POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO, SRI LANKA

Prospectus
DOCTOR OF MEDICINE (MD)
AND
BOARD CERTIFICATION IN CHEMICAL PATHOLOGY

(To be effective from the year 2016)

BOARD OF STUDY IN PATHOLOGY

Contents

1 Nomenclature 2
2 Background and Justification for Amendments 2
3 Eligibility for the Entry into the Training Programme 2
4 Selection Examination 3
5 The Number to be selected for Training 4
6 Learning Outcomes 4
7 Structure of the Training Programme 5
8 MD Part 1 in Chemical Pathology 7
9 MD Part 2 in Chemical Pathology 13
10 Post MD Training 18
11 Board Certification 23
12 Recommended Reading 23
13 Contributors to Development/Revision of Prospectus 24
Annexure 1 - Subject Content for the Selection Examination in Pathology 25
Annexure 2 - Learning Outcomes for Pre-MD training in Chemical Pathology 27
Annexure 3 - Content areas for Pre MD training in Chemical Pathology 31
Annexure 4 - Training Units 37
Annexure 5 - Trainee Portfolio for Postgraduate training in Chemical Pathology 38
Annexure 6 - Case book 43
Annexure 7–Progress Report for Postgraduate training in Chemical Pathology 44
Annexure 8 - Research Project in Chemical Pathology and its Assessment 45
Annexure 9 – Supervisor Consent Form - MD Research Project 46

This prospectus is made under the provisions of the Universities Act, the Postgraduate Institute of Medicine Ordinance, and the General By-Laws No. 1 of 2016 and By-Laws No. 2 of 2016 for Degree of Doctor of Medicine(MD) and Board Certification as a Specialist.

1 Nomenclature

1.1	Full title:	Doctor of Medicine and Board Certification in Chemical Pathology
1.2	Abbreviated title:	MD (Chem Path) and Board Certification
1.3	University:	University of Colombo
1.4	Institute:	Postgraduate Institute of Medicine
1.5	Department:	Board of Study in Pathology

2 Background and Justification for Amendments

The PGIM's postgraduate training programme in Pathology was commenced in 1980 with a two year course for the Diploma which included six months of training in each in the disciplines of Histopathology, Haematology, Chemical Pathology and Microbiology followed by a two year pre-MD training period either in Histopathology, Haematology or Chemical Pathology and a year each for local and overseas training, leading to Board Certification in Pathology. In 2008 with the revision of the prospectus, each subspecialty was endowed with its own Diploma and MD with the selection exam and Course in Basic Laboratory Sciences as common features.

3 Eligibility for the Entry into the Training Programme

Entry to the training programme will be based on passing the Selection Examination in Pathology.

Prospective applicants must satisfy the following requirements.

3.1. A medical degree registered[1] with the Sri Lanka Medical Council.

3.2. Satisfactory completion of an internship acceptable to the Sri Lanka Medical Council.

3.3. Satisfactory completion of one year of post internship in Medical/Clinical practice in a university/public/private sector institution in Sri Lanka acceptable to the PGIM.

3.4. The criteria prescribed in paragraphs (1) to (3) must have been satisfied by the applicants as at the date of closure of applications. Where a short-fall has occurred due to any reason including sick, maternity or other leave, the doctor concerned should complete such shortfall in order to become eligible to apply for the Selection Examination.

3.5. Six months of training in General Medicine or Paediatrics during the internship

OR

during the post-intern period, working in a General Medical or Paediatric ward under the supervision of a Consultant Physician or a Consultant Paediatrician for a six months period.

A quota for the private sector is presently available.

[1]Foreign nationals who seek to apply to register for selection examinations should possess a medical degree which could be registered with the Sri Lanka Medical Council. The decision of the Board of Management will be final in all such applications.

4 Selection Examination

The Selection Examination will be administered by a panel of examiners selected by the Board of Study in Pathology. It comprises of an MCQ paper and a Short Essay/Essay paper.

4.1 MCQ Paper

MCQ paper comprises of 45 questions to be answered in two hours and 15 minutes:

General Pathology	10
Systemic Pathology	10
Haematology	10
Chemical Pathology	10
Microbiology	05

Each MCQ will have five responses of the True / False type. Each correct response will be awarded +1 mark; each incorrect response will be awarded -1 mark; and if no response is marked, zero. There will be no negative carry over, so that each question will carry a maximum of 5 marks, and minimum of 0.

Those who obtain 45% or more for the MCQ paper will be called for the Short Essay / Essay Paper.

4.2 Short Essay / Essay paper

The Short Essay/Essay paper comprises of **four** questions to be answered in two hours. The four questions will be from each of the following four specialties/ areas; General Pathology, Haematology, Chemical Pathology and Systemic Pathology. Each question may have multiple components.

4.3 Requirements to pass the Selection Examination

The MCQ and the Essay papers contribute equally to the final mark (50% from each component). Candidates who have obtained 50% or more of the total aggregate shall be considered to have passed the Selection Examination.

4.4 Selection of the field of Pathology

Depending on the number of training slots available and the merit order of those who have been successful at the selection Examination candidates will be selected to follow the postgraduate training in Pathology. Those who wish to enter the training programme in Chemical Pathology need to fulfill the additional criteria given in 3.5 above. **The selection of the specialty will be done at the outset of the course.** Those who are selected for the postgraduate training in Chemical Pathology will be enrolled to follow the two year training programme of Pre MD training leading to MD Part 1 Examination in Chemical Pathology.

5 The Number to be selected for Training

Available training opportunities will be indicated by the PGIM in the public circular for the MD in Chemical Pathology Examination. The number of training slots will be predetermined each year by the relevant Board and approved by the Board of Management in consultation with the Ministry of Health. This predetermined number will be selected from among those who have passed the Selection Examination, in rank order of merit and in compliance with the General Regulations of the PGIM and relevant Examination Circulars.

There is no limitation on the number of attempts at the Selection Examination. Curriculum for the Selection Examination is annexed. (Annexure 1)

6 Learning Outcomes

The aim of the Postgraduate Training in Chemical Pathology is to produce a specialist medical officer capable of managing and supervising the services provided by a Chemical Pathology laboratory either in the government or the private sector whilst offering expert advice related to Chemical Pathology services in optimizing patient care and improving clinical outcomes.

At the end of successful completion of the training programme leading to Board Certification in Chemical Pathology, the specialist medical officer should be able to give expert advice related to the optimal use of Chemical Pathology services in clinical diagnostics, supervise and manage Chemical Pathology services offered by a laboratory and provide training in Chemical Pathology to the relevant medical and allied health sciences personnel and engage in research aiming to improve patient outcomes through effective Chemical Pathology laboratory services.

The specific learning outcomes for each stage of Pre MD training are given in Annexure 2.

The main content areas leading to Postgraduate training in Chemical Pathology include Analytical Biochemistry, Clinical Biochemistry and Laboratory Management.

The content specified for each stage of Pre MD training is given in Annexure 3.

7 Structure of the Training Programme

7.1 Overview of the Course

The total duration of the postgraduate training in Chemical Pathology is six years. It includes training in Analytical Biochemistry, Clinical Biochemistry and Laboratory Management. The postgraduate training takes place in two parts. Part 1 consists of two years of training in Chemical Pathology, on completion of which the trainees are required to sit the MD Part 1 Examination in Chemical Pathology, which they must pass in order to proceed to the MD Part 2 training in Chemical Pathology. MD Part 1 examination is considered a barrier examination. Part 2 consists of a further two years of training, on completion of which, the trainees will sit the MD Part 2 Examination in Chemical Pathology. Those who pass the MD Part 2 examination will undergo one year of training locally as a senior registrar and a further one year of training at an overseas centre of excellence, approved by the Board of Study in Pathology. A summary of the Postgraduate Training Programme and Examinations is given in Figure 1.

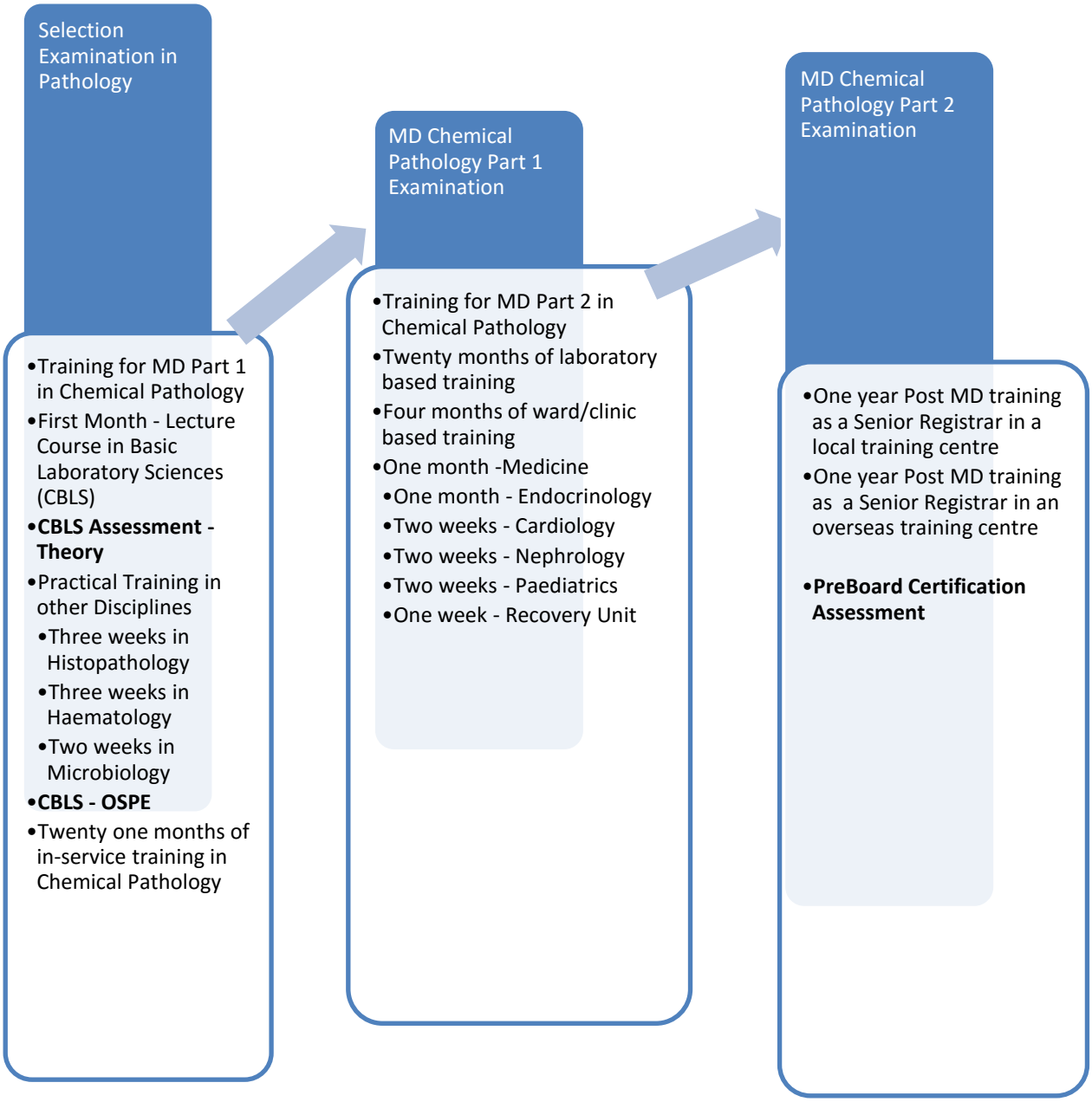

Figure 1: Postgraduate Training Programme and Examinations in Chemical Pathology

7.2 Learning Activities during Pre-MD Training

The learning takes place mostly in the form of day to day routine work in a laboratory setting under the supervision of a consultant Chemical Pathologist who will give regular feedback to the trainee on the progress, standard of conduct and practice of the discipline. Regular case discussions, lectures, tutorials, seminars, laboratory based practical sessions, multidisciplinary meetings, journal clubs, annual academic sessions of the relevant fields of medicine will be the other opportunities for learning.

7.3 Training Units and Trainers

There are currently eight training units accredited by the Board of Study in Pathology for training in Chemical Pathology. (Annexure 4) All stages of training takes place at these units. Trainees are allocated to these units according to their preference based on the order of merit obtained at the Selection Examination. The training centre allocated at the outset of the course for a trainee would be the primary centre at which the trainee undergoes both the pre MD and the post MD local training. Consultants/Specialists in Chemical Pathology with at least 3 years of experience after Board certification will be eligible to be appointed as trainers. New training units are required to be accredited by the Board of Study in Pathology as suitable for training in Chemical Pathology. Clinic/ward based training in MD Part 2 would be conducted in units approved by the Board of Study in Pathology in consultation with the respective Boards of Study in relevant disciplines.

7.4 Leave and attendance requirements

Refer to the PGIM General Regulations for stipulations regarding leave and attendance requirements.

8 MD Part 1 in Chemical Pathology

8.1 Course in Basic Laboratory Sciences

The training for MD Part 1 in Chemical Pathology commences with a Lecture Course in Basic Laboratory Sciences (CBLS) of 4 to 5 weeks duration followed by a laboratory based training of 8 weeks duration in other Pathology disciplines; Histopathology, Haematology and Microbiology.

8.1.1Learning outcomes

The aim of the lecture course and the laboratory based training in other disciplines is to ensure that basic knowledge of the services of all fields of Pathology is acquired to enable the use and interpretation of basic test results of those disciplines and to ensure sufficient basic background knowledge is acquired to proceed with a specialized training in Chemical Pathology.

At the end of the course in basic laboratory sciences, the trainees should be able to

1. Describe the basic pathological processes in terms of pathogenesis, morphological changes and their application in clinical situations.
2. Describe specimen collection, transport, processing and clinical applications with regard to Histopathological, Cytological, Haematological, Microbiological, and Chemical Pathological investigations
3. Discuss the basis, value and limitations of the Molecular Biological and other special tests in the diagnosis, management and screening of diseases.
4. Discuss the value of good laboratory management in improving the Pathology laboratory services
5. Discuss the uses of statistics in the practice of Pathology.

8.1.2 Course contents

Refer Annexure3 for the contents of the CBLS. Immediately after the completion of the lecture course, the CBLS Assessment in theory will be held.

8.1.3 Practical Training in other Pathology Disciplines

At the end of the CBLS Assessment in theory the trainees are required to undergo practical training in Histopathology, Haematology and Microbiology in order to observe the collection, transport and processing of samples in those disciplines, at the end of which a practical examination; Objective Structured Practical Examination (OSPE) would be held.

Table 1 gives an overview of the Course in Basic Laboratory Sciences (CBLS) which would take place at the onset of training for MD Part 1 in Chemical Pathology.

Table 1.

Area of Training	**Duration**	**Centre**
Lecture Course in Basic Sciences	Four weeks	PGIM
CBLS Assessment- Theory Component: The Knowledge gained during the Lecture course is assessed.		
Laboratory training in Haematology	Three weeks	Training Centre to which the trainee is attached.
Laboratory training in Histopathology	Three weeks	Training Centre to which the trainee is attached.
Laboratory training in Microbiology	Two weeks	Training Centre to which the trainee is attached.
CBLS Assessment - Practical Component (OSPE): The practical Knowledge and skills gained in Haematology, Histopathology & Microbiology are assessed.		

8.1.4 CBLS Assessment

CBLS assessment comprises of two components, a theory examination (multiple choice questions) and a practical examination in the form of an Objective Structured Practical Examination (OSPE). Theory examination will be held soon after the completion of the Basic Laboratory Sciences Lecture course.

The practical component will be held soon after the completion of eight weeks of laboratory training in, Histopathology, Haematology and Microbiology.

Attendance of 80% at the lecture course and the eight weeks of practical training is mandatory to be eligible to sit for each component of the continuous assessment.

In the case of a trainee being unable to comply with this rule due to medical reasons the trainee may complete the lecture course/practical training in Histopathology, Haematology and Microbiology with the next batch of trainees and sit the relevant component of CBLS assessment in the second year of training with the next batch of trainees.

The Format of the CBLS Assessment of the MD in Chemical Pathology Part I examination is given below.

	Composition	**Marks Allocated**	**Total Marks**	**Duration**	**% of Final 100 for MD Part 1 Examination in Chemical Pathology**
Component 1 Theory Examination (MCQ)	30 True/False	30X5 = 150	195	Two hours	5%
	15 SBR	15X3 = 45			
Component 2 Practical Examination (OSPE)	10 OSPE	10X10 = 100	100	40 minutes	5%

Each MCQ of the True / False type will have five responses. Each correct response will be awarded +1 mark; each incorrect response will be awarded -1 mark; and if no response is marked, zero. There will be no negative carry over, so that each question will carry a maximum of 5 marks, and minimum of 0.

Each MCQ of the Single Best Responsetype will also have 5 responses. Each correct response will be awarded +3 marks; incorrect responses and no responses will be awarded 0.

The total mark (out of 195 marks) will account for 5% of the final marks of the MD Part 1 Examination in Chemical Pathology.

Each OSPE in the practical examination will be awarded 10 marks and marked against a marking grid approved at the scrutiny board. The total mark (out of 100) will account for 5% of the final marks of the MD Part 1 Examination in Chemical Pathology.

Trainees are expected to sit the first available CBLS assessment. Taking the CBLS assessment is compulsory before sitting the MD Part 1 Examination. A trainee will not be considered eligible to sit the MD Part 1 Examination without sitting for the CBLS assessment.

8.2 In Service Training in Chemical Pathology

On completion of the CBLS Programme followed by the Assessment trainees proceed to laboratory based training in Chemical Pathology of twenty one month's duration.

The trainees will be rotated among centers approved by the Board of Study to gain theoretical knowledge and practical skills in general and specialized Chemical Pathology. Specific learning outcomes and content areas for training are annexed.(See Annexure 2 and annexure 3)

8.3 Learning Activities during In-Service Training

The trainees will be engaged full time in laboratory based training under the supervision of a Consultant Chemical Pathologist. Trainees need to acquire hands on experience in all aspects of the total testing process including quality assurance, with a special emphasis on setting up of assays and trouble shooting in the analytical phase.

8.4 Monitoring Progress in Training

Monitoring is done through a learning portfolio and regular progress reports sent by the trainer.

8.4.1 Portfolio

A learning portfolio is included as evidence of learning from the activities that the trainees are involved in during the training period. It recognizes and encourages autonomous and reflective learning that is an integral part of professional development. The trainee has to compile a portfolio demonstrating how she/he has achieved the learning outcomes specified for the training for MD Part 1 in Chemical Pathology (see Annexure 5).The portfolio should be submitted to the PGIM one month before the examination. The BOS will assign the assessment of the portfolio to two examiners who need to give a recommendation regarding the portfolio following a viva held one month after the MD Part 1 examination. See Annexure 5 for assessment of the portfolio.

8.4.2 Progress Reports

Monitoring of training will be done through progress reports received from the trainers for each trainee at regular 6 monthly intervals (6, 12 and 18 months of training) during each stage of training (Annexure 7). If a supervisor identifies a trainee's work or attendance or any other parameters assessed according to the progress report as not satisfactory, he/she should have a discussion with the trainee to find out the reasons for this and remedial action should be taken. If the trainee's work continues to be unsatisfactory in any of the qualities assessed, this should be indicated in the next progress report. In such cases the Board of Study should take necessary remedial action by way of counseling the trainee. The Board of Study will appoint a trainer from another training unit for this purpose.

It's the trainee's responsibility to make sure that the progress reports reach the PGIM at the above specified regular intervals.

8.5 MD Part 1 Examination in Chemical Pathology

8.5.1 Eligibility:

a) completion of two years of training leading to the MD in Chemical Pathology Part I examination with a minimum of 80% attendance for the Course in Basic Laboratory Sciences and minimum of 80% attendance for the laboratory based training in Chemical Pathology of twenty one month's duration.
b) Sitting the theory and practical assessments in the Course in Basic Laboratory Sciences
c) Satisfactory progress reports
d) Submission of the portfolio **one month before** the examination

8.5.2 Format of the MD Part 1 Examination

The examination comprises both theory (Component 1) and practical (Component 2) A panel of examiners will be appointed by the Board of Study in Pathology.

Component 1: Theory

The Theory component consists of **two papers**.

Theory Paper I

Multiple Choice Question (MCQ) paper	two hours	15 marks

This paper consists of 50 multiple choice questions of which 20 will be true false type, 15 single best responses(SBR) and 15 extended matching Questions(EMQ).

The true/false type MCQ will carry +5 marks, SBR+3 marks and EMQ +3 marks. In a True / False type MCQ, (five responses) each correct item shall score +1, wrong item –1 and if

not attempted 0. Negative marks will apply within the question and will not be carried forward. In a SBR type question (five items) the correct response shall score +3, a wrong response and if not attempted 0. In an EMQs correct response shall score +3, a wrong response and if not attempted 0.

Theory Paper II

Short Answer Question (SAQ) paper	three hours	25 marks

Paper II consists of 20 compulsory SAQs.

Each question comprises of a stem and 5-6 sub-questions. The answer required to each sub-question will relate specifically to the material provided in the stem. Approximately equal weighting would be given to analytical and clinical aspects.

Theory Paper II would be marked using conference marking against a marking grid prepared and approved at the scrutiny board.

Component 2: Practical

The Practical component consists of two papers, one of which is a bench practical.

Practical Paper I	one hour	10 marks

This paper consists of three questions on clinical data interpretation and two questions on calculations related to Chemical Pathology.

Practical Paper II	06 hours	40 marks

This paper consists of bench practical work and will have two sessions of approximately 3 hours each.

Candidates are expected to plan an experiment, execute bench work, record, analyse raw data and draw appropriate conclusions.

Component 3

CBLS Assessment	10 marks

8.5.3 Requirements to pass the MD Part 1 Examination

Candidates should obtain a minimum of 50% for the theory (Component 1) (20/40) and a minimum of 50% for the practical (Component 2) (25/50) and 50% overall marks to pass the MD in Chemical Pathology Part I examination.

Format of the MD in Chemical Pathology Part I examination

Component	Composition of the Component	Duration	%
Component 1 Theory	Paper I MCQ 20 True/False 15 SBR 15 EMI	Two hours	15
	Paper IISAQ Paper (20 compulsory questions)	Three hours	25
Component 2	Practical Paper I 3 questions on clinical data 2 questions on calculations	One hour	10
	Practical Paper II wet practical	Six hours	40
Component 3	CBLS Assessment Theory	Refer 8.1.4	05
	CBLS Assessment Practical		05

8.5.4 Unsuccessful Candidates

A candidate who fails the examination will have to sit Components 1 & 2 in the next attempt. The marks obtained for Component 3 (CBLS Assessment) will be counted for the next and subsequent attempts as well.

A maximum of six attempts within a period of eight years from the 1st attempt at the examination are allowed for a candidate to pass the MD in Chemical Pathology Part I Examination, as per the General PGIM rules.

9 MD Part 2 in Chemical Pathology

The trainee undergoes supervised training in Chemical Pathology laboratories and other training units approved by the Board of Study in Pathology. The trainee is expected to develop practical and professional skills in liaising with clinicians in optimizing patient care through optimal utilization of Chemical Pathology laboratory services.

This comprises of laboratory based training of twenty months and training in ward and clinic setting of fifteen weeks duration.

Ward based training include the following rotations.

Medicine:	one month
Endocrinology:	one month
Cardiology :	two weeks
Nephrology:	two weeks
Paediatrics:	two weeks
Recovery Unit:	one week

9.1 Eligibility to enter the training programme in MD Part 2

Only those trainees who are successful at the MD in Chemical Pathology Part 1 examination will be eligible to commence MD Part 2 training in Chemical Pathology. A candidate may defer entering the programme for a valid reason for a maximum of two years. Such requests should be made to the Board of Study in Pathology.

9.2 Learning Outcomes

1. Provide expert opinion related to Chemical Pathology services
2. Demonstrate ability in taking safe clinical decisions pertaining to Chemical Pathology services, and seek advice/second opinion where necessary
3. Efficiently manage a Chemical Pathology service in a hospital
4. Demonstrate the ability to effectively liaise with the members of the health care delivery team in the delivery of patient care
5. Demonstrate commitment to continuous professional and self-development
6. Engage in service improvement activities through research and audit
7. Demonstrate adherence to safe laboratory practices and ethical conduct of self

Refer Annexure 2 and annexure3 for detailed learning outcomes and the content areas.

9.3 Learning activities during MD Part 2

1. Supervised laboratory based training with hands-on training in analytical techniques
2. Training in clinics, wards and special units
3. Participation in teaching learning activities: lectures, tutorials, and journal clubs
4. Participating in activities related to quality assurance
5. Technical &clinical validation of reports
6. Conduct of audits

7. Maintaining a reflective portfolio (Annexure5)
8. Compilation of a case book as part of the portfolio(Annexure6)
9. Participation in relevant national scientific meetings and workshops

9.4 Monitoring Progress

Monitoring is done through a learning portfolio and regular progress reports sent by the trainer.

9.4.1 Portfolio for MD Part 2

The trainee should maintain a portfolio during the training leading to MD Part 2. **A case book comprising of five case reports is a component of the portfolio** and should be submitted to the Board of Study at the end of the first year of training leading to MD Part 2 Examination and assessed by an examiner appointed by the Board of Study in Pathology. The approval of the case book by the Board of Study in Pathology is a prerequisite to sit the MD Part 2 examination. The rest of the portfolio should be submitted to the PGIM one month before the examination. See annexure 5 for assessment of the portfolio.

9.4.2 Progress Reports

Monitoring of training will be done through progress reports received from the trainers for each trainee at regular 6 monthly intervals (6, 12 and 18 month of training) during each stage of training (Annexure 7). If a supervisor identifies a trainee's work or attendance or any other parameters assessed according to the progress report as not satisfactory, he/she should have a discussion with the trainee to find out the reasons for this and remedial action should be taken. If the trainee's work continues to be unsatisfactory in any of the qualities assessed, this should be indicated in the next progress report. In such cases the Board of Study should take necessary remedial action by way of counseling the trainee. The Board of Study will appoint a trainer from another training cluster for this purpose.

It's the trainee's responsibility to make sure that the progress reports reach the PGIM at above specified regular intervals.

9.5 MD Part 2 Examination in Chemical Pathology

9.5.1 Eligibility to sit the MD Part 2 Examination in Chemical Pathology Satisfactory

a. Completion of pre-MD Part 2 training in approved centres with a minimum of 80% attendance
b. Submission of the portfolio
c. Acceptance of case book component of the portfolio by the Board of Study in Pathology
d. Satisfactory progress reports

9.5.2 Format of the MD Part 2 Examination in Chemical Pathology

A panel of examiners including an external examiner is appointed by the Board of Study in Pathology. The examination consists of three components, theory, practical and viva.

Component 1

Theory

The theory component carries 40% of the final mark and consists of two papers.

Theory paper I

Essay paper (Analytical) three hours 20 marks

Theory Paper I will have four compulsory questions.

Questions 1&2 will have 3 compulsory sub-questions each.

Theory Paper II

Essay Paper (Clinical) three hours 20 marks

Theory Paper II will have four compulsory questions.

Questions 1& 2 will have 3 compulsory sub-questions each.

Each question will be independently marked out of 100, by two examiners against a model answer.

If there is a discrepancy of more than 15% the marks will be reviewed by the two examiners concerned in the presence of the chief examiner, and the marks adjusted so that the discrepancy is less than 15%. In the event that the two examiners cannot agree a third examiner may be consulted.

Component 2

Practical

The practical component carries 50% of the final mark and consists of two papers and a clinical case discussion.

Practical Paper I three hours 20 marks

This paper consists of ten questions on clinical data interpretation and five questions on calculations related to Chemical Pathology.

Practical Paper II

Objective structured practical examination (OSPE) three hours 20 marks

In the OSPE, candidates are expected to move between a series of 15 stations. The skills assessed would include bench work, reporting and interpretation of laboratory and quality assurance data.

Practical Paper I & II would be marked using conference marking against a marking grid prepared and approved at the scrutiny board.

Clinical Case Discussion 45 minutes 10 marks

The candidates are given 20 minutes to prepare on their own for two clinical cases given following which they will be questioned by a panel of examiners (three) on issues related to the two cases for 25 minutes.

Component 3

Viva voce 40 minutes 10 marks

The Viva voce will be of a structured format. There will be two panels of examiners with a minimum of two examiners in each panel. A candidate shall be examined by each panel for duration of 20 minutes on any given area in the syllabus. Topics for viva include diagnosis and epidemiology of diseases, laboratory methods and efficacy of test utilization, quality assurance and management, laboratory management, laboratory safety and ethics or commenting on a research paper.

Format of the MD Part 2 Examination in Chemical Pathology

Component	Composition of the Component	Duration	%
Component 1 Theory	Paper I Analytical Biochemistry	Three hours	20
	Paper II Clinical Biochemistry	Three hours	20
Component 2	Practical Paper I Clinical laboratory data & calculations	Three hours	20
	Practical Paper II OSPE	Three hours	20
	Practical Paper III Clinical Case discussion	45 minutes	10
Component 3	Viva voce	40 minutes	10

9.5.3 Requirements to pass the MD Part 2 Examination in Chemical Pathology

Candidates should obtain a minimum 50% for the theory (component 1) and a minimum of 50% for the practical (component 2) and 50% overall marks to pass the examination.

9.5.4 Qualification awarded

Those who are successful at the examination will be awarded MD in Chemical Pathology.

Candidates who fail the examination will have to sit all three components at the next examination and in any subsequent attempts.

A maximum of six attempts within a period of eight years from the 1st attempt at the examination are allowed for a candidate to pass the MD Part 2 Examination in Chemical Pathology, as per the PGIM general rules and regulations.

10 Post MD Training

Trainees who are successful at the MD Part 2 Examination in Chemical Pathology are eligible to commence the post MD training.

Post MD training in Chemical Pathology is of two years duration of which the trainees undergo supervised training in a local training centre approved by the Board of Study in Pathology and a further one year of training in a centre of excellence overseas approved by the Board of Study. The aim of the training is to enhance the knowledge, skills and attitudes gained during the pre MD training leading to the Board Certification in Chemical Pathology.

10.1 Learning Outcomes

10.1.1 Learning outcomes for the local post MD training

The trainee should be able to

1. develop a research question, conduct a literature review and successfully conduct a research project
2. demonstrate the ability in procuring equipment and reagents
3. demonstrate an adequate knowledge in principles of laboratory management, quality assurance and accreditation
4. perform clinical validation of test reports and add interpretative comments
5. communicate satisfactorily with clinicians and other members of the health care delivery team in relation to the diagnostic services offered by the Chemical Pathology laboratory
6. communicate laboratory and research data in scientific meetings
7. train the laboratory staff
8. take steps in ensuring safety of the personnel working and visiting the laboratory

10.1.2 Learning outcomes for the overseas post MD training (in addition to the above)

9. demonstrate knowledge and skills in performing specialized laboratory techniques
10. demonstrate knowledge and skills in effectively conducting an internal quality control programme

11. demonstrate knowledge and skills in interpreting external quality assessment data and taking corrective action
12. interpret complex laboratory data (dynamic function tests) and provide interpretative comments
13. conduct method comparison and validation studies
14. present research, audit or other laboratory data at international scientific meetings
15. demonstrate knowledge and adherence to ethics in laboratory medicine

10.2 Research Project

The trainee should engage in a research project during the two year post MD training period (local or overseas). The trainee needs to submit the project proposal to the Board of Study within the first quarter of commencing either the local or the overseas training. The Board of Study shall appoint two assessors to review and give approval/recommendation regarding the project proposal. Once the proposal is approved by the Board of Study the trainee shall proceed with the project by taking ethical approval and collecting data which should be completed within the second and third quarters of the said training. The trainee should submit six monthly progress reports through the primary supervisor of the project to the Board of Study. The project report should be submitted to the Board of Study in Pathology within the last quarter of the relevant training period. Instead of the project report an original full paper derived from the study, published in a peer reviewed journal (preferably indexed) in which the trainee is the first author can be submitted to the Board of Study for approval.

The same two assessors who examined the proposal would be appointed by the Board of Study to review the project report/publication.

For the writing of the proposal & dissertation the trainees are referred to the relevant sections of the PGIM document, Generic Guidance to Boards of Study/Specialty Board for Evaluation of Research Projects for MD Programmes.

The Assessment of the Project Proposal & Report would be based on the Generic Guidance to Boards of Study/Specialty Board for Evaluation of Research Projects for MD Programmes by the PGIM.

Acceptance of the research project by the BOS may be based on fulfillment of either of the following.

1. Publication of the research findings as an original full paper (not case reports) in a peer-reviewed journal (preferably indexed) with the trainee as the first author. No further evaluation is required on the premise that a paper which is already peer-reviewed.
2. Submission of a detailed project report to the BOS. This should be evaluated by two assessors nominated by the BOS and marked as either satisfactory or unsatisfactory.
3. If there is disagreement between the two assessors, with only one assessor's decision being 'unsatisfactory', the project report should be sent to a third assessor for a final decision.

10.3 Monitoring Progress

Monitoring is done through the portfolio compiled by the trainee for both local and overseas training components and progress reports submitted by the local and overseas supervisors.

10.3.1Post MD Portfolio

A portfolio highlighting the achievement of learning outcomes specified for post MD local and overseas training should be submitted to the PGIM prior to pre-board certification assessment.

The portfolio is required to provide evidence for achieving the broad learning outcomes of specialist training in Chemical Pathology:

1. Subject Expertise
2. Teaching
3. Research and Audit
4. Ethics and medico-legal issues
5. Information Technology
6. Life-long learning
7. Reflective Practice

The Pre-Board Certification Assessment will be based on the portfolio maintained by the trainee during the period of post-MD training. The contents of the portfolio should encompass all of the above learning outcomes and contain evidence of achievement of these outcomes by the trainee during the post-MD training, both locally and overseas.

Contents of portfolio

The contents of the portfolio should be divided into sections according to the outcomes stated above, followed by a final section that contains evidence of reflective practice for each section.

The following list sets out the type of evidence to be provided under each section. The trainee needs provide satisfactory evidence under each category including the essential items in bold.

1. Subject expertise:
    - **progress reports from supervisors (essential, should be according to the prescribed format)**
    - **A minimum of two peer/trainer feedback per year**
    - **A log of procedures carried out**(See Annexure 5)
    - results of any work-place assessments conducted
    - evidence of special training/exposure which the trainee had during the local and overseas training
2. Teaching
    - undergraduates
    - postgraduates
    - ancillary laboratory staff

3. Research and Audit relevant to specialty
    - **Post MD Project proposal and dissertation or a full paper**
    - Research papers published or accepted for publication
    - abstracts of presentations
    - **Audit reports (A minimum of two; one for local & one for overseas training)**
4. Ethics and Medico-legal Issues
    - **Completed Professionalism Observation Forms (from integrated learning component of Professionalism Strand)**
    - **Completed PTR forms during post-MD training**
5. Information Technology
    - Participation in training programmes / workshops
    - Evidence of searching for information and application of findings in practice
    - Evidence for the knowledge gained regarding Laboratory Information Systems
6. Life-long learning
    - Evidence for participation in conferences and meetings
7. Reflective practice
    - **narration of at least one learning event experienced by the trainee, in relation to each of the above outcomes, with reflection on what and how the trainee learned from this experience**

Refer the section on Post MD Portfolio in Annexure 5 for further details.

10.3.2 Progress Reports

The trainers of local and overseas training need to submit progress reports to the PGIM, at regular 6 monthly intervals (Annexure 7) Certification of satisfactory completion of local and overseas training should be forwarded to the Director, PGIM by the respective trainers.

10.4 Eligibility for Pre-Board Certification Assessment

Following completion of the two years of post MD training the trainee can apply for pre-board certification assessment provided that the following criteria has been fulfilled.

a) Completion and acceptance of the Research Project (Annexure 8)

The project proposal and the report (or published paper) have to be approved by the Board of Study in Pathology. The project should have been conducted during the post MD local or overseas training.

b) Submission of the completed post MD Portfolio (Relevant Section of Annexure 5)

Trainees should submit a portfolio covering the period of local senior registrar training and overseas training for pre-board certification assessment.

c) Completion of local & overseas training with a minimum of 80% attendance in each period

d) Satisfactory progress reports from supervisors covering the entire duration of training

10.5 Format of the Pre-Board Certification Assessment (PBCA)

PBCA is based on the adoption of the following broad outcomes for specialist training:

1. Subject expertise
2. Teaching
3. Research and audit
4. Ethics and medico-legal issues
5. Information technology
6. Life-long learning
7. Reflective practice

Pre-Board Certification assessment in Chemical Pathology consists of two components

Component 1

Assessment of the Portfolio

When the trainee is eligible for PBCA, three copies of the completed portfolio should be submitted to the examinations branch of the PGIM. The portfolio should be assessed by three independent examiners appointed by the Board of Study, one examiner being outside the discipline to improve objectivity.

Required Contents of portfolio

The contents of the portfolio will be assessed according to the outcomes stated above.

The recommendation of the examiners could be one of the following.
Satisfactory – Inclusion of essential items and appropriate reflection
Satisfactory with minor corrections – Inclusion of all essential items but inadequate discussion/ inappropriate reflection
Unsatisfactory and needs resubmission – Omission of an essential item

Component 2

A viva for assessing the Portfolio will be conducted for 20 minutes; by a panel of three examiners appointed by the Board of Study in Pathology

The trainee shall prior to the viva do a presentation to the panel of examiners/Board of Study regarding the training received during the post MD period for 10 minutes duration.

11 Board Certification

A trainee who has successfully passed the Pre-Board Certification Assessment is eligible for Board Certification as a Specialist in Chemical Pathology on the recommendation of the Board of Study in Pathology. Such candidates after following counseling session/s should sit for the assessment again after a minimum period of three months. If the candidate is successful at this attempt, the date of Board certification shall be backdated. If unsuccessful, the date of Board certification will be the date of passing the subsequent assessment following further training for a minimum period of six months in a unit selected by the Board of Study.

12 Recommended Reading

Books

1. TietzText Book of Clinical Chemistry and Molecular Diagnostics.
   Carl A Burtis, Edward R Ashwood, David E Bruns
   5th edition
2. Clinical Chemistry: Theory, Analysis, Correlation
   Lawrence A Kaplan, Amadea J Pesces
   5th edition
3. Clinical Chemistry: William J Marshall, Stephen K Bangert
   7th edition
4. Clinical Chemistry in Diagnosis and Treatment.
   Philip Mayne
   6th edition.
5. A guide to Diagnostic Clinical Chemistry
   R N Warmsley, G H White
   3rd edition
6. Cases in Chemical pathology, a Diagnostic Approach
   R N Warmsley, L R Walkinson, H J Cain
7. Kumar & Clark's Clinical Medicine
   P Kumar, M. Clark 8thEditionWilliams Textbook of Endocrinology. H Kronenberg , S Melmed , K Polonsky , PR Larsen
   11th Edition

Journals

Annals of Clinical Biochemistry

Clinical Chemistry

ClinicaChimicaActa

Clinical Chemistry and Laboratory Medicine

Journal of Clinical Pathology

13 Contributors to Development/Revision of Prospectus

1. Dr ID Siriwardhana, Department of Pathology, Faculty of Medicine, University of Ruhuna (compilation & editing)
2. Dr SS Siriwardane, Department of Pathology, National Hospital of SriLanka
3. Dr MM Gunathilake, Department of Pathology, National Hospital of Sri Lanka
4. Dr C Meegama, Department of Pathology, Colombo South Teaching Hospital
5. Dr E Jasinge,Department of Pathology, Lady Ridgeway Hospital, Colombo
6. Dr R Samarasinghe, Department of Pathology, National Cancer Institute, Maharagama
7. Dr G Katulanda, Department of Pathology, Medical Research Institute, Colombo
8. Dr BKTP Dayanath, Department of Pathology, Teaching Hospital, Ragama
9. Dr T Herath Department of Pathology, General Hospital, Rathnapura

Annexure 1 - Subject Content for the Selection Examination in Pathology

1. Normal histology
2. Cell injury, Cell death, and Adaptations
3. Acute and Chronic Inflammation
4. Tissue Repair: Regeneration, Healing, and Fibrosis
5. Hemodynamic Disorders , Thrombosis, and Shock
6. Diseases of the Immune System
7. Neoplasia
8. Genetic and Pediatric Diseases
9. Environmental and Nutritional Diseases
10. General Pathology of Infectious Diseases
11. The Blood Vessels
12. The Heart
13. The Hematopoietic and Lymphoid System
14. The Lung
15. The Kidney and Its Collecting System
16. The Oral Cavity and Gastrointestinal Tract
17. The Pancreas
18. The Male Genital System
19. The Female Genital System and Breast
20. The Endocrine System
21. The Musculoskeletal System
22. The Skin
23. The Nervous System
24. Classification and types of anaemia
25. Leukaemia & myelodysplastic disorders

26. Myeloproliferative disorders
27. Multiple myeloma
28. Defects of Haemostasis
29. Disorders of water and electrolytes
30. Disorders of Acid Base Balance
31. Diabetes mellitus
32. Disorders of Lipid Metabolism
33. Plasma Proteins and Enzymes
34. Biochemical Investigations for Renal Disorders
35. Biochemical Investigations for Liver Disorders
36. Endocrine Disorders (Pituitary, Adrenal, Thyroid and Gonadal)
37. Disorders of Calcium and Phosphate Metabolism
38. Biochemical analysis of body fluids
39. Morphology and nature of micro-organisms
40. Classification, identification and typing of micro-organisms
41. Bacterial growth, physiology and death
42. Antimicrobial agents
43. Virus-cell interaction
44. Immunological principles
45. Immunity to bacterial and viral infections
46. Bacterial, viral and fungal pathogens and associated diseases
47. Diagnosis, treatment and control of infections

References:

Pathologic Basis of Disease by Robbins &Cotran 8th Edition Clinical Chemistry by William J. Marshall & Stephen K Bangert& Marta Lapsley 7th Edition

Essential Haematology by A.V.Hoffbrand 5th Edition

Annexure 2 - Learning Outcomes for Pre-MD training in Chemical Pathology

Learning Outcomes for the MD Part 1 Examination in Chemical Pathology

By the end of the two year training programme leading to MD Part 1 the trainee will be able to

Subject Specific Knowledge

1. describe the laboratory techniques that underlie clinical laboratory practice, and good laboratory practices including health, safety and quality assurance
2. describe the presentation, differential diagnosis and natural history of the common disorders encountered in the practice of Chemical Pathology
3. advice on sample collection and transport requirements for general and specialized biochemical tests
4. offer advice on the interpretation of laboratory results using the understanding of Chemical Pathology acquired during the training period
5. describe the principles of quality management and quality assurance
6. describe the important principles applied in sample collection and transport of other laboratory disciplines (CBLS)
7. describe the principles & instrumentation used in common Histopathology, Haematology and Microbiology tests (CBLS)

Skills

8. operate basic laboratory equipment
9. perform calibration for basic laboratory equipment
10. perform general biochemical and specialized biochemical tests using manual analytical methods and interpret and discuss test results
11. conduct an internal quality control programme, interpret data and suggest corrective action where necessary
12. interpret external quality assurance data and suggest corrective action where necessary

The trainee has to compile a portfolio demonstrating how she/he has achieved the learning outcomes during the training period.

Learning Outcomes for the MD Part 2 Examination in Chemical Pathology

At the end of the 2 years training the trainee will be able to

1. Efficiently manage a Chemical Pathology service in a hospital.
2. Demonstrate adequate knowledge, skills and appropriate attitude in routine and specialized clinical and laboratory work.
3. Demonstrate responsibility in taking safe clinical decisions pertaining to Chemical Pathology services, acknowledge the limitations of competence and refer to other senior colleagues for advice where appropriate.
4. Interpret test result following technical and clinical validation.
5. Perform diagnostic techniques to become technically competent in practical work and master the underlying analytical and clinical principles.
6. Provide specialist advice in Chemical Pathology related to specialized areas such as clinical endocrinology, paediatrics, oncology, toxicology and molecular medicine.
7. Carry out activities of continuing professional development such as literature searches, case discussions and journal clubs.
8. Plan and implement new techniques and practices following adequate evaluation procedures.
9. Describe the bio-safety practices required in a Chemical Pathology laboratory.
10. Describe the ethical aspects of Chemical Pathology laboratory practice in relation to investigations, research, teaching and quality control.
11. Describe the principles of audit, internal quality control, and external quality assurance and accreditation of a Chemical Pathology laboratory.
12. Explain the value of information technology in Chemical Pathology service.

Learning Outcomes for training in Clinic/Ward Setting for MD Part 2 Examination in Chemical Pathology

Learning Outcomes – Internal Medicine

At the end of the one month training the trainee will be able

1. Communicate effectively with patients, relatives and members of the health care team.
2. Acquire the knowledge and skills to obtain a clinical history, arrive at a differential diagnoses, request the laboratory investigations accurately to arrive at a definitive diagnosis.
3. Advice the ward staff how to avoid the errors occurring in the pre-analytical phase and educate them on the validity of the quality assurance programme in the laboratory.

4. Utilize the laboratory resources cost effectively when ordering tests for patients and educate the junior doctors where relevant.
5. To teach postgraduates, undergraduates and nursing staff.

Learning Outcomes – Endocrinology

General
The trainee needs to be familiar with various presentations of endocrine disorders & master history taking and physical examination skills in arriving at differential diagnoses of endocrine disorders.

At the end of the one month training the trainee will be able to

1. Plan and perform general and specific endocrine investigations including the following dynamic endocrine function tests.
2. Advice on sample collection procedure (patient preparation, interfering drugs, storage of samples before transport, sample transport) of all the endocrine tests.
3. Explain above precautions to the patient, advice clinicians and other medical staff regarding specimen collection for endocrine investigations.
4. Plan, perform and advise other clinicians and medical staff regarding dynamic endocrine function tests including the following.
    - Growth Hormone stimulation tests *(Ex/Arginine/Glucagon/Clonidine etc)*
    - Growth Hormone suppression tests
    - Pituitary stimulation tests*(Insulin hypoglycemia etc)*
    - Dynamic endocrine tests related to Cushing's syndrome *(Overnight, low dose & high dose dexamethasone suppression tests)*
    - Short Synacthen test
    - Water deprivation test
    - Other less common dynamic function tests
5. Demonstrate knowledge regarding rare but important invasive endocrine testing procedures *(eg: Inferior Petrosal Venous sinus sampling, Adrenal vain sampling etc).*
6. Interpret all the results related to endocrine testing considering analytical methodology, possible interferences and advice on diagnosis and management of the patient.
7. Demonstrate knowledge regarding current endocrine guidelines related to diagnosis of major endocrine disorders.

Learning Outcomes - Cardiology

At the end of the two weeks training the trainee will be able to

1. Interpret specific diagnostic tests and procedures (ECG, exercise ECG, Echocardiography, and cardiac biomarker results) that are ordered to evaluate patients who present with common symptoms and diagnoses encountered in the practice of cardiology.
2. acquire skills to arrive at differential diagnoses, including potential emergencies based on clinical presentation and investigations
3. Acquire knowledge on risk assessment of cardiovascular diseases.
4. Interpret lipid profiles; acquire knowledge and skills on diagnosis and management of primary and secondary dyslipidaemias

Learning Outcomes - Nephrology

At the end of the two weeks training the trainee will be able to

1. Acquire skills in history taking and arriving at a diagnosis for patients with renal disorders
2. Interpret laboratory results in relation to renal function
3. Acquire knowledge in renal replacement therapy and related biochemical changes
4. Acquire knowledge regarding biochemical assessment of donors and recipients of renal transplantation

Learning Outcomes - Paediatrics

At the end of the two week training the trainee will be able to

1. acquire knowledge on natural history, pathophysiology, epidemiology, presentation, differential diagnosis, complications and biochemical investigations of common and rare paediatric chemical pathology disorders
2. Discuss history, examination findings, planning out investigations and ward management of patients with the trainer (Paediatrician/Chemical pathologist) while following up the patient in the ward.
3. advise clinical staff on patient preparation, appropriate use and interpretation of specialized biochemical tests (e.g. ammonia, lactate)
4. educate parents and relatives about the disease and lifestyle (patients with rare disorders)
5. gain knowledge in analytical chemical pathology in order to offer basic interpretation of results of neonates and children

Learning Outcomes – Recovery Unit

At the end of the one week training the trainee will be able to

1. Acquire knowledge regarding biochemical changes occurring in patients in the recovery unit
2. Interpret results of biochemical tests in patients in the recovery unit

Learning Outcomes - Oncology

To be achieved while undergoing laboratory based training at Cancer Institute of Maharagama/or in the trainee's centre if an Oncology Unit is available under the supervision of the Chemical Pathologist

1. Explain biochemical changes associated with malignancy and therapeutic agents (renal functions, liver functions and electrolyte changes) and methods of overcoming adverse effects.
2. Outline the principles of prevention and management tumourlysis syndrome
3. Outline the principles of managing hypocalcaemia and hypercalcaemia in patients with disseminated malignancy
4. Assessment of half-life and doubling time of tumour markers in the management of malignancy.
5. Discuss the clinical utility of CSF examination in malignancy.
6. Demonstrate knowledge on adverse effects of chemotherapeutic agents on certain biochemical assays.
7. Explainbiochemical effects of certain paediatric malignancies

Annexure 3 - Content areas for Pre MD training in Chemical Pathology

Training Leading to MD Part 1 Examination in Chemical Pathology

Contents of the Course in Basic Laboratory Sciences

Histopathology

<u>Subject Specific Knowledge</u>

1. Cellular response to stress and toxic insult; cellular injury, adaptation and death
2. Acute and chronic inflammation
3. Tissue renewal, regeneration and repair
4. Haemodynamic disorders, thrombo-embolic disease and shock
5. Neoplasia
6. Environmental and nutritional diseases

7. The scientific basis of histopathological and cytological investigations, specimen collection and transport

Practical aspects

1. Principles of sample collection and transportation for different types of Histopathological and Cyto-pathological studies

   E.g.: routine, frozen section, cytology, electron microscopy, molecular biology
2. Various procedures carried out by the laboratory with regard to Histopathology and cytopathology. e.g.: Tissue Processing and staining, special stains, Immunohistochemistry.
3. Common laboratory errors.

Haematology

Subject Specific Knowledge

1. The scientific basis of the basic Haematological investigations
2. A basic knowledge on the common Haematological diseases

Practical aspects

1. Venesections and collection of blood samples for Haematological tests
2. Preparation and staining of blood films.
3. Maintenance of laboratory registers and clinic registers.
4. Interpretation of basic changes in a blood film.
5. Laboratory safety and quality control
6. Detection of laboratory errors
7. Interpretation of analyzer reports
8. Communication with patients, laboratory staff and ward staff and the concept of team work

Chemical Pathology

Subject Specific Knowledge

1. A basic understanding of disease processes where Chemical Pathology tests are more commonly used.
2. Principles of quality assurance and application of this knowledge in the Chemical Pathology laboratory.

Practical Aspects

1. Venesections and collection of venous blood for routine Chemical Pathology tests
2. Giving instructions on preparation of patients for tests in Chemical Pathology.

3. Giving instructions on specimen transport and processing.
4. Basic steps involved in performing routine tests in Chemical Pathology.
5. The range of tests available in a Chemical Pathology laboratory.
6. A basic knowledge on the usage of basic laboratory equipment.
7. Interpretation of results of routine Chemical Pathology tests.
8. Laboratory safety.
9. Effective communication with the laboratory staff.

Immunology

1. Normal Immunological mechanisms.
2. The Patho-physiological basis of immune mediated diseases including autoimmune disease and hypersensitivity reactions.
3. The HLA system and Immuno-pathological reactions involved in graft rejection
4. A basic knowledge on primary and acquired immune deficiency syn¬dromes.

Microbiology and Parasitology

1. Identification and classification of micro organisms
2. The normal flora of the human body
3. Clinical presentation and diagnosis of common infections.
4. Contribution of the laboratory to the diagnosis and management of infec¬tions.
5. Limitations of Microbiology laboratory investigations in patient manage¬ment.
6. Safe laboratory practices.
7. Main hospital acquired infections and control of such infections

Genetics & Molecular Biology

Genetics & Molecular Biology

A. Basic knowledge of genetics

1. Cytogenetics (Chromosomal structure)
2. Molecular genetics (DNA, RNA, etc.)
3. Patterns of inheritance
4. Genetic nomenclature (HUGO nomenclature)
5. Genetic data bases, resources, etc.

B. Genetic basis of normal cell regulation and development of disease states

1. Regulation of the cell cycle
2. DNA damage and repair mechanisms
3. Molecular mechanisms of aging and cell death
4. Mutagenesis – causes / mechanisms and its importance in disease

5. Oncogenic mechanisms including epigenetic mechanisms (Histone methylation, DNA de acetylation, etc.)

C. Genetic disorders

1. Cytogenetic abnormalities (inherited and acquired clonal abnormalities)
2. Molecular genetic abnormalities (inherited and acquired clonal abnormalities)

D. Laboratory identification of genetic defects

1. Chromosomal abnormalities (karyotyping techniques, molecular cytogenetic techniques, microarrays, etc.)
2. Molecular genetic abnormalities (PCR, ARMS-PCR, PCR/RFLP, DNA Sequencing, Triplet Repeat Expansions - PCR/Fragment Analysis, Deletion Duplication Analysis - Multiplex PCR, MLPA, etc)
3. Newer Techniques - Next Generation sequencing (Whole Genome and Whole Exon)

E. Practical issues in genetic testing

1. Specimen collection & transport
2 Ethical issues (consent & counseling)
3. Quality Assurance

Statistics

1. The uses of research and statistics in biomedical sciences
2. Definitions of the following terms: Quality assurance, quality control, standard, control material, accuracy, precision, descriptive statistics, inferential statistics, reference interval, random error, systematic error, dispersion, delta check, confidence interval, inter and intra observer variation, standard normal distribution
3. Calculation of the following: sensitivity, specificity, efficiency, predictive value, mean, mode, median, range, correlation, variance and standard deviation
4. The basic concepts of sampling and sampling methods and significance testing

Embryology

1. Introduction to developmental Biology
    a. The fundamentals in developmental Biology
    b. The key terminology in developmental Biology
    c. The key developmental mechanisms
2. Molecular developmental Biology

    The tests that should be requested and other resources that could be utilized to investigate development anomalies encountered in a clinical setting

Laboratory Management

1. The basic concepts of management of laboratory resources
2. Definition of quality management
3. The components of quality management
4. The value of quality policy statement for a laboratory
5. A basic understanding of quality manual and its contents
6. The value of internal quality control and external quality assessment
7. Basic concepts of laboratory accreditation
8. Pre-analytical and post analytical phases of quality assurance
9. The value of maintaining electronic records of patient data in terms of maintaining confidentiality and continuation of care (Laboratory informatics)
10. The components of a formal laboratory safety programme

Content for MD Part 1 in Chemical Pathology

1. Specimen collection and transport for biochemical tests
2. Principles of laboratory safety
3. Principles of optical techniques
    - 3.1. Spectrophotometry
    - 3.2. Reflectance photometry
    - 3.3. Flame photometry
    - 3.4. Atomic absorption spectrophotometry
    - 3.5. Nephelometry and Turbidimetry
4. Principles of
    - 4.1 Osmomtery
    - 4.2 Electrochemistry
    - 4.3 Electrophoresis
    - 4.4 Chromatography
    - 4.5 Mass Spectrometry
    - 4.6 Clinical Enzymology
    - 4.7 Immunochemical techniques
    - 4.8 Techniques used in Molecular Biology
5. Basics of laboratory automation
6. Principles of Quality Management
7. Basics of Statistics in Laboratory Medicine
8. Analytical Principles for general biochemical analytes, hormones and tumour markers

9. Analysis of body fluids
10. Serum proteins in health and disease
11. Disorders of lipid metabolism
12. Biochemical changes in
    - 12.1 Cardiovascular disease
    - 12.2 Renal disease
    - 12.3 Water and electrolyte disturbances
    - 12.4 Acid-Base imbalances
    - 12.5 Liver and gastrointestinal diseases
    - 12.6 Metabolic bone disorders
    - 12.7 Pituitary disorders
    - 12.8 Thyroid disorders
    - 12.9 Adrenal gland disorders
    - 12.10 Diabetes mellitus
    - 12.11 Reproductive disorders
    - 12.12 Malignant disorders
13. Disorders of Haem and Porphyrin Metabolism
14. Physiology of pregnancy
15. Principles of investigation for inherited metabolic disorders
16. Principles of therapeutic drug monitoring

Content for MD Part 2 in Chemical Pathology

1. Principles of analytical techniques used in biochemistry and the specifications of equipment
2. Principles of techniques used in Molecular Biology and their applications
3. Pathogenesis and pathological and biochemical changes of common and rare disorders encountered in clinical practice
4. Principles and analytical techniques used in therapeutic drug monitoring and toxicology
5. Selection and evaluation of analytical methods using appropriate statistical techniques
6. Establishment of reference intervals
7. Principles and different aspects of laboratory management with an emphasis on quality management
8. Principles of evidence based laboratory medicine
9. Clinical audit
10. Laboratory safety

Annexure 4 - Training Units

1. Department of Pathology, National Hospital of Sri Lanka
2. Department of Pathology, Colombo South Teaching Hospital
3. Department of Pathology North Colombo Teaching Hospital
4. Department of Pathology, Lady Ridgeway Hospital (LRH), Colombo
5. Department of Pathology, Medical Research Institute(MRI), Colombo
6. Department of Pathology, National Cancer Institute (CIM), Maharagama
7. Department of Pathology, Teaching Hospital, Karapitiya
8. Department of Pathology,Teaching Hospital, Kandy

Training in Clinical disciplines will take place in the units of respective hospitals. Trainees allocated to MRI & LRH would undergo such training at NHSL. The trainees allocated to CIM would undergo such training at Sri Jayewardenepura General Hospital.

Annexure 5 - Trainee Portfolio for Postgraduate training in Chemical Pathology

Trainees undergoing postgraduate training in Chemical Pathology need to maintain a portfolio during the total training period of six years. Therefore it will have three components (MD Part 1, MD Part 2 and post MD training). The first two components (MD Part 1 and Part 2) should be submitted one month before the corresponding examination. The 3rd component; post MD component, should be submitted for the pre-board certification assessment, after the completion of the two year post MD training. A panel of examiners appointed by the Board of Study in Pathology will assess the portfolio and give a recommendation. Submission of the portfolio before the deadline will be one of the requirements to be eligible to sit for the respective examinations and for pre-board certification assessment.

The learning portfolio is included as evidence of learning from the activities that the trainees are involved in during the training period. It recognizes and encourages autonomous and reflective learning that is an integral part of professional development. The trainee has to compile a portfolio demonstrating how she or he has achieved the learning outcomes specified for the training for each stage of the Pre MD & post MD training in Chemical Pathology.

The supervisor/trainer will be the mentor of the trainee in preparing the portfolio. The trainer/s should review the progress of the trainee with regard to the development of the portfolio at least twice during the training period for each level.

The basic structure of the portfolio should be

1. A title page, giving the name, post, years of training and supervising pathologist
2. A contents page, listing what is in the portfolio with page reference
3. A list of learning outcomes ; the portfolio should demonstrate the achievement of these activities with a short reflective overview
4. The evidence of activities completed/done, grouped together into the areas contained in the learning outcomes. Evidence should be given in the form of letters, articles, presentations, critical incident reviews, audit reports, review of literature. Evidence of participation at workshops, conferences, special training/exposure to new techniques, relevant to Chemical Pathology and evidence of multi-disciplinary team meetings participated/conducted also can be included.

Contents for Portfolio – Postgraduate Training in Chemical Pathology

Portfolio –MD Part 1 in Chemical Pathology

Submission of a portfolio would be a pre-requisite to be eligible to sit the MD Part 1 Examination in Chemical Pathology.

Practical Skills

The trainees need to perform and record the following tests.

1. Routine Biochemical Tests
   - a minimum of five serum based assays using manual techniques

     (E.g. plasma glucose, urea, creatinine, transaminases, calcium, protein, albumin etc)
   - Urine analysis to compile a urine full report
2. Immunoassays and tumour markers
   - Perform ELISA, RIA and IRMA on at least two analytes

     * Recording of test principles, methodology, quality control data and results is required for all performed tests.
3. Laboratory Equipment
   - Demonstrate skills in using the following equipment

     Centrifuge

     pH meter

     Ion selective electrode

     Osmometer

     Electrophoresis apparatus

     Automated analysers
   - Perform calibration and record the data for the following equipment

     Automated pipette

     Analytical balance

     Spectrophotometer
4. Quality Assurance

   Plotting of internal quality control data for a given analyte (for a minimum of four weeks duration) with a discussion on interpretation and corrective action

   Communication Skills
5. Presentations

   A minimum of two presentations to be done at the journal club

   A copy of the slides of each presentation to be attached to the portfolio

A reflective statement written by the trainee at the end of each teaching learning activity with comments/feedback given by the attending supervisor should be included.

Items 1-5 are essential items.

Portfolio – MD Part 2 in Chemical Pathology

1. A case book with five cases needs to be submitted as a prerequisite for the MD Part 2 examination in Chemical Pathology. The trainee shall select five different interesting cases (with the approval from the trainers) from endocrinology and metabolism (diabetes, thyroid, pituitary, adrenal medulla, adrenal cortex, neuroendocrine), lipidology, inborn errors of metabolism, bone pathology, renal, water-electrolyte-acid-base metabolism, reproductive disorders, cardiac markers, therapeutic drug monitoring and toxicology, tumour markers, GI and liver pathology, pregnancy related issues. They can be rare diseases or unusual presentations of common conditions. Discussion of cases should be of a reflective nature highlighting the unique features of the individual case.

   The case book needs to be submitted at the end of the first year of MD Chemical Pathology training and assessed by an examiner appointed by the Board of Study in Pathology. The approval of the case book by the Board of Study is a prerequisite to sit the MD Part 2 Examination in Chemical Pathology.
2. Plan, perform and write a report of a clinical audit on a relevant topic
3. Record the evidence of evaluation of one month internal quality control data and one external quality assurance cycle data with corrective actions
4. Record evidence for contributing to a method evaluation/validation study. The Standard Operating Procedure of the method evaluated/validated and the relevant laboratory data and statistical tests applied may be included in the portfolio.
5. Write a discussion on the technology and design of a fully automated biochemistry and immunoassay analyzers with an appreciation of their limitations and benefits

A reflective statement written by the trainee at the end of each teaching learning activity with comments/feedback given by the attending supervisor should be included.

Items 1-5 are essential items.

The rest of the portfolio (excluding the case book) should be submitted one month before the MD in Chemical Pathology Part II examination, and is a pre-requisite to sit the examination.

Portfolio - Post MD Training in Chemical Pathology

Submission of the portfolio is a prerequisite for Board certification and the contents would be assessed at the Pre-Board Certification assessment viva.

The portfolio should consist of documentary evidence for the following

1. Subject Expertise
    I. Analytical Biochemistry

    Practical knowledge in using

    - SpecializedanalyticaltechniquesEg Atomic absorption spectrophotometry, Chromatography, Tandem Mass Spectrometry and techniques in molecular biology
    - automated analyzers and point of care devises

    II. Clinical Biochemistry

    - Clinical validation of test results and providing interpretative comments as a duty biochemist
    - Liaising with clinicians in conduction of dynamic function tests and metabolic screens
    - Case based discussions and participationin multi-disciplinary meetings

    III. Laboratory Management

    - Direct participation in activities pertaining to Quality Management, Quality Assurance and Accreditation
    - Corrective actions taken for quality failures detected in Internal Quality Control and External Quality Assessment
    - Demonstrate knowledge in the principles and regulations pertaining managing resources
    - Selection of equipment and introducing new tests
    - Demonstrate knowledge in principles and their application in laboratory safety

2. Teaching

    - Evidence for teaching undergraduates, postgraduates and technical staff

    Research and Audit

    - Conduction of at least one research project and two internal audits

3. Ethics and Medico-legal issues

    - Maintaining patient safety, privacy and confidentialityduring test procedures
    - Adherence to professional conduct

4. Knowledge on Information Technology and Laboratory Statistics

- Records on Laboratory Information Systems used
- Evidence for applying Statistical tests in analyzing laboratory data

5. Continuous professional Development
    - Certificates of participation in national and international conferences
    - Published abstracts, research papers (optional)
    - Case based discussions about patients seen/clerked during clinic visits and ward rounds

A reflective statement written by the trainee at the end of each teaching learning activity with comments/feedback given by the attending supervisor should be included.

Items 1-6are essential items.

Assessment of Portfolio

Portfolio – MD Part 1 in Chemical Pathology

The portfolio should be submitted through the assigned supervisor of the trainee and duly signed by the respective trainers for each learning activity undertaken, one month prior to the MD Part 1 examination in Chemical Pathology. The Board of Study would appoint two examiners for the assessment of the portfolio at a viva voce examination to be held one month after the above examination.

The recommendation of the examiners could be one of the following.

Satisfactory – Inclusion of all essential items and appropriate reflection

Satisfactory with minor corrections – Inclusion of all essential items but inadequate reflection

Unsatisfactory and needs resubmission – Omission of one or more essential items

Portfolio – MD Part 2 in Chemical Pathology

The Portfolio should be submitted through the assigned supervisor of the trainee and duly signed by the respective trainers for each learning activity undertaken one month prior to the MDPart 2 Examination in Chemical Pathology. The Board of Study would appoint two examiners for the assessment of the portfolio at a viva voce examination to be held one month after the above examination.

The recommendation of the examiners could be one of the following.

Satisfactory – Inclusion of all essential items and appropriate reflection

Satisfactory with minor corrections – Inclusion of all essential items but inadequate reflection

Unsatisfactory and needs resubmission – Omission of one or more essential items

Portfolio - Post MD Training in Chemical Pathology

The Portfolio should be submitted through the assigned supervisor of the trainee and duly signed by the respective trainers for each learning activity undertaken for the Pre Board Certification assessment. The examiners for the Pre-Board Certification viva would be appointed as the examiners for the assessment of the portfolio (two examiners from the discipline and one examiner from another discipline in Pathology). The Portfolio would be assessed at the Pre-Board Certification viva.

The recommendation of the examiners could be one of the following.

Satisfactory – Inclusion of essential items and appropriate reflection

Satisfactory with minor corrections – Inclusion of all essential items but inadequate discussion/ inappropriate reflection

Unsatisfactory and needs resubmission – Omission of an essential item

Annexure 6 - Case book

A case book with five cases needs to be submitted at the end of the first year of MD training. It is also considered as part of the MD portfolio.

The trainee shall select five different interesting cases encountered during their in-servive training in Chemical Pathology (with the approval from the respective supervisor) from endocrinology and metabolism (diabetes, thyroid, pituitary, adrenal medulla, adrenal cortex, neuroendocrine), lipidology, inborn errors of metabolism, bone pathology, renal, water-electrolyte-acid-base metabolism, reproductive disorders, cardiac markers, therapeutic drug monitoring and toxicology, tumour markers, GI and liver pathology, pregnancy related issues. They can be rare diseases or unusual presentations of common conditions.

Discussion of cases should be of a reflective nature highlighting the unique features of the individual case.

The case book should be submitted (with each case report approved by the relevant supervisor) to the Board of Study in Pathology at the end of the first year of MD training. It would be assessed by an examiner appointed by the Board of Study in Pathology. The approval of the case book by the Board of Study in Pathology is a pre-requisite to sit the MD Chemical Pathology examination.

Annexure 7–Progress Report for Postgraduate training in Chemical Pathology

Progress Report (Pre MD Training& Post MD Training)

(To be filled by the trainer)

Name of the trainee:

Postgraduate training course/programme:

Institution:

Period covered: from …… to ……..

	Excellent	Good	Average	Poor
Attendance & punctuality	☐	☐	☐	☐
Attitudes	☐	☐	☐	☐
Communication skills	☐	☐	☐	☐
Honesty & integrity	☐	☐	☐	☐
Team player skills	☐	☐	☐	☐
Self-motivation	☐	☐	☐	☐
Presentation skills	☐	☐	☐	☐
Application of knowledge	☐	☐	☐	☐
Overall professional competence	☐	☐	☐	☐

General/Specific comments:

.....
.....
.....
.....
.....
.....

Name of the trainers/supervisors:

Signature :

Date:

Annexure 8 - Research Project in Chemical Pathology and its Assessment

The trainee should engage in a research project during the two year post MD training period (local or overseas). The proposal need to be approved by the Board of Study in Pathology and the successful completion and the approval of the dissertation is a prerequisite for PBCA and board certification. The trainee would be questioned about the research project during the pre-board certification viva.

For the writing of the proposal & dissertation the trainees are referred to the relevant sections of the PGIM document, Generic Guidance to Boards of Study/Specialty Board for Evaluation of Research Projects for MD Programmes.

The Assessment of the Project Proposal & Report would be based on the same document by the PGIM.

Acceptance of the research project by the BOS may be based on fulfillment of either of the following.

1. Publications of the research findings as an original full paper (not case reports) in a peer-reviewed journal (preferably indexed) with the trainee as the first author. No further evaluation is required on the premise that a paper which is already peer-reviewed.
2. Submission of a detailed project report to the BOS. This should be evaluated by two assessors nominated by the BOS and marked as either satisfactory or unsatisfactory.
3. If there is disagreement between the two assessors, with only one assessor's decision being 'unsatisfactory', the project report should be sent to a third assessor for a final decision.

Annexure 9 – Supervisor Consent Form - MD Research Project

Postgraduate Institute of Medicine

Board of Study in Pathology

SUPERVISOR CONSENT FORM

MD Research Project

1. Name of Trainee :

2. Training Centre :

3. Supervisor :

4. Title of Project :

5. Institution(s) where work would be carried out:

6. Institution from where the ethical approval will be /has been obtained:

Recommendation of supervisor: ……

Signature: …….. Date: ……