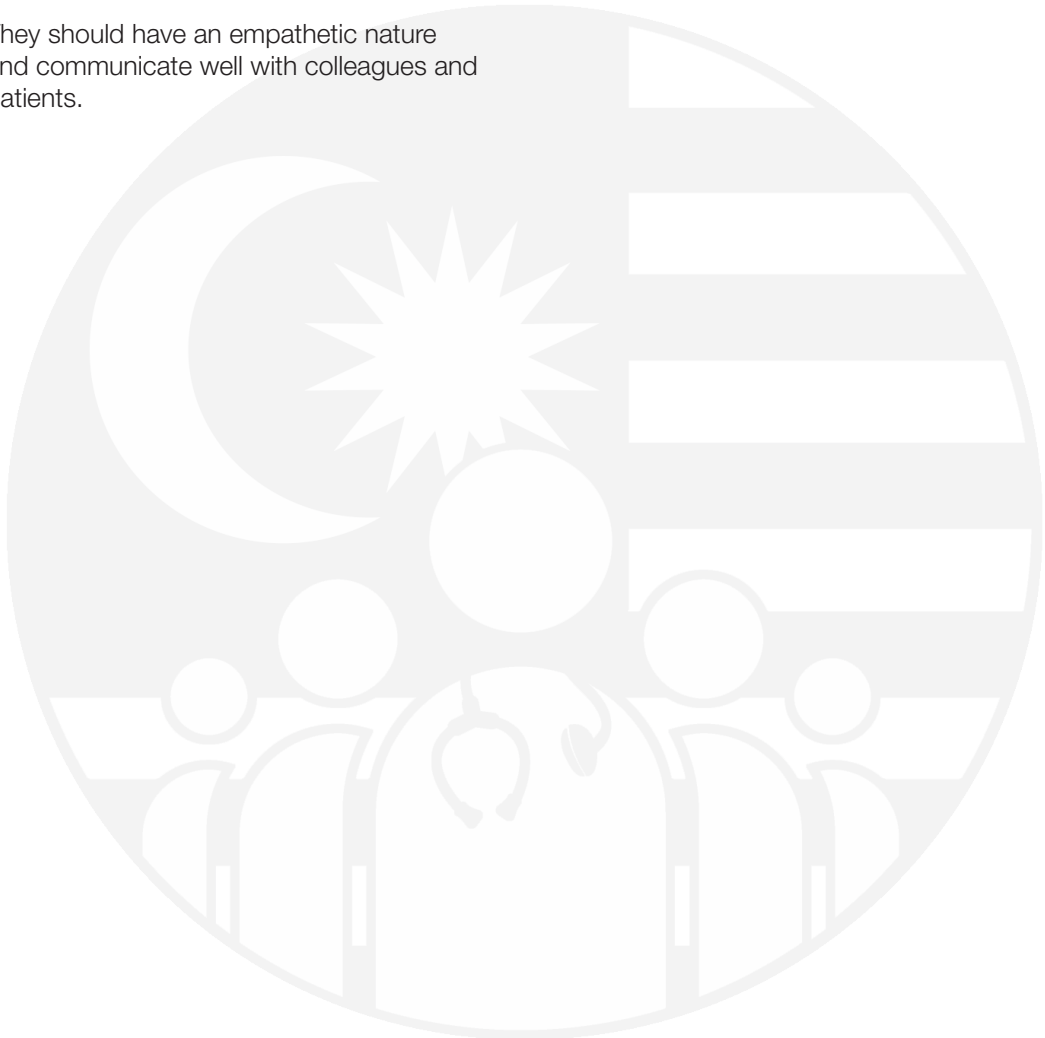
A full description of the Entry ELAs is included in Appendix 2.

Personal Qualities

- Applicants should have an inclination for pathophysiology of diseases. They should have an interest in relating the laboratory investigations with the clinical history and other investigations to arrive at a diagnosis and in aiding patient management.
- They should be committed to self-learning and have the aptitude for searching online Pathology education resources.
- They should be committed to continued professional development and life-long

learning. They should have the aptitude for group fora, professional discourse, and participation in live and virtual seminars/ webinars and conferences.

- They should behave with integrity, honesty and responsibility at all times in their practice.
- They should have critical and analytical thinking in their practice. They should be problem-solvers rather than complacent followers.
- They should have an empathetic nature and communicate well with colleagues and patients.



3. Entry Process

Calls for applications will be advertised, and entrance evaluations conducted by the relevant bodies (e.g., National Conjoint Specialty Committee for Chemical Pathology).

Eligible applicants may apply either through MOH (government-MOH sponsored candidates) or directly to the university of their choice (private Malaysian and international candidates).

Applicants are required to go through a selection process following which they are informed of the outcome of their application by the MOH and the university respectively.

MOH sponsored candidates:

Applications must be made to the Training Management Division, MOH. Any further enquiries should be directed to the Training Management Division, MOH.

Private candidates (Malaysian/ International):

Applications can be made directly throughout the year through the website of any university that is offering the training programme. Candidates may apply to more than one university and should refer to the university's postgraduate studies administrative office for further application details.

Essential Criteria

Event	Process
Document Compilation	Applicants must compile the following documents for presentation: • Sijil Pelajaran Malaysia (SPM) or its equivalent and any other pre-university certificates as evidence of education level • Basic medical degree certification • Certificate of registration with the MMC • Curriculum vitae with details of work experience • Evidence of previous training records
Application	
MOH-sponsored candidates	Applications can be made online at http://ehlp.moh.gov.my/ Applications for pre-entrance evaluation are available at http://apps.mpm.edu.my/medex/public/register
Non-MOH sponsored candidates	Applications can be made online at the postgraduate studies web link of the respective universities.
Entrance Evaluation	An entrance evaluation which can take the form of an entrance examination e.g., Medical Specialist Pre-Entrance Examination (MedEx) [see Appendix 3] or an interview.
Shortlisting	MOH-sponsored candidates and non-MOH sponsored candidates, on satisfactory performance at the Entrance Evaluation will be shortlisted by their respective sponsors (if relevant) and the list of potential candidates presented to the participating training universities.

Event	Process
Outcome	The universities will select the candidates for training based on the number of training positions available. Successful MOH-sponsored candidates will be informed by the Training Division of MOH. Non-MOH sponsored candidates will be informed of the outcome by the respective universities.
Orientation	Successful candidates will attend an Orientation/Induction Programme at the respective training universities at the commencement of the academic year.

Orientation/Induction Process

The Orientation/Induction process is a set of steps put in place to orientate the trainee to the institution, curriculum and training requirements.

Each university is responsible for the organisation and conduct of the programme for its own candidates.

The Orientation/Induction programme covers the following aspects:

- Registration process
- Payment of fees
- Details of the programme of study to be followed
- Learning opportunities that will be provided
- Assessments used and their purpose
- Location of training centres
- The duties of a trainee
- Guidelines and protocols in the workplace
- Support provided in the workplace
- Role of trainers
- Continuous Professional Development (CPD) requirements
- Attendance during training
- Disciplinary processes
- Processes to report concerns about training
- Systems for supporting a trainee in difficulty

Attendance and participation in the Orientation/Induction programme is compulsory. Failure to attend the Orientation/Induction programme will result in the trainee not being able to commence training.

4. Syllabus

Overview

The syllabus defines what will be taught and learned throughout the training programme in Malaysia. It outlines the domains and competency levels to be achieved in each stage of the training programme. It details the generic and specialty-specific breadth of knowledge, skills and attitudes that a trainee needs to attain and apply to patient care.

The syllabus provides a framework for the:

1. structure of the training programme.
2. competencies expected in the domains of knowledge, skills and professional behaviours.
3. expected levels of competency at different stages of training.

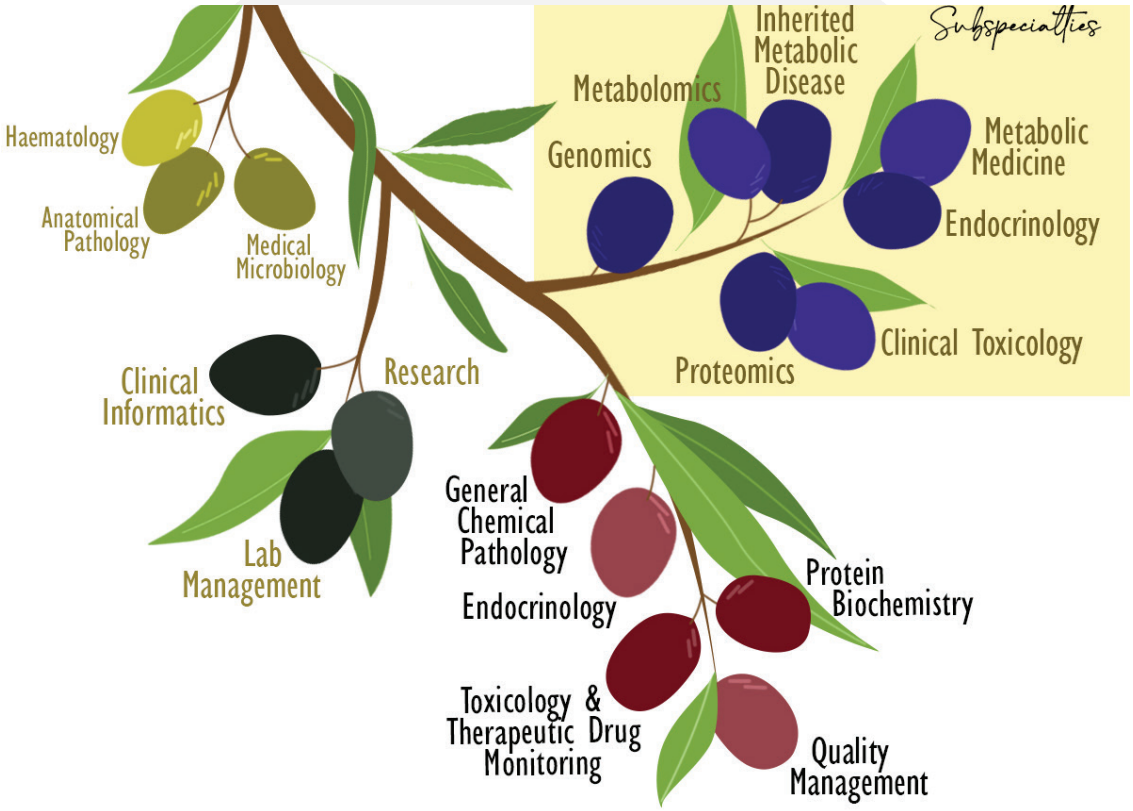


Figure 1: The branches of the olive tree illustrate the relationship between various domains in the Chemical Pathology training programme, incorporating foundation, core and subspecialty areas.

The syllabus is based on supervised competency-based training in diagnostic Chemical Pathology. The approach is one where the trainee undergoes a spiral progression of competence achievement and the trainee is expected to progressively acquire a range of knowledge, skills and values during the period of training, bringing them from an "observer" to a fully-competent independent Chemical Pathologist.

The syllabus is extensive. While acquiring knowledge, skills and professional values to function as a competent Chemical Pathologist, the trainee will not only be exposed to core areas of General Chemical Pathology, Endocrinology, Protein Biochemistry, Toxicology and Therapeutic Drug Monitoring and Quality Management, but many other state-of-the-art skillsets that will enable the trainee to become a competent, well-rounded, confident leader in the field. Candidates are referred to training guidebooks of the MPath Programmes and the Royal Colleges of Pathologists of Australasia and United Kingdom for details (Appendix 4).

Training Structure

This is a fully-supervised 4-year programme structured as TWO (2) Stages, offered by local universities accredited to provide the programme.

Stage 1 (year 1) of the programme focuses on foundational knowledge and practical skills in Chemical Pathology. This must be sound enough as the basis on which to build on, prior to entry into the more patient-centred and practice-focused training of Stage 2. For this reason, there is a formal Part I examination at the end of Stage 1 to evaluate the suitability of a trainee for a career in Chemical Pathology.

Stage 2 (years 2, 3 and 4) of the programme focuses on the spiral acquisition of specialised knowledge and practical skills in Chemical Pathology through the handling of increasingly complex clinical cases. Concurrent with this is the development of professional behaviours, conduct and character to achieve the competence level required of a specialist Chemical Pathologist. There is a formal Final (exit) examination at the end of Stage 2 that serves as the exit assessment.

Competency Indicators

The competence levels, which reflect a combination of knowledge and skills achievements, are as below. At each level, knowledge would precede and usually exceed skills but should always be appropriate and adequate to support skills competence.

Level	Description
1	Observer status only
2	Assistant status
3	Able to perform under close and direct supervision
4	Able to perform under indirect supervision
5	Able to perform unsupervised

Knowledge and Skills Syllabus

The syllabus broadly covers THREE (3) major focus areas (clinical, technical and management aspects of Chemical Pathology) in which the trainee must progress in both knowledge and skills throughout the training programme.

Focus Areas	Topics
Clinical aspects	Pathophysiology of diseases. Interpretation of laboratory test results relating to assay methodology and patient's clinical condition. Selection of appropriate tests for investigation of more complex disorders. Provision of interpretative comments to written reports crucial to clinical management. Basic knowledge and understanding of other Pathology specialties as required.
Technical aspects	Principles and Applications of Analytical Techniques in Chemical Pathology: • Fundamental Laboratory Techniques • Common Laboratory Techniques • Specialised Laboratory Techniques Factors affecting Laboratory Processes in Chemical Pathology: • Pre-Analytical • Analytical • Post-Analytical
Management aspects	Organisation of Laboratory Services Personnel Management Facilities and Safety Resourcing and Finances Purchasing and Inventory Laboratory Information System (LIS) Risk Management Laboratory Quality Management System (QMS) Laboratory Accreditation

Learning Outcomes

Stage 1

1. To apply basic theoretical knowledge in the selection, interpretation and reporting of laboratory tests for "non-complex" cases.
2. To apply basic understanding of other specialties, i.e., Haematology, Medical Microbiology and Anatomical Pathology in relation to Chemical Pathology.
3. To apply standard operating procedures in laboratory management including laboratory

organisation, quality assurance, laboratory safety and infection control.

4. To demonstrate an understanding of medico-legal implications of Chemical Pathology reports.

Stage 2

1. To develop the appropriate competencies in the selection and utilisation of routine and specialised techniques and assays.
2. To demonstrate the appropriate competencies in interpretation and reporting of results in order to optimise patient care.
3. To develop the appropriate competencies in the management of laboratory services, including implementation of quality assurance system.
4. To acquire the appropriate competencies in developing and undertaking research.

The knowledge and skills syllabi will support the development of the trainee in the various modalities of Chemical Pathology throughout the training programme.

A summary of the Syllabus is included in Appendix 5.

Professional Behaviours

Professionalism is 'placing the interests of the patient above those of the specialist, setting and maintaining standards of competence and integrity, and providing expert advice to society on matters of health'. Therefore, the highest standards of professional behaviour must be instilled in and practised by all trainees.

Domains	Positive behaviours
Responsibility	• Punctuality • Conscientiousness • Industriousness • Accurate documentation
Relationships with and respect for patients	• Maintenance of patient confidentiality • Appropriate behaviour • Respect of boundaries • Respect of cultural differences • Effective communication • Courtesy in all interactions
Probity and honesty	• Ethical decision-making based on best evidence • Transparency • Integrity
Self-awareness and capacity for reflection	• Constructive attitude to feedback • Willingness to learn from experiences of self and others • Regular audit of outcomes
Collaboration and working with colleagues	• Teamwork and collaboration • Effective communication • Appropriate behaviour • Avoidance of negative behaviours, such as bullying and harassment • Respect of diversity and boundaries • Promotion of a positive workplace culture

References:

1. ABIM Foundation, ACPeASIM Foundation, European Federation of Internal Medicine. Medical professionalism in the new millennium: a physicians' charter. Lancet 2002; 359:520e2
2. Rogers W, Ballantyne A. Towards a practical definition of professional behaviour. J Med Ethics. 2010 Apr; 36(4):250-4. doi: 10.1136/jme.2009.035121

Research Syllabus

Chemical Pathologists must be trained in applying the principles of evidence-based medicine in clinical practice in order to offer the best available care to their patients, while accounting for local resources and cultural expectations.

The postgraduate training syllabus includes the requirement for completion of a research project leading to a research report. Trainees are also exposed to journal clubs, symposia and scientific conferences, to improve and expand their understanding of research principles.

The research syllabus consists of the following:

Clinical research design

1. Understanding the value of clinical research
2. Formulating the research question
    - literature review
    - tools for managing your references
3. Choosing the right study design for the research question
4. Assessing feasibility
5. Ethics approval - considerations and the application process
6. Funding – sourcing, application and increasing their chances of success

Statistics and other methods of data analysis

1. Quantitative methods
2. Qualitative methods
3. Sample size and power calculation
4. Sampling methods

Good clinical practice

1. Defining Good Clinical Practice
2. Collaborators' roles in clinical research
    - investigator-initiated studies
    - sponsor-initiated studies
3. Institutional research boards (IRB) and institutional ethics committees (IEC)
4. Protocol deviations
5. Informed consent
6. Safety management

Scientific writing

1. Principles of scientific writing
2. Converting data into a manuscript
3. Plagiarism, and how to use plagiarism checkers
4. Choosing a journal
5. Journal formats
6. Writing an abstract
7. Writing a cover letter

Research presentation skills

1. Designing slide presentations and posters
2. Capturing an audience - verbal and non-verbal skills
3. Defending your work
4. Concluding strongly

5. Assessment Tools

Introduction

This section outlines the assessment methods and modalities, their utility, and timing in Chemical Pathology training. Formative and summative assessments are carried out to assess all domains in which the modern Chemical Pathologist is expected to be competent. Assessments serve the following key functions:

1. To track the trainee's achievement of the required competencies, facilitate the provision of feedback, and identify opportunities for improvement.
2. To ascertain if the trainee has met the learning requirements and competencies expected from a placement/rotation as a precursor to progressing to the next placement and/or stage of training.

Training Placements for Stages 1 and 2

Stage 1

1. A one-month Foundation posting rotation to each of the other major specialties of Pathology, namely: Haematology, Medical Microbiology and Anatomical Pathology, to familiarise themselves with the workings of these other specialties of Pathology.
2. Failure to obtain a "Satisfactory" grade in a trainee placement will result in the trainee having to repeat the training placement.
3. Trainees must obtain a "Satisfactory" grade for the placement immediately preceding the date of the Part I examination. Failure to obtain a "Satisfactory" grade for this placement will disqualify the trainee from the Part I examination. Failure to sit for the Part I examination for this reason may be considered a failed attempt at the examination.
4. The trainee will undergo supervised competency-based training in Chemical Pathology for the remainder of Stage 1.

Trainees are required to pass the Part I examination as an indication of suitability to continue training in Chemical Pathology.

Stage 2

1. The trainee will undergo supervised competency-based training in Chemical Pathology with the aim of progressing to Level 5 competence. Some subspecialty areas will be introduced at this stage, including inherited metabolic diseases, toxicology and therapeutic drug monitoring, endocrinology, genomics, metabolomics and proteomics.
2. Trainees are also required to complete and submit a research report SIX (6) months prior to the Final (exit) examination.
3. A satisfactory completion of a research project is evidenced by a pass assessment of a research report. A pass re-evaluation after remedial action can replace an unsatisfactory/failed initial evaluation.

Trainees are required to pass the Final (exit) examination to complete the training programme.

Formative Assessments

Formative assessments in Chemical Pathology training will be largely workplace-based assessments (WBAs). This is the appraisal of the trainee's professional skills and attitudes that evidences their actual performance in the workplace. These are for the continuous provision of feedback and identification of areas for improvement, and are carried out throughout the training period. The assessment tools for WBAs include Directly Observed Practical skills (DOPS), Case-Based Discussions (CBD), Evaluation of Clinical Events (ECE) as well as Multi-source Feedback (MSF).

The assessment methods for WBAs include:

WBA		Description
DOPS	Directly Observed Practical Skills	The emphasis of DOPS assessments is provision of feedback that supports the development of competency and proficiency. The assessment typically takes 15-20 minutes, with an additional 5 minutes for feedback.
CBD	Case-Based Discussions	CBD provide the trainer the means of reviewing a trainee's practice or their thoughts about practice. It enables trainers to explore the thinking of their trainee, share understanding, and develop professional thinking. Each assessment should typically take 15-20 minutes with an allowance of an additional 5-10 minutes for feedback provision by the assessor.
ECE	Evaluation of Clinical Events	A tool used for assessing the trainee in the performance of their duties in complex tasks, often involving teamworking or interacting with other professional staff.
MSF	Multi-source Feedback	Feedback provision from wide range of staff in multiple roles who have had engagement with the trainee.

Summary of the Assessment Strategy for all Chemical Pathology Trainees:

Element	Details	End of attachment	End of year	End of training	Comments
Portfolio	Record of professional learning, WBAs, supervisor reports, reflections, and development activities	N/A	Satisfactory completion of the year (at Annual Review)	Satisfactory completion of training (at Annual Review)	The Portfolio is a record of all training activities and forms an integral part of the evidence to demonstrate professional development. Subsequently used for NSR registration.

Element	Details	End of attachment	End of year	End of training	Comments
Research / Audit	Evidence of project management	N/A	Conducted throughout years 2-4. Progress to be demonstrated	Submitted as part of the evidence for completion of training	Application of the scientific approach including formulating an idea, literature reviewing, interpretation and analysis OR an audit / a quality improvement exercise.
Workplace-based assessments	DOPS ECE CBD MSF	Minimum 1 DOPS every 3 months Minimum 1 CBD and 1 ECE every 4 months	Minimum 4 DOPS every year (years 2-4) Minimum 3 CBDs and 3 ECEs every year 1 MSF for every year (but more frequently if needed)	Minimum 12 DOPS Minimum 9 CBDs and 9 ECEs Minimum 4 MSF Evidence of 1 consultation to clinician in managing / resolving a case	WBAs provide an opportunity for feedback and reflection. They will also be used as part of the evidence for the end of year / training Portfolio review.
Educational and Clinical Supervisor Reports	Summary of progress through postings and learning sessions	Satisfactory completion of attachment			Part of the Portfolio
Courses, Workshops and Conferences	Developing knowledge and skills				Part of the Portfolio

Summative Assessments

Summary of the Examination for all Chemical Pathology Trainees:

Part	Examinations	When	Components	Occurrence	Comments
I (SA-1)	Chemical Pathology (Part I Examination)	End of Stage 1 (end of Year 1)	MCQ, Essay and OSPE	Once per year.	A trainee is allowed a maximum of 2 repeat examinations to pass the Part I examination.
Final (SA-2)	Chemical Pathology [Final (Exit) Examination]	End of Stage 2 (end of Year 4)	Essay, Practical and Viva Voce	Once per year.	A trainee is allowed a maximum of 4 repeat examinations. The maximum duration permitted for the completion of the entire programme is 7 years.

*SA: Summative Assessment; MCQ: Multiple Choice Question; OSPE: Objective Structured Practical Examination

Maintenance of Trainee Portfolio

The Trainee Portfolio is a compilation of training / learning events and formative assessment activities throughout training. The Trainee Portfolio should contain the following documents:

- Learning agreements
- Procedure logbook
- **ALL** WBAs
- All research report progress evaluations
- End of Posting evaluation reports
- Proof of attendance of CPD activities

Research Report Progress Evaluations

Research report progress is evaluated SIX (6) monthly. This meeting is attended by trainees in Stage 2 of training, supervisors, and programme coordinators. This exercise aims to identify potential problems and allows for the provision of feedback and suggestions to overcome problems identified. Each evaluation is recorded in a research report progress evaluation form. This form must be kept in the Trainee Portfolio with a copy provided to the office of the programme administrators.

Trainees are required to submit the completed research report SIX (6) months before the Final (exit) examination. A satisfactory completion of a research project is evidenced by a pass assessment of a research report. A pass re-evaluation after remedial action can replace an unsatisfactory/failed initial evaluation.

6. Appendices

Appendix 1: Accredited Training Centres

The list of training centres accredited for Chemical Pathology Training by the National Conjoint Specialty Committee – Pathology (as of 31st December 2020)

University Centres
Pusat Perubatan Universiti Malaya
Pusat Perubatan Universiti Kebangsaan Malaysia
Hospital Universiti Sains Malaysia
Hospital Pengajar Universiti Putra Malaysia
Hospital Universiti Teknologi MARA

Ministry of Health
Hospital Sultanah Aminah, Johor
Hospital Tengku Ampuan Afzan, Kuantan
Hospital Sultanah Nur Zahirah, Kuala Terengganu
Hospital Raja Perempuan Zainab II, Kota Bharu
Hospital Pulau Pinang
Hospital Raja Permaisuri Bainun, Ipoh
Hospital Kuala Lumpur
Hospital Selayang
Hospital Tuanku Ja'afar, Seremban
Hospital Melaka
Hospital Tengku Ampuan Rahimah, Klang
Hospital Sg Buloh
Hospital Ampang
Hospital Sultan Ismail, Johor Bharu

Appendix 2: Entry Level ELAs

All items on the tables below are examples, and they do not constitute an exhaustive list in any aspect.

Entry Essential Learning Activity 1	
Activity	Sample collection (pre-analytical variables)
Description (if necessary)	Pre-analytical variables that affect sample collection include patient identification, collection technique, containers/tubes, types of blood samples (venous, arterial or capillary), etc.
All items on the table below are examples, they do not constitute an exhaustive list in any aspect	

Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Lists the causes of pre-analytical errors. Recognises the importance of providing complete and correct information on the request form. Recognises the correct technique and containers used for sample collection. Explains the safety and infection control measures to be taken during sample collection. Explains the appropriate sample transportation.	Performs appropriate venepuncture. Follows the order of draw. Chooses appropriate containers for sample collection. Adheres to the safety procedure during sample collection. Transports the sample to the laboratory as per the requirement.	Recognises knowledge limits and asks for assistance when necessary. Talks to the patient in a polite manner explaining the procedure. Communicates with the patient with empathy and respect especially if complications occur.

Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Systematic approach in collecting samples and giving instructions to the patient. Understands the gravity of non-adherence to the above, which can affect patient management and safety.	Failing to recognise the importance of pre-analytical variables. Not knowing the importance of safety procedure.	Failing to know the importance of providing complete and correct information on the request form.

Assessment/Evidence
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme

Entry Essential Learning Activity 2		
Activity	Laboratory investigation in a patient with suspected liver dysfunction	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Explains the formation of bilirubin. Lists the causes of jaundice in adults, children and newborn. Describes the predominant patterns of liver disease based on the results of routine liver tests. Provides common differential diagnosis for each pattern of liver injury. Recognises the role of laboratory in the diagnosis of hepatic failure.	Able to identify the pattern of liver dysfunction. Relates the laboratory investigations with the clinical history and other investigations to arrive at a diagnosis.	Informs the clinician about the pertinent findings. Recognises the importance of communication between the laboratory and the clinician regarding abnormal laboratory results. Recognises the limitations of knowledge and seeks guidance appropriately.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Demonstrate an ability to undertake life-long learning. Considers common conditions for the differential diagnosis.	Failing to recognise the pattern of liver function test.	Failing to know the importance of communication of critical results.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Entry Essential Learning Activity 3		
Activity	Laboratory investigation in a patient with suspected renal disease	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Describes the pathophysiology of chronic kidney disease (CKD) and acute kidney injury (AKI). Lists risk factors for CKD. Discusses the biochemical changes in CKD and AKI. Explains the importance of reporting estimated glomerular filtration rate (eGFR) and urine albumin creatinine ratio (ACR).	Based on the laboratory investigations, able to categorise the patient in different stages of CKD and AKI. Interprets eGFR and ACR taking into consideration the factors that can affect the calculated parameters.	Informs the clinician about the pertinent findings. Recognises the importance of communication between the laboratory and the clinician in the management of kidney disease. Recognises the limitations of knowledge and seeks guidance appropriately.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Comprehensive knowledge about eGFR and ACR. Considers the factors that can affect the results.	Failing to recognise factors that can affect eGFR and ACR.	Failing to consider the urine microscopic findings in the management.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Entry Essential Learning Activity 4		
Activity	Diagnosis of diabetes mellitus (DM) and the complications of DM	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Defines the diagnostic criteria of diabetes mellitus (DM). Lists the types of DM. Differentiates impaired glucose tolerance (IGT), impaired fasting glucose (IFG) from DM. Describes the pathophysiology and risk factors of DM. Explains the acute and chronic complications of DM.	Prepares the patient for oral glucose tolerance test. Demonstrates the ability to perform appropriate laboratory investigations and interpret their results.	Informs the clinician about the pertinent findings. Recognises the limitations of knowledge and seeks guidance appropriately. Appropriate approach to the diagnosis and management of the patient.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Considers common and life-threatening conditions, e.g., hypoglycaemia and diabetic ketoacidosis. Comprehensive assessment of the laboratory investigations. Understands the role of laboratory in the management of DM. Maintains good communication channels with senior and junior colleagues as well as all other clinical colleagues who are part of the patient management team.	Failing to recognise the urgency of laboratory investigations in life-threatening conditions and complications.	Failing to consider other laboratory investigations for the comorbidities that can occur with DM.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Appendix 3: The Medical Specialist Pre-Entrance Examination (MedEx) – Pathology Component

The salient features of the MedEx - Pathology are:

a. TWO (2) true-false MCQ papers relating to the understanding of basic Anatomical Pathology, Haematology, Chemical Pathology, Medical Microbiology, Forensic Pathology, Medical Genetics and Immunology.

b. Marking system: A computerised marking system is used. There is negative marking within the question and the minimum score for each question is ZERO (0), i.e., there will be no carryover of negative marks.

c. Selection of candidates for entry into the MPath programme will be based on the best performing candidates of the year's cohort.

Please refer to the MedEx website for updates on the examination: https://bit.ly/3nuvtPu

Appendix 4: References to Chemical Pathology Trainee Guides

1. Master of Pathology Guide to Trainees and Trainers, Revised October 2016. National Conjoint Specialty Committee - Pathology.
2. Royal College of Pathologists (UK) Curriculum for Specialty training in Chemical Pathology https://bit.ly/3KdDdhy
3. The Royal College of Pathologists of Australasia Curriculum/Training Handbooks. https://bit.ly/3MnryOR

Appendix 5: Summary of Syllabus in Chemical Pathology

Summary of Syllabus in Chemical Pathology	
Topic	**Content**

Clinical Chemistry	• Disorders of water, sodium and potassium
	• Acid-base imbalance
	• Renal disorders
	• Hepatobiliary disorders
	• Gastrointestinal disorders
	• Endocrine disorders
	  • hypothalamus and pituitary gland
	  • adrenal gland
	  • thyroid gland
	• Disorders of reproductive system
	• Disorders of carbohydrate metabolism
	• Disorders of calcium, phosphate and magnesium
	• Musculoskeletal disorders
	• Disorders related to plasma proteins and enzymes
	• Disorders of lipid metabolism
	• Disorders of cardiovascular system
	• Disorders of nervous system
	• Disorders related to clinical nutrition
	• Disorders of haemoproteins, porphyrins and iron
	• Genetic disorders
	• Disorders of immune system
	• Inherited metabolic diseases
	• Metabolic aspect of malignant diseases
	• Therapeutic drug monitoring and clinical toxicology

Summary of Syllabus in Chemical Pathology	
Topic	**Content**

Techniques	• **Fundamental laboratory techniques**
	  • Centrifugation
	  • Pipetting
	  • Calibration
	  • Quality control
	  • Reagents
	• **Common laboratory techniques**
	  • Ion-selective electrodes
	  • Osmometry
	  • Spectrophotometry
	  • Flame photometry
	  • Enzymatic assays
	  • Immunoassay
	  • Turbidimetry and Nephelometry
	  • Blood gas analysis
	  • Point of care technology (POCT)
	  • Urinalysis
	• Specialised laboratory techniques
	  • Chromatography (thin-layer, gas, ion exchange, high-performance liquid chromatography)
	  • Electrophoresis
	  • Atomic absorption spectrophotometry
	  • Isoelectric focusing
	  • Mass spectrometry
	• Molecular methods (blotting techniques, polymerase chain reaction, sequencing)

Summary of Syllabus in Chemical Pathology	
Topic	**Content**

Laboratory Processes	• Pre-analytical
	  • Patient preparation
	  • Sample collection
	  • Sample handling (transport, processing, storage)
	• Analytical
	  • Instruments
	  • Reagents, Controls, Calibrators
	  • Procedure
	  • Method
	  • Technologists
	  • Work environment
	  • Statistics
	  • Quality assurance
	  » Internal quality control (IQC)
	  » External quality assurance (EQA)
	  • Measurement of uncertainty (MU)
	  • Between-reagent lot variation
	  • Method validation and method verification
	  • Total laboratory automation
	• Post-analytical
	  • Reference interval
	  • Units of measurement
	  • Critical results
	  • Turnaround time (TAT)
	  • Calculation and/or statistical analysis including, but not limited to:
	  » Specificity
	  » Sensitivity
	  » Efficiency
	  » Predictive values
	  » Likelihood ratios
	  » Critical Difference or Reference Change Value (RCV)

Summary of Syllabus in Chemical Pathology	
Topic	**Content**
Laboratory Management	• Organisation of laboratory services • Personnel management • Facilities and safety • Resourcing and finances • Purchasing and inventory • Laboratory information system (LIS) • Risk management • Laboratory quality management system (QMS) • Laboratory accreditation

Glossary of Terms

APC	Annual Practicing Certificate
BPL	Bahagian Pengurusan Latihan (Training Management Division)
CBD	Case-Based Discussions
CPath-AMM	College of Pathologists, Academy of Medicine of Malaysia
CPD	Continuous Professional Development
DOPS	Directly Observed Practical Skills
ECE	Evaluation of Clinical Events
ECSMQ	Evaluation Committee for Specialist Medical Qualifications
ELA	Essential Learning Activities
FRCPA	Fellow of the Royal College of Pathologists of Australasia
FRCPath	Fellow of the Royal College of Pathologist, United Kingdom
HO	House Officer
JBILP	Jawatankuasa Bersama Ijazah Lanjutan Perubatan
JBSP	Jawatankuasa Bersama Sarjana Perubatan - Patologi
MCQ	Multiple Choice Questions
MEC	Medical Education Committee
MedEx	Medical Specialist Pre-Entrance Examination
MMC	Malaysian Medical Council
MO	Medical Officer
MOD	Ministry of Defence
MOH	Ministry of Health
MOHE	Ministry of Higher Education
MQA	Malaysian Qualifications Agency
MQF	Malaysian Qualifications Framework
MSF	Multi-source Feedback
NPMC	National Postgraduate Medical Curriculum
NSR	National Specialist Register
OSPE	Objective Structured Practical Examination
PEO	Programme Educational Objectives
PLO	Programme Learning Outcomes
QAD	Quality Assurance Division of the Ministry of Higher Education
SA	Summative Assessment
SPM	Sijil Pelajaran Malaysia
SSCs	Specialty Sub-Committees
UKM	Universiti Kebangsaan Malaysia
UM	Universiti Malaya
UPM	Universiti Putra Malaysia
USM	Universiti Sains Malaysia
UiTM	Universiti Teknologi MARA
WBA	Workplace-based assessment

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