The Royal College of Pathologists

Pathology: the science behind the cure

Curriculum for specialist training in chemical pathology

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INTRODUCTION

Chemical pathology in the UK encompasses both practical laboratory and clinical skills. The award of the Certificate of Completion of Training (CCT) will require evidence of satisfactory completion of training in both the Good Medical Practice and core aspects of chemical pathology, which are outlined in this curriculum. Doctors who are applying for entry to the Specialist Register via the award of a certificate confirming eligibility for specialist registration (CESR) will be evaluated against the Good Medical Practice and core aspects of the curriculum.

The curriculum complies with the Postgraduate Medical Education and Training Board (PMETB) standards and principles:
Standards for Curricula (March 2005)
Principles of good medical education and training (2005).

The curriculum will be integrated with and supported by the following documents in order to produce a coordinated training package. The relevant documentation includes:

- a training and learning record including a logbook
- an online College training portfolio (www.rcpath.org/onlinetrainingportfolio – login required)
- Membership of the Royal College of Pathologists (MRCPath) examination regulation and guidelines
- an assessment framework including the Chemical Pathology Year 1 Assessment and workplace-based assessments.

All examinations and assessments undertaken during training will be clearly linked to the content of the curriculum and their reliability and validity will work towards complying with PMETB's *Principles for an Assessment System for Postgraduate Medical Training*.

Elements of the curriculum are common to both medical and scientific trainees. However, the Association of Clinical Biochemists (ACB) has responsibility for the curriculum and training records for scientific trainees. The Joint Royal Colleges of Physicians Training Board (JRCPTB) has responsibility for the metabolic medicine curriculum that pertains to five areas of direct patient care required.

Entry requirements

Trainees are eligible for entry to a chemical pathology training programme following satisfactory completion of a UK foundation training programme or equivalent. Entry is also possible following post-foundation clinical training.

Duration of training

The Royal College of Pathologists anticipates that training of five years' duration would normally be required to satisfactorily complete the chemical pathology curriculum to the required depth and breadth. However, in order to ensure flexibility, the College advises that the minimum duration of training as identified in Schedule 3 of the General and Specialist Medical Practice (Education, Training and Qualification) Order 2003 is four years, but that all provisional CCT dates should be set at five years in the first instance.

The CCT in chemical pathology will be awarded on the recommendation of the Royal College of Pathologists following evidence of:

- satisfactory completion of the chemical pathology curriculum (including workplace based assessments) and the minimum training period
- attainment of the College's Chemical Pathology Year 1 Assessment
- MRCPath by examination
- acquisition of Record of In-Training Assessment (RITA) Form G.

Subspecialty training

It is possible for trainees to undertake postgraduate subspecialty training in metabolic medicine. The organisation of training for trainees in chemical pathology (metabolic medicine) is essentially the same as for chemical pathology trainees, but incorporates the requirements of the metabolic medicine curriculum, which is the responsibility of the JRCPTB of The Royal College of Physicians.

The minimum duration of chemical pathology (metabolic medicine) training is five years plus two years CMT.

The CCT in chemical pathology (metabolic medicine) will be awarded on the joint recommendation of The Royal College of Pathologists and the JRCPTB following:

- Membership of The Royal College of Physicians (MRCP), MRCP(I) or equivalent
- evidence of satisfactory completion of the chemical pathology curriculum (including workplace based assessments) and the minimum training period
- attainment of the College's Chemical Pathology Year 1 Assessment
- MRCPath by examination
- acquisition of RITA Form G.

Satisfactory completion of a recognised metabolic medicine training programme can lead to inclusion of metabolic medicine against a chemical pathology entry on the Specialist Register. Further details regarding subspecialist training in metabolic medicine are available in the *Curriculum in the Subspecialty of Metabolic Medicine,* 2006.

Flexible training

'Flexible training' is the term used to describe doctors undertaking training on a less than full-time basis, normally between five and eight sessions per week. The aim of flexible training is to provide opportunities for doctors in the NHS who are unable to work full time. Doctors can apply for flexible training if they can provide evidence that "training on a full-time basis would not be practicable for well-founded individual reasons".

Flexible trainees must accept two important principles outlined in European law (Directive 93/16/EEC):

- part-time training shall meet the same requirements (in depth and breadth) as full-time training
- the total duration and quality of part-time training of specialists must be not less than those of a full-time trainee. In other words, a part-time trainee will have to complete the minimum training time for their specialty *pro rata*.

Trainees must have their flexible training approved by PMETB, the statutory body. Prior to submitting their application to PMETB, trainees must inform the Training and Educational Standards Department at the Royal College of Pathologists that they will be undertaking flexible training in order that the Chemical Pathology College Advisory Training Team (CATT) can ensure that the trainee will comply with the requirements of the CCT programme. The documentation towards a CCT recommendation will be collected by the Training and Educational Standards Department at the College and a revised provisional CCT date issued. Separate guidance and an application form are available on the College website for this purpose.

Research

Some trainees may wish to spend a period of time in research, either before entering chemical pathology training or as 'Out-of-Programme Experience' (OOPE) after entering a chemical pathology programme.

Research undertaken prior to entry to a chemical pathology training programme

Trainees who have undertaken a period of research that includes clinical and/or scientific work directly relevant to the chemical pathology curriculum, prior to entering a chemical pathology training programme, can have a maximum of up to one year accepted by the Chemical Pathology CATT towards their CCT. Following satisfactory completion of ST1 training, trainees may apply to have the relevant competencies gained in research approved by the College. It is expected that the trainee's educational supervisor should assess their progress to determine the suitability of their previous research to be counted towards the CCT. Any research to be counted towards the CCT should be agreed by the Programme Director, who will be required to make a recommendation to the College. Separate guidance and an application form are available on the College website for this purpose.

Research undertaken during a chemical pathology training programme

Trainees who undertake a period of research as out-of-programme experience after entering a chemical pathology training programme and obtaining their National Training Number (NTN) can have up to one year accepted by the Chemical Pathology CATT towards their CCT. Prior to beginning the period of research, trainees must inform the Training and Educational Standards Department at the Royal College of Pathologists in order that the Chemical Pathology CATT can ensure that the trainee will comply with the requirements of the CCT programme. The period of research must include clinical and/or laboratory work directly relevant to the chemical pathology curriculum. For those undertaking an extended period of research after entering a programme, a further limited amount of additional educational credit (up to six months) may be granted at the discretion of the Chemical Pathology CATT for clinical and/or laboratory work relevant to the programme undertaken in the course of research beyond the initial year. This concession does not apply to those undertaking research prior to entry to a specialist training programme. The documentation towards a CCT recommendation will be collected by the Training and Educational Standards Department at the College and a revised provisional CCT date issued. Separate guidance and an application form are available on the College website for this purpose.

Trainees must have their OOPE research approved by the relevant Deanery and PMETB and accepted by the Chemical Pathology CATT before beginning their research.

Academic training

Trainees who intend to pursue a career in academic or research medicine may undertake specialist training in chemical pathology. Such trainees will normally be clinical lecturers and hold an NTN(A). It is expected that such trainees should complete the requirements of the chemical pathology curriculum in addition to their academic work. However, the content of their training, while meeting the requirements of the curriculum, will have to take into account their need to develop their research and the provisional CCT date should be amended accordingly. NTN(A) holders in chemical pathology should consult the Training and Educational Standards Department at the College on an individual basis with regard to the agreement of their provisional CCT date.

Overseas training

Prospective recognition

Some trainees may wish to spend a period of training overseas as OOPE after entering a chemical pathology training programme in the UK. **In order to be eligible to have this period of training recognised towards the award of the CCT, trainees must have their OOPE overseas training approved prospectively by PMETB before beginning their overseas training.** Prior to submitting their application to PMETB, trainees must inform the Training and Educational Standards Department at the Royal College of Pathologists that they will be undertaking overseas training in order that the Chemical Pathology CATT can ensure that the trainee will comply with the requirements of the CCT programme. The documentation towards a CCT recommendation will be collected by the Training and Educational Standards Department at the College and a revised provisional CCT date issued. Separate guidance and an application form are available on the College website for this purpose.

Retrospective recognition

Some trainees may have undertaken a period of chemical pathology training overseas prior to entering a chemical pathology training programme in the UK. Such trainees must enter a chemical pathology training programme at ST1. Following satisfactory completion of ST1 training, trainees may apply to have the relevant competencies gained in previous overseas training accepted by the Chemical Pathology CATT. It is expected that the trainee's educational supervisor should assess their progress to determine the suitability of their previous overseas training to be accepted. Any overseas training to be accepted should be agreed by the Programme Director who will be required to make a recommendation to the Chemical Pathology CATT. **Therefore recognition of chemical pathology training undertaken overseas <u>prior</u> to entry to a recognised UK chemical pathology training programme cannot contribute towards the award of the CCT unless it has been prospectively approved by PMETB. The Chemical Pathology CATT may accept competencies gained during previous overseas training but the route of entry to the Specialist Register for such trainees will normally be via the award of a CESR certificate, rather than the award of a CCT.** Separate guidance and an application form are available on the College website for this purpose.

Clinical training

Some trainees may have undertaken clinical training in a UK training programme approved by PMETB prior to entering specialist training in chemical pathology and obtained competencies which can be mapped directly to the chemical pathology curriculum. Such trainees must enter a chemical pathology training programme at ST1. Following satisfactory completion of ST1 training, trainees may apply to have the relevant competencies gained in previous clinical training accepted towards their CCT by the Chemical Pathology CATT. It is expected that the trainee's educational supervisor should assess their progress to determine the suitability of their previous clinical training to be accepted. Any clinical training to be approved should be agreed by the Programme Director who will be required to make a recommendation to the Chemical Pathology CATT. The Chemical Pathology CATT, on behalf of the College, will accept up to one year of such training. An application for approval should include evidence of PMETB approval status, the knowledge, skills and attitudes satisfactorily obtained and agreement by the Chemical Pathology Programme Director who will be required to make a recommendation to the Training and Educational Standards Department at the College.

Clinical training undertaken overseas prior to entering specialist training in chemical pathology cannot contribute towards the award of the CCT unless it has been prospectively approved by PMETB. The Chemical Pathology CATT may accept relevant competencies gained during previous clinical training overseas but the route of entry to the Specialist Register for such trainees will normally be via the award of a CESR certificate rather than the award of a CCT.

RATIONALE

Purpose of the curriculum

The purpose of the curriculum for specialist training in chemical pathology is to set the standards required by the Royal College of Pathologists and PMETB for attainment of the award of the CCT in chemical pathology and to ensure that trainees are fully prepared to lead a full clinical and laboratory biochemistry service at consultant level in the National Health Service (NHS).

The educational programme provides:

- experience of laboratory practice to enable the trainee to attain an understanding of biochemical processes associated with pathological change, the rationale for investigation and treatment of disease and the interpretation of test results and to provide a basis for research activity
- experience of the diagnostic techniques required to become technically competent in practical work, and to master the underlying analytical and clinical principles
- the opportunity to gain knowledge of the metabolic changes that occur in disease
- the opportunity to gain knowledge of specialist areas such as paediatric chemical pathology and toxicology, in order to be able to provide specialist advice
- training in the communication and teaching skills necessary for effective practice
- the acquisition of the ability to provide specialist opinion in chemical pathology
- the acquisition of management skills to lead a department providing an effective service
- experience of research and development projects and critical assessment of published work so as to contribute in a team and individually to the development of the service

- the acquisition of life-long habits of reading, literature searches, consultation with colleagues, attendance at scientific meetings, and the presentation of scientific work that are essential for continuing professional development (CPD)
- experience of the practice of clinical governance and audit (specialist and multidisciplinary) through evaluation of practice against the standards of evidence-based medicine, which underpin biochemistry practice.

The balance between practical laboratory and clinical training will be influenced by educational background, personal interests and guidance from supervisors. The acquisition of clinical competence is required in at least two of the areas listed in Direct Patient Care (section 8), depending on the training experience available during the programme. Trainees in chemical pathology (metabolic medicine) will acquire clinical competence in nutrition, inborn errors of metabolism, disorders of lipid metabolism and cardiovascular risk assessment, disorders of calcium metabolism and bone and diabetes mellitus as described in the JRCPTB *Curriculum in the Subspecialty of Metabolic Medicine*, 2006.

The award of a CCT will indicate suitability for independent professional practice. During training, trainees will be able to use the curriculum to monitor their progress towards this goal. Formal assessments and examinations will be based on curricular objectives. The curriculum will facilitate regular assessment of trainees' progress by trainees and their educational supervisors.

Curriculum development

The curriculum was developed by the Chemical Pathology CATT and with input from the Specialty Advisory Committee (SAC) on Chemical Pathology and the Examination Panel of The Royal College of Pathologists. In addition, the College's Lay Advisory Committee was consulted and a draft version of the curriculum was published on The Royal College of Pathologists website for consultation with College Members, Fellows and Registered Trainees on 29 September 2006 for a three week period.

The metabolic medicine curriculum is developed by the Metabolic Medicine Sub-committee of the JRCPTB.

The content of the curriculum was derived from current UK hospital and laboratory practice in chemical pathology. Educational supervisors and trainees were involved in curriculum development via their representation on various College committees such as the Chemical Pathology CATT, SAC on Chemical Pathology, Metabolic Medicine Sub-committee and the Trainees Advisory Committee (TAC).

The curriculum will allow trainees to take control of their own learning and to measure achievement against objectives. It will help in formulation of a regularly updated education plan in conjunction with an educational supervisor and the local Specialty Training Committee (STC).

The curriculum was agreed by the Chemical Pathology CATT on 11 October 2006 and the Joint Committee on Pathology Training (JCPT) on 14 November 2006 and approved by the Council of The Royal College of Pathologists on 2 November 2006.

The curriculum was approved by PMETB on 12 April 2007 and formally published in May 2007.

Stages of training and learning

There are four stages in the chemical pathology curriculum. Trainees may not progress to the next stage of training until they have satisfactorily completed the preceding stage. Please read this section in conjunction with the illustrative timetable of chemical pathology training at appendices 3a and 3b (see pages 87 and 88).

Stage A

The trainee has a comprehensive understanding of the principles and practices of chemical pathology under direct supervision.

Stage A of training is 12 months whole-time equivalent. This stage of the curriculum (see page 37) will begin with a formal introduction to the basic principles of chemical pathology. Following the induction period, the trainee will receive instruction and practical experience in further aspects of chemical pathology. This stage of training will be formally assessed by the Royal College of Pathologists' Chemical Pathology Year 1 Assessment.

In order to satisfactorily complete stage A of chemical pathology training, trainees must have:

- satisfactorily completed stage A of the chemical pathology curriculum and a minimum training period of 12 months (whole-time equivalent)
- performed satisfactorily in the Royal College of Pathologists' Chemical Pathology Year 1 Assessment
- obtained a satisfactory RITA outcome.

Stage B

The trainee has a good general knowledge and understanding of most principles and practices under indirect supervision. He/she should be able to deal with most of the day-to-day issues in a hospital chemical pathology laboratory to an adequate level but will still require consultant input with regard to complex management and clinical issues.

Stage B of training is between month 13 and month 36 of whole-time equivalent training. During Stage B of training, the trainee will continue to broaden their experience and understanding of chemical pathology. The knowledge gained during this stage of training will be assessed by the MRCPath Part 1 examination.

In order to complete stage B of chemical pathology training, trainees must have:

- satisfactorily completed a total of at least 24 months of training (whole-time equivalent) of which at least 12 months should be in Stage B
- passed the MRCPath Part 1 examination in clinical biochemistry
- obtained one or more RITA Form Cs to indicate satisfactory progress in training.

Stage C

Stage C of training is between month 25 and month 48 of whole-time equivalent training. This stage of the curriculum enables the trainee to undertake further specialised general chemical pathology training. This stage of training will in part be summatively assessed by the MRCPath Part 2 examination.

In order to complete stage C of chemical pathology training, trainees must have:

- satisfactorily completed a total of at least 42 months of training (whole-time equivalent) of which at least 12 months should be in Stage C
- passed the MRCPath Part 2 examination in clinical biochemistry
- obtained one or more RITA Form Cs to indicate satisfactory progress in training and undertaken a Penultimate Year Appraisal (PYA).

Stage D

The trainee has an in-depth knowledge and understanding of the principles of chemical pathology. He/she should be competent to discuss and deal with the subject (or, where appropriate, perform the task/procedure), demonstrating a level of clinical or professional judgement commensurate with independent professional practice at consultant level. It is anticipated that a trainee at this level should have consultant input readily available at all times where required.

Stage D of training is between month 43 and month 60 of whole-time equivalent training. This stage of the curriculum prepares the trainee for their consultant post. The PYA undertaken near the end of Stage C should identify goals for the trainee to achieve during their final year of training. By the end of Stage D, the trainee should be able to demonstrate a level of knowledge and skill indicating suitability for independent professional practice in chemical pathology.

In order to complete stage D of chemical pathology training, trainees must have:

- satisfactorily completed a total of at least 60 months of training (whole-time equivalent) of which at least 12 months should be in Stage D
- satisfactorily completed all core and generic areas of the chemical pathology curriculum
- obtained a RITA Form G to indicate final record of satisfactory progress, leading to the award of the CCT.

Training programmes

Training programmes will be quality assured by PMETB and training posts and programmes will be recommended for approval by the relevant Postgraduate Deanery.

Training programmes should include suitable rotational arrangements to cover all the necessary areas of the curriculum and should include an appropriate balance between teaching hospitals, district general hospital laboratories and clinics (this may vary from six months to two years, depending on the interests and experience of the trainee) and specialist units such that each trainee gains the breadth of training required for satisfactory completion of the curriculum and a wide exposure to different content, educational supervisors and methods. The exact rotational arrangements will vary according to the size of the departments in the various training hospitals, the number of placements on the training scheme and the number of other trainees on the training programme. The training scheme should be organised in such a way as to give each trainee some experience in most recognised areas of subspecialisation. Where this is not possible with isolated training centres, secondment may be necessary to obtain specialised training.

The structure and operation of the training programme is the responsibility of an STC, which will ensure that every trainee is provided with an appropriate range of educational experience to complete his or her training.

The local Programme Director or Regional Specialty Advisor are responsible for the overall progress of the trainee and will ensure that the trainee satisfactorily

covers the entire curriculum by the end of the programme.

Each trainee should have an identified educational supervisor at every stage of their training. The educational supervisor is the consultant under whose direct supervision the trainee is working. A trainer is any person involved in training the trainee (e.g. consultant, clinical scientist, senior biomedical scientist [BMS]). A trainee may be trained by a number of trainers during their training.

CONTENT OF LEARNING

The curriculum details the level of knowledge and skill that a trainee should acquire to provide a high quality service at consultant level in the National Health Service (NHS) and meet PMETB's *Criteria for Entry to the Specialist Register*. The Good Medical Practice and core content of the curriculum is outlined below.

Generic skills required for chemical pathology, in accordance with Good Medical Practice (see pages 19-36)

Basic knowledge and skills

1. **Laboratory aspects of chemical pathology**
   The trainee should aim to become a competent analyst with a thorough understanding of method development, performance and application. Extensive experience of all laboratory techniques is not expected but trainees should gain in-depth practical experience of techniques used for the most commonly measured analytes, and of other more specialised techniques available in their training programme as required to provide a critical insight into laboratory methodology. They should at least have observed all other techniques listed in the curriculum.

   Theoretical knowledge of the analytical techniques is essential in order to develop a critical attitude to the principles underlying methods and instrumentation, their performance and usefulness in the clinical setting. Laboratory problems should be used to create learning opportunities. Trainees must become proficient in the theory and application of data handling and statistical methods.

2. **Management and communication**
   Trainees must gain experience under supervision in formulating departmental policies and clinical guidelines and in applying the leadership and teamwork skills that are necessary to implement them. Understanding the organisation and operation of a modern laboratory service, both within the hospital and the NHS, and how different staff groups contribute to the pre-, intra- and post-analytical processes is a key skill to be acquired. Communication skills should be developed by report writing, presentation of data at meetings, through contributions to group discussions and attendance at departmental business meetings. Trainees should experience strategic planning, preparation of a business plan, contracting processes, service level agreements and departmental and directorate budgeting. Formal training should be gained by attending suitable management courses. Trainees, as colleagues, should sit on departmental, directorate and committee meetings as observers in order to gain experience of committee procedures, aspects of confidentiality, decision-making and the importance of maintaining good interpersonal relationships.

3. **Clinical governance, clinical audit and evidence-based medicine**
   Clinical governance is defined by the Department of Health as 'a framework through which NHS organisations are accountable for continuously improving the

quality of their services and safeguarding high standards of care, by creating an environment in which excellence in clinical care will flourish.' In chemical pathology, trainees must acquire knowledge of the lines of accountability, quality improvement programmes, clinical audit, evidence-based practice, clinical standards and guidelines, managing risk and quality assurance programmes. Training in these areas must continue throughout all stages of the curriculum.

4. **Clinical training**
   Trainees must acquire a detailed understanding of biochemical processes and the changes that occur in disease. They must then develop the skills to use this knowledge in the diagnosis and management of disease. They must also develop an understanding of the rationale for investigation and treatment of disease and the clinical usefulness and limitations of laboratory tests in these settings. **Trainees are not required to know every aspect, as certain conditions are rare. Knowledge of where to obtain relevant information is required.**

5. **Direct patient care in the outpatient setting**
   This forms an important part of training. The specialty experience gained will vary but the majority of trainees will gain expertise in at least two areas, e.g. lipidology and nutrition.

6. **Recent advances in the clinical and laboratory aspects of the subject as published in scientific literature**
   The curriculum outlines the knowledge, skills, attitudes and expertise that a trainee is expected to obtain in order to achieve the award of the CCT. It is expected that every trainee should undertake the core training outlined in pages 21–85 but it is recognised that the sequencing of learning and experience will differ according to the programme. The curriculum maps components of *Good Medical Practice* against the clinical components of chemical pathology.

The recommended learning experiences are listed on page 17. The intended outcomes of learning are benchmarked to identifiable stages of training and these are listed on pages 10–11.

The Royal College of Pathologists is committed to supporting self-care, promoting well-being and community engagement, prevention and early intervention with services designed around the patient/service user rather than the needs of the patient/service user being forced to fit with the services offered. The following common core principles of self-care are therefore supported. These are:

Principle 1: Empower people who use services/patients to make informed choices to manage their condition and care needs more effectively.
Principle 2: Communicate effectively to enable people who use services/patients to develop and gain confidence in their self care skills.
Principle 3: Enable and support people who use services/patients to use technology to support self care.
Principle 4: Enable and support people who use services/patients to develop skills in self care.
Principle 5: Enable and support people who use services/patients to participate in service planning and to access support networks.

Further details are available in *Supporting People with Long Term Conditions to Self Care: A guide to developing local strategies and best practice* (www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4100252&chk=f7nOXn).

On completion of the chemical pathology training programme, the trainee must have acquired and be able to demonstrate:

- appropriate attitudes in order to be able to work as a consultant
- good working relationships with colleagues and the appropriate communication skills required for the practice of chemical pathology
- the knowledge, skills and attitudes to act in a professional manner at all times
- the knowledge, skills and attitudes to provide appropriate teaching and to participate in effective research to underpin chemical pathology practice
- an understanding of the context, meaning and implementation of clinical governance
- a knowledge of the structure and organisation of the NHS
- the acquisition of management skills required for the running of a chemical pathology laboratory
- familiarity with health and safety regulations, as applied to the work of a chemical pathology department.

Methods of assessment

Trainees will be assessed in a number of different ways during their training.

Trainees will be expected to undertake workplace-based assessment throughout the entire duration of their training in chemical pathology. These will take the form of:

- Case-based discussion (CbD) or evaluation of clinical events (ECE)
- Directly observed practical skills (DOPs)
- Mini-clinical evaluation exercise (Mini-CEX)
- Multi-source feedback (MSF).

Separate guidance is provided about the method and required frequencies of these assessments.

Trainees must pass the Chemical Pathology Year 1 Assessment as a requirement for satisfactory completion of Stage A of training. The major assessments will occur during Stage B of training in the shape of the MRCPath Part 1 examination and summatively towards the end of Stage C of training in the shape of the MRCPath Part 2 examination. The Chemical Pathology Year 1 Assessment and the MRCPath examination will be required for the eventual award of the CCT.

Evidence of competence

Evidence of competence will be judged based on a portfolio of documentation provided by the trainee at regular intervals. This will include:

- workplace-based assessments
- summative assessments e.g. MRCPath
- a correctly maintained and up-to-date logbook and portfolio
- appraisals
- educational supervisors reports.

Trainees must undergo an annual RITA at which the evidence of their competence and progress as listed above must be presented. This list is not exhaustive. A copy of all RITA Forms issued to the trainee must be provided to the Royal College of Pathologists prior to recommendation for the award of the CCT. Lack of progress, identified by the issue of a RITA E will necessitate repeat training to rectify deficiencies. Training resulting from the award of a RITA E will not be recognised towards the award of the CCT.

MODEL OF LEARNING

The models of learning can be applied to any stage of training in varying degrees.

The majority of the curriculum will be delivered through work-based experiential learning, but the environment within the department should encourage independent self-directed learning and make opportunities for relevant off-the-job education by making provision for attendance at local, national and, where appropriate, international meetings and courses. Independent self-directed learning should be encouraged by providing reference text books. It is the trainee's responsibility to seek opportunity for experiential learning. The rotation should also be arranged in such a way that trainees have time available for participation in research projects as part of their training. The more academically inclined trainees will be encouraged to take time out from the training time to include a more sustained period of grant-funded research working towards an MSc or PhD.

LEARNING EXPERIENCES

The following teaching/learning methods will be used to identify how individual objectives will be achieved:

a. observation of, assisting and discussion with senior staff
b. task specific on the job training
c. observation of laboratory methods
d. personal study
e. appropriate postgraduate education courses
f. tailored clinical experience
g. laboratory and clinical team meetings
h. undertaking a laboratory-based project
i. practical bench work.

SUPERVISION AND FEEDBACK

Specialist training must be appropriately supervised by the senior medical and scientific staff on a day-to-day basis under the direction of a designated educational supervisor and STC that links to the appropriate Postgraduate Deanery.

Educational supervision is a fundamental conduit for delivering teaching and training in the NHS. It takes advantage of the experience, knowledge and skills of educational supervisors\trainers and their familiarity with clinical situations. It ensures interaction between an experienced clinician and a doctor in training. This is the desired link between the past and the future of medical practice, to guide and steer the learning process of the trainee. Clinical supervision is also vital to ensure patient safety and the high quality service of doctors in training.

The College expects all doctors reaching the end of their training to demonstrate competence in clinical supervision before the award of the CCT. The College also acknowledges that the process of gaining competence in supervision starts at an early stage in training with foundation doctors supervising medical students and specialty registrars supervising more junior trainees.

The example provided by the educational supervisor is the most powerful influence upon the standards of conduct and practice of a trainee. The role of the educational supervisor is to:

- have overall educational and supervisory responsibility for the trainee in a given post
- ensure that the trainee is familiar with the curriculum relevant to the year/stage of training of the post
- ensure that the trainee has appropriate day-to-day supervision appropriate to their stage of training
- ensure that the trainee is making the necessary clinical and educational progress during the post
- ensure that the trainee is aware of the assessment system and undertakes it according to requirements
- act as a mentor to the trainee and help with both professional and personal development
- agree a training plan (formal educational contract) with the trainee and ensure that an induction (where appropriate) has been carried out soon after the trainee's appointment
- discuss the trainee's progress with each trainer with whom a trainee spends a period of training
- undertake regular formative/supportive appraisals with the trainee (two per year, approximately every six months) and ensure that both parties agree to the outcome of these sessions and keep a written record
- regularly inspect the trainee's training record, inform trainees of their progress and encourage trainees to discuss any deficiencies in the training programme, ensuring that records of such discussions are kept
- keep the STC Chair informed of any significant problems that may affect the trainee's training.

In order to become an educational supervisor, a consultant must have significant experience in the specialty, a demonstrated interest in teaching and training, appropriate access to teaching resources, be involved in and liaise with the appropriate regional training committee~~s~~, be involved in annual reviews and liaise closely with the College Regional Specialty Adviser. The deaneries organise extensive training programmes for educational supervisor's development. Educational supervisors are expected to keep up-to-date with developments in postgraduate medical training (e.g. by attending deanery and national training the trainer courses),

have access to the support and advice of their senior colleagues regarding any issues related to teaching and training and to keep up-to-date with their own professional development.

MANAGING CURRICULUM IMPLEMENTATION

The curriculum outlines the minimum chemical pathology training requirements for delivery in a regional training programme. It guides educational supervisors in the teaching methods required to deliver the curriculum and trainees in the learning and assessment methods required for satisfactory completion of training.

It is the responsibility of the Programme Director and their deanery, with the assistance of the regional STC and supported by the Regional Specialty Advisor, to ensure that the programme delivers the depth and breadth of chemical pathology training outlined in the curriculum. The Programme Director must ensure that each post or attachment within the programme is approved by PMETB.

It is the responsibility of PMETB to quality assure training programmes and the responsibility of the Chemical Pathology CATT and Joint Committee on Pathology Training to ensure training programmes across the UK are able to deliver a balanced programme of training.

It is the responsibility of the educational supervisor of a particular post or attachment within a programme to ensure that the training delivered in their post meets the requirements of the relevant section(s) of the curriculum. They must undertake regular appraisal with their trainee to ensure structured and goal-oriented delivery of training.

Trainees must register with the Royal College of Pathologists on appointment to a chemical pathology training programme. They must familiarise themselves with the curriculum and with the minimum training requirements to satisfactorily complete each stage of training and the award of the CCT. They must also be familiar with the requirements of the assessment system including workplace based assessment, the Chemical Pathology Year 1 Assessment and the MRCPath examination and must make appropriate use of the chemical pathology logbook and portfolio.

CURRICULUM REVIEW AND UPDATING

The curriculum will be evaluated and monitored by the Training and Educational Standards Department of the Royal College of Pathologists, as part of continuous feedback from STCs, Programme Directors, Regional Specialty Advisors, educational supervisors and trainees, underpinned by a programme of visits to quality assure training programmes.

In the first instance, the curriculum will be reviewed by the Chemical Pathology CATT within two years of publication. In reviewing the curriculum, the opinion of the SAC on Chemical Pathology, Metabolic Medicine Sub-committee, the TAC, the LAC and the College's Membership, Fellowship and Registered Trainees will be sought.

Any significant changes to the curriculum will need the approval of The Royal College of Pathologists' Council and PMETB.

EQUALITY AND DIVERSITY

Extract from the Royal College of Pathologists' *Diversity and equality policy and approach* (December 2006). A full copy of the policy is available on the College website (www.rcpath.org/index.asp?PageID=912).

The Royal College of Pathologists is committed to the principle of diversity and equality in employment, membership, academic activities, examinations and training. As part of this commitment we are concerned to inspire and support all those who work with us directly and indirectly.

Integral to our approach is the emphasis we place on our belief that everyone should be treated in a fair, open and honest manner. Our approach is a comprehensive one and reflects all areas, of diversity, recognising the value of each individual. We aim to ensure that no one is treated less favourably than another on the grounds of ethnic origin, nationality, age, disability, gender, sexual orientation, race or religion. Our intention is to reflect not only the letter but also the spirit of equality legislation.

Our policy will take account of current equality legislation and good practice. Key legislation includes:

- The Race Relations Act 1976 and the Race Relations Amendment Act (RRAA) 2000
- The Disability Discrimination Act 1995 and subsequent amendments
- The Sex Discrimination Act 1975 and 1986 and the 1983 and 1986 Regulations
- The Equal Pay Act 1970 and the Equal Pay (Amendment) Regulations 1983 and 1986
- The Human Rights Act 1998
- The Employment and Equality (Sexual Orientation) Regulations 2003
- The Employment and Equality (Religion or Belief) Regulations 2003
- Gender Recognition Act 2004
- The Employment Equality (Age) Regulations 2006.

The Training and Educational Standards Department collects information about the gender and ethnicity of trainees as part of their registration with the College. This information is recorded by the College and statistics published on an annual basis in the annual report. Further information about the monitoring activities of the College trainees, candidates, members and fellows are available in the College policy.

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GOOD MEDICAL PRACTICE CURRICULUM FOR CHEMICAL PATHOLOGY

This section outlines the generic knowledge, skills and attitudes that are tailored to and required for specialist training in chemical pathology and the competencies acquired in relation to the practice of chemical pathology. It is intended that trainees follow this curriculum for their entire training period in chemical pathology. This section will be complemented by training and courses organised by the local Deanery holding the trainee NTN. It is the responsibility of the educational supervisor to liaise with the local Programme Director and the Postgraduate Dean to ensure that the trainee has access to the necessary training opportunities, including attendance at courses to enable them to acquire the competencies as outlined in this curriculum.

1. GOOD CLINICAL CARE

Objective: to demonstrate adequate knowledge and skills and appropriate attitudes in routine clinical work.

New specialists will:

- have the breadth of knowledge and skills to take responsibility for safe clinical decisions.
- have the self-awareness to acknowledge where the limits of their competence lie and when it is appropriate to refer to other senior colleagues for advice.
- have the potential (or the ability) to take responsibility for clinical governance activities, risk management and audit in order to improve the quality of service provision.

Subject	Knowledge	Skills and knowledge application	Attitudes
Patient medical (or clinical) history	Define the patterns of symptoms found in patients presenting with metabolic/biochemical disease.	Be able to take and analyse a clinical history in a relevant succinct and logical manner. Be able to overcome difficulties of language, physical and mental impairment. Use interpreters and advocates appropriately.	Show empathy with patients. Appreciate the importance of psychological factors for patients and relatives. Appreciate the interaction of social factors and the patient's illness.

Subject	Knowledge	Skills and knowledge application	Attitudes
Examination	Define the pathophysiological basis of physical signs. Define the clinical signs found in diseases.	Be able to perform a reliable and appropriate examination.	Respect patients' dignity and confidentiality. Acknowledge cultural issues. Appropriately involve relatives. Appreciate the need for a chaperone.
Investigations including imaging	Define the pathophysiological basis of investigations. Define the indications for investigations. Define the risks and benefits of investigations. Know the clinical and cost effectiveness of individual investigation.	Be able to interpret the results of investigations. Be able to perform appropriate clinical investigations competently where relevant. Be able to liaise and discuss investigations with colleagues and to advise them appropriately.	Understand the importance of working with other healthcare professionals and team-working. Show a willingness to provide explanation to patient as to rationale for investigations, and possible unwanted effects.
Treatment (therapeutics)	Explain the scientific theory relating to pharmacology and the pathophysiology of therapeutic interventions metabolic/biochemical diseases.	Be able to accurately assess the patient's needs.	Clearly and openly explain treatments and side effects of drugs.

Subject	Knowledge	Skills and knowledge application	Attitudes
Note-keeping, letters, etc.	Know how to write summaries, letters, medico-legal reports. Define the structure, function and legal implications of medical records and medico-legal reports. Know the relevance of the data protection pertaining to patient confidentiality.	Record concisely, accurately, confidentially and legibly the appropriate elements of the history, examination, results of investigations, differential diagnosis and management plan. Be able to write summaries, letters, medico-legal reports. Date and sign all records.	Appreciate the importance of timely dictation, cost effective use of medical secretaries and the growing use of electronic communication. Be aware of the need for prompt and accurate communication with primary care, other agencies and patients or their families. Show courtesy towards medical secretaries and clerical staff.
Management of chronic disease	Define the clinical presentation and natural history of patients with chronic disease.	Maintain hope whilst setting long term realistic goals. Develop long-term management plans for relevant chronic disease.	Treating each patient as an individual. Appreciate the effects of chronic disease states on patients and their relatives. Appreciate the importance of co-operation with primary care.
Time-management	Know which patients/tasks take priority.	Start with the most important tasks. Work more efficiently as clinical skills develop. Recognise when he/she is falling behind and re-prioritise or call for help.	Have realistic expectations of tasks to be completed by self and others. Willingness to consult and work as part of a team.
Decision making	Understand clinical priorities for investigation and management.	Analyse and advise on clinical problems related to biochemical/metabolic diseases.	Be flexible and willing to change in the light of changing conditions. Be willing to ask for help.

2. MAINTAINING GOOD MEDICAL PRACTICE

Objective: to keep knowledge and skills and appropriate attitudes up to date.

New specialists will:

- take responsibility for and keep up-to-date in their own relevant professional and self-development, and facilitate that of others
- acknowledge that the balance of their skills and expertise will change as their careers progress and they specialise in certain areas of clinical practice.

Subject	Knowledge	Skills and knowledge application	Attitudes
Overall clinical judgement	Possess sufficient clinical and biochemical knowledge to enable integration of clinical and laboratory features.	Correct interpretation of test results in the context of available clinical information.	Critical appraisal of the available clinical and laboratory data in coming to diagnostic/treatment decisions.
Recognise own limitations	Know the extent of one's own limitations and know when to ask for advice.		Be willing to consult and to admit mistakes.
Written records	Possess knowledge of the appropriate content of clinical records. Understand the problems faced by people for whom English is not a first language. Understand the problems faced by people with educational and/or physical disabilities. Know the relevance of data protection pertaining to patient confidentiality.	Produce accurate letters/reports and other written correspondence with clear conclusions.	Appreciate the importance of timely dictation, cost-effective use of medical secretaries and the growing use of electronic communication. Be aware of the need for prompt and accurate communication with clinicians and patients and their families. Show courtesy towards medical secretaries and clerical staff.
Decision making	Understand clinical priorities for investigation and management.	Analyse clinical and laboratory problems effectively.	Be flexible and willing to change in the light of changing conditions. Be willing to ask for help.

Subject	Knowledge	Skills and knowledge application	Attitudes
Life-long learning	Understand the importance of continuing professional development.	Recognise and use learning opportunities. Use the potential of study leave to keep one up to date. Able to maintain a professional portfolio. Monitor own performance through audit and feedback.	Be self-motivated and eager to learn. Show willingness to learn from colleagues and to accept constructive feedback.
Good use of information technology (IT)	Understand use of email, internet, fax and the telephone. Know the principles of how to retrieve and utilize data recorded in clinical systems. Know the principles of literature searching using medical databases. Demonstrate an understanding of the range of possible uses for clinical data and information and appreciate the dangers and benefits of aggregating clinical data. Define the main features, responsibilities and liabilities in the UK and Europe pertaining to confidentiality.	Demonstrate competent use of database, word processing and statistics programmes. Be able to undertake searches (including literature searches) and access websites and health related databases. Apply the principles of confidentiality in the context of IT.	Demonstrate the acquisition of new attitudes in patient consultation in order to make maximum use of IT. Demonstrate appropriate techniques to be able to share information on computer with the patient in a constructive manner. Adopt proactive and enquiring attitude to new technology.

Subject	Knowledge	Skills and knowledge application	Attitudes
The organisational framework for clinical governance and its application in practice	Possess an understanding of the important aspects of clinical governance: • medical and clinical audit • research and development • integrated care pathways • evidence-based practice • clinical effectiveness • clinical risk systems • to define the procedures and the effective action when things go wrong in one's own practice or that of others • complaints procedures • risk assessments Understand the benefits a patient might reasonably expect from clinical governance.	Be an active participant in clinical governance. Be able to undertake medical and clinical audit. Be actively involved in audit cycles. Be active in research and development. Critically appraise medical data research. Practise evidence-based medicine. Aim for clinical effectiveness (best practice) at all times. Educate self, colleagues and other healthcare professionals. Be able to handle and deal with complaints in a focused and constructive manner. Learn from complaints.	Make the care of your patient your first concern. Respect patients' privacy, dignity and confidentiality. Be prepared to learn from mistakes, errors and complaints. Recognise the importance of teamwork. Share best practice with others.

Subject	Knowledge	Skills and knowledge application	Attitudes
The organisational framework for clinical governance and its application in practice (continued)		Report critical incidents. Take appropriate action if you suspect you or a colleague may not be fit to practice. Develop and institute clinical guidelines and integrated career pathways.	
Risk management	Possess knowledge of such matters as health and safety policy, policies on needle stick injuries, note keeping, communications and staffing numbers. Possess knowledge of risk management issues pertinent to laboratory processing. Possess knowledge of risk assessment, perception and relative risk. Know the complications and side effects of treatments and investigations.	Confidently and authoritatively discuss relevant risks with patients and to obtain informed consent. Able to balance risks and benefits with patients.	Willingness to respect and accept patients' views and choices. Willingness to be truthful and to admit error to patients, relatives and colleagues.
Evidence	Know and understand: • the principles of evidence-based medicine • the types of clinical trial • the types of evidence.	Ability to critically appraise evidence. Ability to be competent in the use of databases, libraries and the internet. Ability to discuss the relevance of evidence with individual patients or their families.	Display a keenness to use evidence in the support of patient care and own decisions therein.

Subject	Knowledge	Skills and knowledge application	Attitudes
Clinical audit	Know and understand the audit cycle, data sources and data confidentiality. Understand the principles of internal and external quality assurance.	Involvement in ongoing audit. Complete at least one clinical audit project per year.	Consider the relevance of clinical audit to benefit patient care and individual performance (i.e. to clinical governance).
Guidelines	Know the advantages and disadvantages of guidelines.	Demonstrate the ability to utilise guidelines. Be able to contribute to the evolution of guidelines.	Show regard for individual patient needs when using guidelines. Show willingness to use guidelines as appropriate.
Structure of the NHS and the principles of management	Know the structure of the NHS, primary care groups and hospital Trusts. Know the local Trust's management structure (including chief executives, medical directors, clinical directors and the pathology laboratory). Know finance issues in general in the NHS, especially budgetary management and commissioning. Understand the importance of a health service for the population.	Develop skills in managing change and managing people. Develop interviewing techniques and those required for performance reviews. Be able to build a business plan. Be able to utilise one's position in the NHS to best effect.	Show an awareness of equity in healthcare access and delivery. Demonstrate an understanding of the importance of a health service for the population. Show respect for others, ensuring equal opportunities.

Subject	Knowledge	Skills and knowledge application	Attitudes
Relevance of outside bodies	Know the role and have an understanding of the relevance to professional life of: • the medical royal colleges • General Medical Council (GMC) • Postgraduate Dean and deaneries • Postgraduate Medical Education and Training Board (PMETB) • defence unions • British Medical Association (BMA) • specialist societies. Know of central government health regulatory agencies (e.g. National Institute for Health and Clinical Excellence [NICE], Healthcare Commission [HCC], NHS Quality Improvement Scotland, National Patient Safety Agency [NPSA]).	Recognise situations when appropriate to involve these bodies and individuals.	Be open to constructive criticism. Accept professional regulation.
Media awareness	Know the importance of media awareness and public communications training and where to obtain it.	Recognise situations when it may be appropriate to implement such training and/or seek further advice from the Trust.	Act professionally. Be willing to ask for help.

3. TEACHING AND TRAINING, APPRAISING AND ASSESSING

Objective: to demonstrate the knowledge, skills and attitudes to provide appropriate teaching and to participate in effective research.

New specialists will:

- be able to demonstrate the potential to teach and train effectively at all levels of undergraduate and postgraduate education where required.
- demonstrate skills and strategies in the process of feedback to colleagues and trainees, ensuring positive and constructive outcomes.
- be capable of judging competence and professional attributes in others.

Subject	Knowledge	Skills and knowledge application	Attitudes
To have the skills, attitudes and practices of a competent teacher	Identify adult learning principles. Identify learner needs. Structure of a teaching activity. Varied teaching strategies. Identify learning styles. Principles of evaluation.	Facilitate learning process. Identify learning outcomes. Construct educational objectives. Design and deliver an effective teaching event. Communicate effectively with the learners. Use effective questioning techniques. Teach large and small groups effectively. Select and use appropriate teaching resources. Give constructive effective feedback. Evaluate programmes and events. Use different media for teaching that are appropriate to the teaching setting.	Demonstrate a willingness and enthusiasm to teach. Show respect for the learner. Demonstrate a professional attitude towards teaching. Show commitment to teach. Demonstrate a learner centred approach to teaching.
To be able to plan and analyse a research project	Know the principles of performing a research study. Know how to use appropriate statistical methods. Know the principles of research ethics and the structure and function of local research ethics committees. Know how to write a scientific paper. Understand principles of research funding and how to obtain funding.	Undertake systematic critical review of scientific literature. Ability to frame questions to be answered by a research project. Develop protocols and methods for research. Be able to use databases. Be able to accurately analyse data. Be able to write a scientific paper. Have good written and verbal presentation skills.	Demonstrate curiosity and a critical spirit of enquiry. Ensure patient confidentiality. Demonstrate knowledge of the importance of ethical approval and patient consent for clinical research. Humility.

Subject	Knowledge	Skills and knowledge application	Attitudes
Appraisal and assessment	Understand the concepts of appraisal and assessment. Understand how to conduct an appraisal interview or assessment.	Able to maintain an appraisal portfolio. Develop the ability to undertake an effective appraisal or assessment.	Demonstrate a positive attitude to appraisal. Be aware of equality and diversity issues as they relate to appraisal.

4. RELATIONSHIPS WITH PATIENTS

Objective: to ensure that the trainee has the knowledge, skills and attitudes to act in a professional manner at all times.

New specialists will:

- be skilled in building relationships of trust with patients and their families, through effective interpersonal skills, a courteous and compassionate approach, and respect for their privacy, dignity and cultural and religious beliefs.
- follow the principles and legal aspects of consent and confidentiality.
- be able to manage difficult and complex situations with patients and their families, to advise them appropriately and to manage complaints effectively.

Subject	Knowledge	Skills and knowledge application	Attitudes
Patient safety	Understand the issues around patient safety and the role of the NPSA. Be aware of the NPSA National Reporting and Learning System.	Demonstrate awareness of patient safety in a practical situation.	Show regard for patient safety.
Continuity of care	Understand the relevance of continuity of care.	Ensure satisfactory completion of reasonable tasks at the end of the shift/day with appropriate handover. Ensure appropriate documentation of/for handover. Make adequate arrangements to cover leave.	Recognise the importance of punctuality and attention to detail. Recognise importance of communication with patients/carers.

Subject	Knowledge	Skills and knowledge application	Attitudes
Informed consent	Know the process for gaining informed consent. Understand the principles of consent issues as relating to clinical practice and research. Know how to gain consent for a research project.	Give appropriate information in a manner patients understand and be able to gain informed consent from patients. Demonstrate appropriate use of written material.	Respect for patients' and relatives' points of view and wishes. Consider the patient's needs as an individual.
Confidentiality	Be aware of relevant strategies to ensure confidentiality. Be aware of situations when confidentiality might be broken.	Use and share all information appropriately. Avoid discussing one patient in front of another. Be prepared to seek patient's wishes before disclosing information.	Respect the right to confidentiality.
Within a consultation	Know how to structure the interview to identify the patient's: • concerns/problem list/priorities • expectations • understanding • acceptance.	Listen. Use 'open' questions followed by appropriate 'closed' questions. Avoid jargon and use familiar language. Be able to communicate both verbally and in writing to patients whose first language may not be English in a manner that they understand. Use interpreters appropriately. Give clear information and feedback to patients and share information with relatives when appropriate Reassure 'worried well' patients.	Demonstrate an understanding of the need for: • involving patients in decisions • offering choices • respecting patients views • dress and appearance that is appropriate to the clinical situation and patient

Subject	Knowledge	Skills and knowledge application	Attitudes
Breaking bad news	Know how to structure the interview and where it should take place. Be aware of the normal bereavement process and behaviour. Have awareness of organ donation procedures and role of local transplant coordinators.	Be able to break bad news in steps appropriate to the understanding of the individual and be able to support distress. Avoid jargon and use familiar language. Encourage questions. Maintain appropriate hope whilst avoiding inappropriate optimism.	Act with empathy, honesty and sensitivity.
Complaints	Have awareness of the local complaints procedures. Have an awareness of systems of independent review.	Manage dissatisfied patients/relatives. Anticipate potential problems.	Act promptly and with honesty and sensitivity. Be prepared to accept responsibility.
Doctor-patient relationship	Understand all aspects of a professional relationship. Establish the limiting boundaries surrounding the consultation. Deal with challenging behaviour in patients that transgress those boundaries, e.g. aggression, violence, racism and sexual harassment.	Help the patient appreciate the importance of cooperation between patient and doctor. Develop the relationship that facilitates solutions to patient's problems. Deal appropriately with behaviour falling outside the boundary of the agreed doctor-patient relationship in patients, e.g. aggression, violence, sexual harassment.	Adopt a non-discriminatory attitude to all patients and recognise their needs as individuals. Seek to identify the healthcare belief of the patient. Acknowledge patient rights to accept or reject advice.

Subject	Knowledge	Skills and knowledge application	Attitudes
Educating patients about: • disease • investigations • therapy	Know investigation procedures including possible alternatives and choices. Be aware of strategies to improve adherence to therapies.	Give information to patients clearly in a manner that they can understand, including written information. Encourage questions. Negotiate individual treatment plans including action to be taken if patient deteriorates or improves.	Consider involving patients in developing mutually acceptable investigation plans. Encourage patients to access: • further information • patient support groups.
Environmental and lifestyle risk factors	Understand the risk factors for disease including: • diet • exercise • social deprivation • occupation • substance abuse • behaviour.	Advise on lifestyle changes. Involve other healthcare workers as appropriate.	Suppress any display of personal judgement.
Epidemiology and screening	Know the methods of data collection and their limitations. Know diseases that are notifiable. Know principles of primary and secondary prevention and screening.	Assess an individual patient's risk factors. Encourage participation in appropriate disease prevention or screening programmes.	Consider the: • positive and negative aspects of prevention • importance of patient confidentiality. Respect patient choice.

5. WORKING WITH COLLEAGUES

Objective: to demonstrate good working relationships with colleagues and appropriate communication skills.

New specialists will:

- strive for continuing improvement in all aspects of their work and that of colleagues while mindful of priorities and high standards
- have effective interpersonal skills which enable them to bring out the best in colleagues, to resolve conflicts when they arise and to develop working relationships within the team
- Support teams that bring together different professions and disciplines and other agencies, to provide high quality healthcare.

Subject	Knowledge	Skills and knowledge application	Attitudes
Clinical teams	Understand how a team works. Understand the roles and responsibilities of team members, especially within the department and within multidisciplinary teams. Know how a team works effectively. Know the roles of other clinical specialties and their limitations.	Be able to communicate effectively and seek advice if unsure. Recognise when input from another specialty is required for individual patients. Be able to work effectively with other health care professionals. Respect skills and contribution of colleagues. Recognise own limitations. Recognise when to delegate. Show leadership and supervise safely.	Show respect for others opinions. Be conscientious and work cooperatively. Respect colleagues, including non-medical professionals and recognise good advice. Recognise own limitations.

Subject	Knowledge	Skills and knowledge application	Attitudes
Communication with colleagues	Know: • how to communicate with other members of the pathology department, other departments and other members of the multidisciplinary team • how to communicate in writing, through letters and reports • when to phone a General Practitioner (GP).	Use appropriate language. Select an appropriate communication method.	Be prompt and respond courteously and fairly.
Complaints	Have awareness of the local complaints procedures. Have an awareness of systems of independent review.	Anticipate potential problems. Manage dissatisfied colleagues.	Act with honesty and sensitivity and promptly. Be prepared to accept responsibility.
Interactions between: • hospital and GP • hospital and other agencies, e.g. social services • medical and surgical specialties	Know the roles and responsibilities of team members. Know how a team works effectively. Know the roles of other clinical specialties and their limitations.	Delegate, show leadership and supervise safely Be able to communicate effectively. Handover safely. Seek advice if unsure. Recognise when input from another specialty is required for individual patients. Be able to work effectively with GPs, other medical and surgical specialists and other healthcare professionals.	Show respect for others opinions. Be conscientious and work co-operatively. Respect colleagues, including non-medical professionals, and recognise good advice. Recognise own limitations.

Subject	Knowledge	Skills and knowledge application	Attitudes
Creating an environment in which mistakes and mismanagement of patients can be openly discussed and lessons learned		Be aware of the advantages and disadvantages of guidelines. Report and investigate critical incidents. Take appropriate action if you suspect you or a colleague may not be fit to practise.	

6. HEALTH

Objective: to understand the importance of the personal health of the doctor.

New specialists will:

- act quickly and effectively if they have reason to believe that their own or a colleague's conduct, performance or health may put patients at risk.

Subject	Knowledge	Skills and knowledge application	Attitudes
Personal health	Know of occupational health services. Know of one's responsibilities to the public. Know not to treat oneself or one's family.	Recognise when personal health takes priority over work pressures and to be able to take the necessary time off.	Recognise personal health as an important issue.
Stress	Know the effects of stress. Have knowledge of support facilities for doctors.	Develop appropriate coping mechanisms for stress and ability to seek help if appropriate.	Recognise the manifestations of stress on self and others.

7. PROBITY

Objective: to be able to demonstrate probity in all aspects of professional practice.

New specialists will:

- always act in their personal and professional lives to maintain public trust in the profession
- undertake duties such as writing reports, giving evidence and completing and signing documents in a timely, honest and conscientious way
- through their leadership encourage the development and practice of these qualities in their colleagues.

Subject	Knowledge	Skills and knowledge application	Attitudes
Service information	Legal framework for advertisements.		Recognise absolute importance. of accuracy and impartiality.
Writing reports and giving evidence			Honesty and integrity. Timeliness.
Research		Obtain ethical approval.	Put safety and care of patients first. Conduct research with honesty and integrity.
Financial dealings			Not induce patients to accept private medical care. Manage funds for the purpose for which they are intended. Declare conflicts of interest.

CORE CHEMICAL PATHOLOGY CURRICULUM (STAGE A)

INTRODUCTION

This curriculum indicates the level of theoretical knowledge, and clinical and laboratory skills which might reasonably be expected to be achieved by a trainee during their first year of training in chemical pathology. This list is not intended to be prescriptive, since the clinical and laboratory workloads of training departments will differ, and it may well be that certain elements cannot be accommodated during the first year of training. The curriculum nonetheless defines those parts of the whole curriculum to which attention should principally be paid in Stage A. In brief, trainees would be expected to acquire the following skills:

- knowledge of laboratory techniques that underpin clinical laboratory practice
- gained knowledge of laboratory practice including health and safety and quality assurance
- a basic knowledge of the presentation, differential diagnosis and natural history of the common chemical pathology disorders
- sufficient understanding of chemical pathology to offer basic advice on the interpretation of laboratory results.

1. LABORATORY COMPETENCIES

Introduction to chemical pathology

Objective: to achieve sufficient knowledge of laboratory chemical pathology to offer basic advice on the interpretation of results.

Knowledge	Skills and knowledge application	Attitudes
Operation of automated analysers	Understand the principles of the operation of automated analysers. Interpretation of results generated. Identification of invalid results.	
Knowledge of specimen collection, handling, transport and sample storage **Understanding the use of specific preservatives and possible interference in assays**	Familiar with the functions of pathology reception, the phlebotomy service. Comprehending the problems associated with 24 hour urine collections.	
Principles of health and safety		Application to the working laboratory and avoiding risks.
IT and communication skills	Familiar with fundamental aspects of computing within the laboratory, databases, spreadsheets, internet. Use on a day-to-day basis.	Proactive attitude to new technology.
Principles of quality control and assurance	Basic understanding of quality control and quality assurance. Understanding the use of External Quality Assurance (EQA) and National External Quality Assurance Service (NEQAS) Evaluation of internal/external quality assurance data so as to identify the possible cause of aberrant data.	Applies principles to laboratory.

Knowledge	Skills and knowledge application	Attitudes
Presentation, diagnosis and management of common chemical pathology disorders	Recognise the biochemical/metabolic features of diseases and their abnormal findings in the laboratory. Advise on the differential diagnosis and initial management of common chemical pathology disorders. Supervised participation in Duty Biochemist rota. Be aware of the need to consult about results that are not understandable.	Works as part of the clinical team. Relates laboratory results to patient care. Understanding the role of other specialities.

Analytical Techniques and Instrumentation

Objective: To become competent analyst in a range of analytical techniques, their performance, comparative usefulness and applications so as to be competent in the management of the chemical pathology laboratory.

Subject	Knowledge	Skills and knowledge application	Attitudes
Basic laboratory techniques and centrifugation	Methods of standardisation and calibration. Identification of common method interferences. Use of pipettes. Preparation and storage of reagents. Use and maintenance of centrifuges.	Experience of techniques, and conversant with the performance and limitations of widely used methods in chemical pathology. To detect errors and sources of error. Taking responsibility for assays. Ensuring analytical competence.	Establishes close rapport and understanding with laboratory staff working as part of a multidisciplinary team. Learning experience with all laboratory staff. Ensure liaison between laboratory and clinical staff. Laboratory problems create learning opportunities
Assay interference	Understands the mechanisms by which common interferents affect laboratory assays (haemolysis, jaundice, lipaemia). Heterophilic antibodies.	Practical experience of investigating assay interference.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Automated instrumentation	Random access, immunoassay analysers robotics and modular systems.	Understand the technology and design of biochemistry analysers and appreciate their limitations and benefits.	
Spectrometric methods	Spectrometry: visible, Ultra-violet (UV), Turbidimetry,	Experience of the application of some of these methods.	
Osmometry	Principle of technique.	Experience of use of technique.	
Electrometric methods	Ion selective electrodes Na^+ , K^+, H^+, pO_2, pCO_2, Ca^{2+},	Experience of the application of some of these methods.	
Enzymology	Fixed interval, kinetic assays, isoenzymes, enzymes as reagents.	Experience of the application of some of these methods.	
Immunochemical techniques	Immuno -assay, -metric. Labels enzyme, fluorimetric, and chemiluminescent.	Experience of the application of some of these methods.	
Electrophoresis	Principles of technique.	Experience of the application of some of these methods.	
Chromatography	Principles of techniques	Experience of the application of some of these methods.	
Point of care testing	Advantages/disadvantages of point of care testing. Glucose, Bilirubinometers, Blood gas, Ion –specific electrodes, urinanalysis	Experience of the use of point of care testing in hospital.	
Solid/dry phase chemistry	Dipstick, thin film		

Evaluation of an Analytical Method

Objective: Knowledge of the processes required to establish and validate a new method.

Knowledge	Skills and knowledge application	Attitudes
Practicability **Optimisation of reaction conditions** **Recognition of critical parameters (robustness)** **Bias** **Imprecision** **Sensitivity** **Specificity** **Investigation of common interferences** **Range** **Criteria for acceptability**	Contribute to establishing and validating a new method. Write the standard operating procedure of the method and place a copy in your portfolio.	Critical attitude to assay performance.

2. CLINICAL GOVERNANCE AND AUDIT COMPETENCIES

Objectives: knowledge of the lines of accountability, quality improvement programmes, clinical audit, evidence-based practice, clinical standards and guidelines, managing risk and quality assurance programmes.

Knowledge	Skills and knowledge application	Attitudes
Clinical governance **Investigative Protocols** **Service Quality**	Recognising roles, responsibility and accountability. Participation in risk assessment. Monitoring/reporting adverse events. Availability and adherence to agreed protocols for investigations of common conditions. Turnaround time, complaint analysis	Patient care is the prime concern. Share best practice with others. Learn from mistakes and complaints. Maintenance of probity in clinical and laboratory practice.
Clinical Audit Clinical Effectiveness and audit: • concept of systematic reviews and evidence-based medicine; • role of audit in the hospital; • audit cycle; • participation in regular clinical audit, within and between departments, at the interface with primary care and at regional level.	Philosophy of clinical effectiveness: role of clinical audit in achieving this, methods of clinical audit in healthcare. Plan, undertake, report, and present at least one audit and undertake follow up. Use audit to gather evidence provided by formal review of practices and clinical performance that quality requirements and the needs of governance are being met. Understanding that clinical audit. Provides the evidence. Indicates change needed. Highlights the resources required.	Recognise the benefit of audit to clinical care and the multidisciplinary nature of clinical audit. Attendance at audit meetings in the department, other disciplines where appropriate, and possibly regional and national audit meetings. Taking responsibility for an audit.

3. COMPETENCIES IN THE CHEMICAL PATHOLOGY OF DISEASE

Objective: to relate understanding of normal human biochemistry and physiology to the chemical pathology of screening, diagnosis and monitoring of disease. Should be fully conversant with generic aspects.

Subject	Knowledge	Skills and knowledge application	Attitudes
Generic aspects	Physiology, biochemistry, pathogenesis, pathophysiology natural history, epidemiology, presentation, diagnosis, causes, classification, complications, molecular biology, diagnostic methods required in the curriculum should be acquired throughout training. Biochemical, haematological and radiological techniques required for the investigations, diagnosis and screening. Knowledge of the pharmacology of the therapeutic agents required in management. Molecular biology to identify genetic disorders.	Advising on the appropriate use and interpretation of the results of the laboratory investigations in screening for disease, to establish (differential) diagnosis, to monitor progress and treatment. Liaise and communicate clearly with colleagues and other clinical teams in primary and secondary care both verbally and via clinic letters.	Acting as an effective interface between laboratory and clinical staff, as part of team. Interact effectively with members of multidisciplinary teams in hospital, GP and community. Recognises the importance of good communication and supportive care for successful patient outcomes. Relate theoretical knowledge and laboratory results to patient management and clinical practice.

Subject	Knowledge	Skills and knowledge application	Attitudes
Biological variability	Reference values and population statistics: • common reference intervals • inter- and intra-individual variation • assessment and application of biological variance data in setting analytical goals • assessing utility of reference values • significance of changes in serial results.	The effect of genetic and environmental influences such as age, sex, nutrition, time of day, stress, posture, hospitalisation and therapeutic agents on biochemical results.	

4. COMPETENCIES IN THE INTERPRETATION OF LABORATORY DATA

Objectives: with supervision, ability to safely advise on the interpretation of laboratory results in diagnosis, treatment and monitoring of patients.
To attain a level of knowledge of clinical practice, giving the ability to conduct a dialogue with clinical colleagues:

- appropriate selection of tests
- interpretation of their results
- initiation of further investigation based on these results.

Subject	Knowledge	Skills and knowledge application	Attitudes
Interpretation of laboratory data	Basic biochemistry, physiology and chemical pathology of the disease processes under investigation in the laboratory. Nature of biochemical investigations undertaken and provided to other specialties.	Contribute competently at ward rounds and case presentations. Competent to take part in duty biochemist and reporting rota with supervision. Appropriate comments when reporting laboratory results. Critical appreciation of the role of biochemical tests. Liaison with clinical colleagues. Follow-up of abnormal investigations.	• Act as part of a multidisciplinary team.

5. COMPETENCIES IN RESEARCH AND DEVELOPMENT

Objectives: critical assessment of published work and an understanding of basic statistical methods.

Knowledge	Skills and knowledge application	Attitudes
Principles of critical review	Critical review and appraisal of literature. To assess the validity of data, experimental design and problem solving techniques. Implementing evidence-based chemical pathology. Using library and IT facilities.	Use evidence based medicine in support of patient care.

Knowledge	Skills and knowledge application	Attitudes
Data handling and statistical methods Statistical interpretation of: • laboratory and population data • standard deviation and error • median and mean • linear regression and correlation methods • methods of assessing agreement • concept of significance and related statistics • confidence intervals • non-parametric statistics • predictive value: positive and negative • specificity and sensitivity • receiver operating characteristic curves.	Computer use within the laboratory: spreadsheets, databases. Correct analysis of results using appropriate statistical tools.	Seek statistical advice before embarking on a project.

6. COMPETENCIES IN DIRECT PATIENT CARE

Generic aspects of clinical management

Objective: competent in the generic clinical and communication skills required for assessment and treatment of patients, referred for a specialist biochemical opinion, within an outpatient setting. Regular attendance at appropriate outpatient clinics under Consultant supervision is required.

Knowledge	Skills and knowledge application	Attitudes
Physiology, biochemistry, pathogenesis, pathophysiology natural history, epidemiology, presentation, diagnosis, causes, classification, complications, molecular biology, diagnostic methods as set out in part in the theoretical curriculum above, which should be acquired throughout training .	Elicit a comprehensive history including social, family and dietary aspects. Recognise presenting features and conduct the examination competently. Use appropriate investigations to establish diagnosis. Formulate management and treatment plans. Document clearly in the patient notes. Explain the diagnosis, treatment and side effects to the patient and relatives. Liaise and communicate with colleagues, teams in primary and secondary care, both verbally and in writing.	Aware of the impact of the disorder/ diagnosis/chronic disease on the patient and family. Acts with empathy in communicating and managing the disorder and its complications. Explains planned treatment to the patient. Works as part of multidisciplinary team. Recognises the importance of good communication and supportive care for successful patient outcomes. Relate theoretical knowledge and laboratory results to patient management and clinical practice.
Educating patients about their disease, investigations, lifestyle, treatment	Inform clearly both verbal and in writing. Advising patients about access to patient groups and information.	Involving patients in developing their treatment and care.

CORE CHEMICAL PATHOLOGY CURRICULUM (STAGES B – D)

There is no intention to use completion of this curriculum and appendices as a measure of aptitude or achievement. It is simply an indication of the range and level of experience that could be reasonably expected of trainees. The level of knowledge gained within each of the areas described below will vary between trainees. However, for each disease process listed, it is recommended that the trainee possesses at least a basic level of knowledge. A detailed curriculum for clinical and laboratory training is set out here.

1. LABORATORY COMPETENCIES

1.1. Introduction to chemical pathology

Objective: to achieve sufficient knowledge of laboratory chemical pathology to offer basic advice on the interpretation of results.

Knowledge	Skills and knowledge application	Attitudes
Operation of automated analysers	Explain the principles behind automated analysers. Interpretation of results-generated identification of invalid results.	
Knowledge of specimen collection, handling, transport and sample storage **Understanding the use of specific preservatives and possible interference in assays**	Familiar with the functions of pathology reception, the phlebotomy service. Comprehending the problems associated with 24-hour urine collections.	
Principles of health and safety	Familiar with all aspects of health and safety in the laboratory. Aware of the pathologist's legal obligations. Clinical Pathology Accreditation (CPA) standards to obtain and retain full laboratory accreditation. The role of the Health and Safety Executive.	Application to the working laboratory and avoiding risks.

Knowledge	Skills and knowledge application	Attitudes
IT and communication skills **Understanding the Data Protection Act**	Familiar with fundamental aspects of computing within the laboratory, databases, spreadsheets, internet. Use on a day-to-day basis.	Proactive attitude to new technology.
Principles of audit	Familiar with audit through participation in multidisciplinary clinical audit.	Recognise the benefit of audit.
Principles of quality control and assurance	Full understanding of quality control and quality assurance. Understanding EQA and NEQAS The use of external NEQAS and the processing of data by these schemes. Critical evaluation of external quality assurance data so as to identify the possible cause of aberrant data, including the constraints due to instrumentation, reagents and operations.	Applies principles to laboratory.
Presentation, diagnosis and management of common chemical pathology disorders	Recognise the disorder in the laboratory and advise on the differential diagnosis and initial management of common chemical pathology disorders. Be aware of the need to consult about results that are not understandable.	Works as part of the clinical team. Relates laboratory results to patient care. Understanding the role of other specialties.

1.2. Analytical techniques and instrumentation

Objective: to become a competent analyst with appreciation of a range of analytical techniques, their performance, comparative usefulness and applications so as to be competent in the management of the chemical pathology laboratory.

NB. Items in *italics* would probably not be encountered universally.

Subject	Knowledge	Skills and knowledge application	Attitudes
Basic laboratory techniques and centrifugation	Methods of standardisation and calibration. Identification of common method interferences. Use of pipettes. Preparation and storage of reagents. Use and maintenance of centrifuges. *Ultrafiltration.* *Ultracentrifugation.*	Wide experience of techniques, together with in depth experience of certain techniques. Fully conversant with the performance and limitations of widely used methods in chemical pathology. To detect errors and sources of error. Taking responsibility for assays. Ensuring analytical competence.	Establishes close rapport and understanding with laboratory staff working as part of a multidisciplinary team. Learning experience with all laboratory staff. Ensure liaison between laboratory and clinical staff. Laboratory problems create learning opportunities.
Assay interference	Understands the mechanisms by which common interferents affect laboratory assays (haemolysis, jaundice, lipaemia). Heterophilic antibodies.	Practical experience of investigating assay interference.	
Automated instrumentation	Random access, immunoassay analysers robotics and modular systems.	Understand the technology and design of biochemistry analysers and appreciate their limitations and benefits.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Spectrometric methods	Spectrometry: visible, UV, *reflectance, bichromatic, derivative, linear diode array, infra red*. Turbidimetry, *nephelometry, densitometry, fluorimetry,* *Nuclear magnetic resonance*. Mass spectrometry *Flame emission spectrometry*. Atomic absorption*: flame, furnace*.	Experience of the application of some of these methods.	
Osmometry	Principle of technique.	Experience of use of technique.	
Electrometric methods	Ion selective electrodes Na^+, K^+, Cl^-, H^+, pO_2, pCO_2, Ca^{2+}, NH_4^+, Mg^{2+}, Li^+		
Enzymology	Fixed interval, kinetic assays, isoenzymes, enzymes as reagents.		
Radioisotope counting	*γ- and β-counting*.		
Immunochemical techniques	Immuno-assay, -metric assays, *-electrophoresis, -fixation, -diffusion*. Labels enzyme, fluorimetric, and chemiluminescent.		
Electrophoresis	*Cellulose acetate, Agarose, PAGE (SDS, gradient), isoelectric focusing.*		
Chromatography	Thin layer chromotgraphy (TLC), column, ion exchange, affinity, gas chromotography (GC), high pressure liquid chromotgraphy (HPLC). Sample preparation: desalting, liquid extraction, derivitisation.		

Subject	Knowledge	Skills and knowledge application	Attitudes
Point of care testing	Glucose, bilirubinometers, blood gas, ion–specific electrodes, urinanalysis, cardiac markers.	Undertake and advise on QA schemes, interdisciplinary liaison.	
Solid/dry phase chemistry	Dipstick, thin film.		
DNA/RNA/chromosomal	Analyses, PCR, Southern blotting.	*Interpret mutation analysis across a variety of disorders, micro satellite analysis, sequencing reactions.* Comprehend their application to diagnoses and family studies.	

1.3. Evaluation of an analytical method

Objective: competence to establish and validate a new method.

Knowledge	Skills and knowledge application	Attitudes
Practicability **Optimisation of reaction conditions** **Recognition of critical parameters (robustness)** **Bias** **Imprecision** **Sensitivity** **Specificity** **Investigation of common interferences** **Range** **Criteria for acceptability**	Establish and validate a new method. Write the standard operating procedure of the method and place a copy in your portfolio.	Involvement in the introduction of new methods.

2. LABORATORY MANAGEMENT COMPETENCIES

Objectives: to develop skills to take independent responsibility for the direction and management of the service.

Subject	Knowledge	Skills and knowledge application	Attitudes
General	Request initiation, specimen transport and what contributes to error. Organisation of the analytical and reporting process. Principles of successful management. The structure and organisation of the NHS, where decision making occurs, process of change and ways of influencing decisions. Practical experience of business planning, finance, financial control, costing, pricing, contracting, purchasing, resource management. Practical aspects of personnel management, industrial relations, team building, staff training, motivation, continuing education, appraisal, dealing with problems, colleagues. Apply the concepts of accreditation, e.g. CPA, good laboratory practice. Conversant with legal requirements and Department of Health guidance. Multidisciplinary working patterns.	Formal training in reception. Appreciates the place of laboratory automation and IT. Management course training. Personnel management including industrial relations. Shadowing senior departmental staff involved in business planning, writing business case, contracting, finance and resource management. Participation where appropriate in appointment of junior staff. Participation in departmental staff appraisal programme, using appraisal to developing your own skills. Attendance at departmental management meetings. Understanding mentoring and supervision relative to personal and professional development, prioritising work, time management, delegation, planning, staff motivation.	Establishes rapport, respect and understanding with laboratory staff. Show respect for others' opinions. Recognise good advice. Recognise own limitations. Enthusiasm, integrity, imagination, determination, professional credibility. Aware of equity in health care access and delivery.

Subject	Knowledge	Skills and knowledge application	Attitudes
General (continued)		Appreciation that compliance with CPA standards ensures that training facilities are adequate. Undertaking accreditation review of a section of the laboratory.	
Quality assurance	Control the quality of a method Internal quality control programmes. Quality control rules. Use of external quality assurance programmes. Laboratory accreditation.	Interpretation of quality control/quality assurance data and advise on subsequent course of action. Acting/assisting laboratory quality control officer and attending laboratory quality control meetings. Application to point of care testing.	
Health and safety	Health and safety and COSHH. Individual and collective responsibility. Handling potentially infectious samples and noxious chemicals. Radiation protection measures. Mechanical, fire and electrical safety. Dealing with an accident. Current safety guidelines.	Attending laboratory safety committee meetings.	Observe safe working practices.

Subject	Knowledge	Skills and knowledge application	Attitudes
Selection of analytical equipment	Specification and evaluation of an analytical system. Financial issues relating to analyser installation (capital purchase, reagent rental, competitive tendering).	Participation in the local process.	
IT	The role of IT in delivery and management of service Stages in producing results and problems with turnaround time. Instrument interfaces. Links to other computers. Reporting/authorisation procedures. Patient identification and methods of ensuring accuracy. Management statistics. E-mail and intra/internet. Data protection act. Retention of records. Review of pathology services. Freedom of Information act.	IT affecting all aspects of chemical pathology.	Proactive attitude to new technology.

Subject	Knowledge	Skills and knowledge application	Attitudes
Communication skills	Acquiring skills to operate with organisations, scientific and medical communities and the public. Principles of effective negotiation, influencing colleagues.	Resolving technical, scientific, clinical and management problems through leadership skills and promoting morale. Explaining laboratory procedures to patients, their relatives and visitors. Working within a team, communicating with clinical, managerial and other health care staff. Preparing, presenting, explaining scientific reviews/data/findings, both orally and in writing. Understanding yourself, conflict resolution.	Understanding the need to involve patients, staff, and colleagues. Act with empathy, honesty and sensitivity.

3. CLINICAL GOVERNANCE AND AUDIT COMPETENCIES

Objectives: knowledge of the lines of accountability, quality improvement programmes, clinical audit, evidence-based practice, clinical standards and guidelines, managing risk and quality assurance programmes.

Knowledge	Skills and knowledge application	Attitudes
Clinical governance **Clinical risk management** **Departmental organisation** **Investigative protocols** **Service quality**	Recognising roles, responsibility and accountability. Participation in risk assessment. Monitoring/reporting adverse events. Workload compared with national standards, clarity of lines of responsibility and accountability in pathology, communications within and outside the department. Availability and adherence to agreed protocols for investigations of common conditions. Turnaround time, complaint analysis with lessons learnt and action taken, availability of out-of-hours service.	Patient care is the prime concern. Share best practice with others. Learn from mistakes and complaints. Maintenance of probity in clinical and laboratory practice.
Clinical audit Clinical effectiveness and audit: • concept of systematic reviews and evidence-based medicine • role of audit in the hospital • audit cycle • participation in regular clinical audit, within and between departments, at the interface with primary care and at regional level.	Philosophy of clinical effectiveness: role of clinical audit in achieving this, methods of clinical audit in healthcare. Plan, undertake, report, and present audits at multidisciplinary audit meetings and the follow up. Use audit to gather evidence provided by formal review of practices and clinical performance that quality requirements and the needs of governance are being met.	Recognise the benefit of audit to clinical care and the multidisciplinary nature of clinical audit. Understanding that clinical audit: • provides the evidence • indicates change needed • highlights the resources required. Attendance at audit meetings in the department, other disciplines where appropriate, and possibly regional and national audit meetings. Taking responsibility for an audit.

4. COMPETENCIES IN THE CHEMICAL PATHOLOGY OF DISEASE

Objective: to relate understanding of normal human biochemistry and physiology to the chemical pathology of screening, diagnosis and monitoring of disease. | NB. Items in *italics* would probably not be encountered universally.

Subject	Knowledge	Skills and knowledge application	Attitudes
Generic aspects	Applicable to the syllabus listed below. Physiology, biochemistry, pathogenesis, pathophysiology natural history, epidemiology, presentation, diagnosis, causes, classification, complications, molecular biology, diagnostic methods required in the curriculum should be acquired throughout training. Biochemical, haematological and radiological techniques required for the investigations, diagnosis and screening. Knowledge of the pharmacology of the therapeutic agents required in management. Molecular biology to identify genetic disorders.	Advising on the appropriate use and interpretation of the results of the laboratory investigations in screening for disease, to establish (differential) diagnosis, to monitor progress and treatment. Liaise and communicate clearly with colleagues and other clinical teams in primary and secondary care both verbally and via clinic letters.	Acting as an effective interface between laboratory and clinical staff, as part of team. Interact effectively with members of multidisciplinary teams in hospital, GP and community. Recognises the importance of good communication and supportive care for successful patient outcomes. Relate theoretical knowledge and laboratory results to patient management and clinical practice.
Biological variability	Reference values and population statistics: • common reference intervals • inter- and intra-individual variation • assessment and application of biological variance data in setting analytical goals • assessing utility of reference values.	The effect of genetic and environmental influences such as age, sex, nutrition, time of day, stress, posture, hospitalisation and therapeutic agents on biochemical results.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Biological variability (continued)	• effects of age upon reference ranges • significance of changes in serial results.		
Gastrointestinal tract	Physiology and biochemistry of digestion. The gut as an endocrine organ. Gastrointestinal hormones. Pathology: • peptic ulcer disease • *Zollinger Ellison syndrome* • pyloric obstruction • intrinsic factor, pernicious anaemia • anaemias and haematinics (iron, iron binding capacity, ferritin, B12 and folate deficiencies) • pancreatitis (acute and chronic) • malabsorption • coeliac disease • inflammatory bowel disease • disaccharidase deficiency • intestinal obstruction • short gut syndrome • intestinal failure • gastrointestinal malignancy • *carcinoid syndrome* • *peptide secreting tumours of the entero-pancreatic system* • drain fluids • investigation of malabsorption • carbohydrate probe molecules • breath tests • *investigation of chronic pancreatic dysfunction by tubeless tests* • serological markers of coeliac disease. Faecal analysis: • occult blood		

Subject	Knowledge	Skills and knowledge application	Attitudes
Gastrointestinal tract (continued)	• elastase.		
Liver	Functions of the liver. Formation of bilirubin. Enterohepatic circulation and bile salts. Jaundice: adult, children, newborn: • familial hyperbilirubinaemias • haemolytic jaundice • intra-hepatic jaundice • obstructive jaundice. Diseases of the liver: • viral hepatitis • cirrhosis • haemochromatosis • Wilson's disease • alcohol/drug hepatotoxicity • non-alcoholic fatty liver disease • cholestasis • biliary obstruction • gall stones and their composition • *hepatoma*. Hepatic failure and encephalopathy. *Liver transplantation*. Assessment of hepatic function: • liver function tests • prothrombin time • ammonia • alpha-fetoprotein.		

Subject	Knowledge	Skills and knowledge application	Attitudes
Urogenital tract	Renal physiology: • glomerular filtration • tubular function • salt and water homeostasis • hydrogen ion homeostasis • renin, erythropoeitin, vitamin D. Renal disease: • uraemia: pre, post • acute, chronic, acute-on-chronic • calculi • glycosuria • tubular defects and Fanconi syndrome • metabolic disease and the kidney. Normal and abnormal urine composition. *Abnormal pigments* *Urinary deposits* Renal stones. Proteinuria: • nephrotic syndrome • *differential protein clearances* • *tubular proteins*. Laboratory assessment of renal function: • glomerular filtration rate including *in vivo* techniques • Modification of Diet in Renal Disease (MDRD) formula • markers of renal function • *renal plasma flow* • tubular function tests • protein/creatinine ratios • drug interference in urine analysis.		

Subject	Knowledge	Skills and knowledge application	Attitudes
Urogenital tract (continued)	Renal replacement therapy: • haemodialysis • peritoneal dialysis • assessment of dialysis adequacy • renal transplantation • markers of transplant rejection. Prostatic diseases. *Semen analysis.*		
Gas transport and H^+ metabolism	Physiology of normal respiration, O_2, CO_2, transport, buffers. Respiratory and renal mechanisms in acid-base homeostasis. Respiratory disease. Causes and assessment of acid-base disturbances: measurement of H^+ pCO_2, pO_2, satn. Concept actual bicarbonate, standard bicarbonate, base excess. Determinants and assessment of tissue oxygenation.	Advise on the investigation of acid-base disorders and management.	
Water and electrolytes	Distribution of water and electrolytes. Turnover of body fluids. Regulation of extracellular fluid, osmolality and volume: • antidiuretic hormone • renin-angiotensin-aldosterone • natriuretic peptides. Water depletion and excess. Hypo- and hypernatraemia. Hypo- and hyperkalaemia. Metabolic effects of trauma/surgery/stress. Principles of intravenous fluid therapy.	Advise on management of fluid balance and on investigation of electrolyte disturbances.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Proteins	Principles of measurement. Properties and functions of the principal plasma proteins including: • albumin • protease inhibitors • transport proteins • ceruloplasmin • clotting factors • *complement* • immunoglobulins. Hypoalbuminaemia and investigation. Paraproteinaemias and investigation. *Cryoglobulinaemia.* Proteins of inflammation. *Plasmapheresis.* Immunoglobulin deficiencies. Alpha-1-antitrypsin deficiency. *Cytokines.*	Advise on the laboratory investigation of normality and disease.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Lipids	Apolipoproteins and lipid metabolism. Metabolic basis inherited and acquired hyper- and hypo-lipoproteinaemias. Biochemical basis for atheroma, coronary heart disease and associated risk factors. Patient classification: familial hypercholesterolaemia, familial combined dyslipidaemia, type III dyslipidaemia, polygenic hyperchol-esterolaemia, atherogenic lipoprotein phenotypes, secondary causes. Primary and secondary cardiovascular disease prevention. Laboratory investigation and principles of management of hyperlipidaemia.	Advise on the investigation and management of hyperlipidaemia, identification of patients with secondary causes, screening family members in case of familial dyslipidaemia.	
Cardiovascular system	Atheroma, coronary heart disease, stroke and associated risk factors. Current methods of calculating risk and their shortcomings. Use of biochemical markers for risk stratification in acute coronary syndromes. Biochemical markers of myocardial damage/ventricular function. Hypertension (biochemical investigation and management).	Advise appropriately on estimation of cardiovascular risk.	
Diabetes mellitus and glucose	Glucose metabolism. Classification of diabetes. Diagnostic criteria: diabetes, impaired glucose tolerance (IGT), IFG impaired fasting glucose (IFG). Pathophysiology of diabetes: • insulin-dependant, type 1 diabetes • insulin-resistance, type 2 diabetes • secondary.	Advise on the laboratory diagnosis, investigation and management. Distinguish between the various causes of diabetes.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Diabetes mellitus and glucose (continued)	Complications of diabetes: 1. Acute metabolic • diabetic ketoacidosis • hyperosmolar non ketotic • hypoglycaemia. 2. Chronic: a. Microvascular: • nephropathy, microalbuminuria • neuropathy and retinopathy. b. Macrovascular: • lipid abnormalities • coronary heart disease • peripheral vascular disease. Principles of treatment of diabetes and monitoring of diabetic control: • use of insulin and other pharmacological agents • dietary modification • home monitoring with meters • continuous overnight glucose monitoring. Extra laboratory glucose monitoring. Glycated haemoglobin, insulin, C-peptide, microalbumin assays. Causes and laboratory investigation of hypoglycaemia in adults and children.		

Subject	Knowledge	Skills and knowledge application	Attitudes
Endocrinology: adult and paediatric	• acromegaly and dwarfism • prolactinoma/macroprolactin • diabetes insipidus • dynamic function testing • isolated hormone deficiency and panhypopituitarism. Adrenal cortex: • steroid production • Cushing's syndrome • insufficiency: assessment of reserve • Conn's syndrome • congenital adrenal; hyperplasia, diagnosis, management, intersex. Adrenal medulla: • catecholamine metabolism • phaeochromocytoma • neuroblastoma • measurement and interpretation of catecholamines and metabolites. Thyroid: • congenital hypothyroidism and screening programmes • hypo- and hyper-thyroidism • autoimmune disease, autoantibodies • adenoma/carcinoma • radioactive iodine *in vivo* studies • investigation and monitoring therapy • problems of interpretation: binding proteins, drug effects, sick euthyroid syndrome. Medullary carcinoma of the thyroid	Interpretation and reporting on results of investigations and monitoring therapy. Appreciation of the role of imaging, scans. Experience of insulin, TRH, GnRH, glucagon, pituitary function, growth hormone secretion and water deprivation tests Experience of tests of adrenal function Advising on appropriate monitoring of replacement therapy. Ability to advise on the appropriate choice of tests to investigate and monitor thyroid disease, according to clinical circumstances. Ability to advise appropriately on the investigation of female andro-genisation. Able to interpret and report on the results of investigations and monitoring therapy.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Endocrinology: adult and paediatric (continued)	Gonads: • pituitary-gonadal axis • sexual differentiation • precocious and delayed puberty • ovarian cycle • metabolism of testosterone • ovarian failure and menopause • polycystic ovarian syndrome • investigation of female; infertility, hirsutism, virilisation • hormone-replacement therapy • oral contraceptives - metabolic effects • investigation of male infertility, gynaecomastia, feminisation, testicular tumours, testicular failure • monitoring of fertility treatment. Endocrine effects: cancer, ectopic hormones. Multiple endocrine neoplasia.		

Subject	Knowledge	Skills and knowledge application	Attitudes
Calcium, magnesium, bone	Calcium, magnesium, phosphate, parathyroid hormone (PTH) and vitamin D metabolism. Hyper- and hypo-parathyroidism. Hyper and hypocalcaemia: • calcium sensor abnormalities. Hypo- and hyper-phosphataemia. Hypo- and hyper-phosphatasaemia. Disorders of magnesium. Osteoporosis inc. steroid therapy and chronic malabsorption. Osteomalacia: • renal osteodystrophy. Paget's disease. Chemical pathology of collagen. Assays: calcium (total, adjusted, ionised), PTH, vitamin D, biochemical markers of bone disease.	Advise on the laboratory investigation of normality and disease to establish diagnosis and monitor treatment.	
Nutrition	Protein-energy malnutrition. Markers of nutritional status. Effects and investigation of vitamin deficiency or excess. Trace element deficiency or excess. Principles and practical nutritional support – parenteral and enteral. Re-feeding syndrome. Biochemistry of starvation. Obesity: investigation, classification, risk factors, complications. Nutritional management of disease.	Advising on the biochemical assessment of nutritional deficiencies, treatment, appropriate clinical and laboratory monitoring of patients receiving nutritional support.	Effective participation with other professionals in a team approach to management of nutritional problems.

Subject	Knowledge	Skills and knowledge application	Attitudes
Nutrition (continued)	Malnutrition: protein-energy, disease related in: 1. Acute disease: stroke, myocardial infarction, acute renal failure, nephrotic syndrome, acute liver failure. 2. Chronic disease: inflammatory bowel disease, coeliac disease, short bowel syndrome, cancer, gall bladder disease, malabsorption. 3. Pre- and post-op nutritional assessment, management for oesophagectomy, malignancy, major abdominal surgery. 4. Burns, multiple injury, systemic sepsis.		
Haemoglobin and porphyrins	Haemoglobin metabolism. Anaemia and its investigation. Assessment iron status. Detection abnormal haemoglobins: inherited and acquired. Metabolic basis of thalassaemia and sickle cell disease, screening. Red cell enzyme defects. Porphyria: metabolic basis, investigation, diagnosis, monitoring.	Advise on the laboratory investigation of normality and disease.	
Enzymology	Stability, induction. Isoenzymes – structural basis, separation, quantitation. Assays: • amylase and lipase • alkaline phosphatase • aminotransferases • angiotensin converting enzyme • creatine kinase • lactate dehydrogenase • gamma-glutamyl transferase • cholinesterase and variants.	Advise on the laboratory investigation of normality and disease.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Genetics and molecular biology	Mode of inheritance: • structure of nucleic acids • meiosis and mitosis • simple Mendelian and complex diseases • mitochondrial inheritance • mode of inheritance for genetic counselling, antenatal diagnosis and screening. Protein synthesis: • transcription and translation • defects in protein synthesis arising from genetic mutations. Molecular pathology of single gene disorders *Gene therapy*.	The application of Mendelian genetics and Bayes Theorem, and the calculation of pre-and post-test probabilities in genetic counselling.	
Pregnancy	Maternal and foetal physiology, complications, detection. Screening: Down's syndrome, foetal malformations, neural tube defects, hydatidiform mole, choriocarcinoma, ectopic pregnancy. Pre-natal investigation: inborn errors. Monitoring phenylketonuria, diabetes, thyroid disease, liver disease.	Effects of pregnancy on routine biochemical tests. Biochemical, statistical and ethical issues surrounding antenatal screening.	Interact effectively with medical and midwifery staff.
Newborn	Biochemical problems in the newborn: • fluid balance • jaundice • liver disease • hypoglycaemia • calcium and phosphate homeostasis; metabolic bone disease of prematurity • hypomagnesaemia • hyperammonaemia • sweat tests • nutrition.	Factors affecting method selection and biochemical results in newborns. Appropriate specimen collection.	

Subject	Knowledge	Skills and knowledge application	Attitudes
Childhood	Hypoglycaemia. Calcium and phosphate disturbances. Hyperammonaemia. Reye's syndrome. Lactic acidosis. Renal disorders including Fanconi syndrome and tubular defects.		
Inherited metabolic disorders	Principles of common disorders: • Quantitative and qualitative enzyme abnormalities. • Biochemical consequences of a primary enzyme block in a metabolic pathway and the way in which clinical and pathological signs may be produced. • Detection: - screening: principles, methods - evaluation of detection programmes - *prenatal diagnosis*. • Methods and monitoring of treatment. • Amino acid, carbohydrate, cerebral lipidosis, fatty acid oxidation, lysosomal, metal, mitochondrial, mucopolysaccharide, organic acid, peroxisomal, purine and pyrimidine (primary and secondary), transport, urea cycle disorders. • Pre-natal investigation of the foetus. • Investigations: encephalopathy, hyperammonaemia. • Analysis: amino acids, organic acids, carnitine and acylcarnitines, enzyme assay, mucopolysaccharides, tissue culture, DNA.	Trainees are not expected to have in-depth knowledge of all inherited metabolic defects but should be aware of the major categories; presentation, investigation, mechanisms of inheritance, scope of prenatal and new-born diagnosis, principles of treatment (co-enzyme supplementation, enzyme inhibition, dietary manipulation). The effects of inborn errors on the results of routine biochemical tests. Advise on appropriate specimens for investigation of possible inherited metabolic disease: hyperammonaemia, hypoglycaemia.	Ability to collaborate with other professionals (paediatricians, nurses, dieticians) in investigation and management of patients. Ability to interact well with patients and relatives.

Subject	Knowledge	Skills and knowledge application	Attitudes
Inherited metabolic disorders (continued)		The effects of metabolic stress upon patients with inborn errors such as PKU, fatty acid oxidation defects, glycogen storage and urea cycle defects.	
Neuromuscular system	Formation and composition of cerebro spinal fluid (CSF). Multiple sclerosis, muscular dystrophy. Parkinson's disease. *Biochemistry of psychiatric disease.* Biochemistry of muscle disease.	Use of CSF in diagnosis and monitoring disease.	
Cancer	Nature of malignancy and tumour growth. Biochemical effects and treatment: • tumour markers: prostate, lung, breast, ovary, gastro-intestinal (GIT), pancreas, thyroid, pituitary, adrenal, neuroblastoma, hepatoblastoma, teratoma.	Use of biochemical markers in diagnosis and monitoring tumours.	
Metabolic response to:	Surgery, trauma, burns, shock.	Advise on biochemical investigations, monitoring and management, especially patients in ITU/HTU.	
Therapeutic drug monitoring and toxicology	Pharmacokinetics, half-life, dosage prediction. Metabolic effects of ethanol. Monitoring of drug therapy, e.g: digoxin, lithium, antiepileptics, theophylline, caffeine, methotrexate, immunosuppressive, antibiotics. Overdose, e.g: salicylate, barbiturate, paracetamol, tri-cyclic antidepressants, benzodiazepines. Drug addiction: opiates, amphetamine, methylenedioxy-methamphetamine (MDMA), benzodiazepines, cocaine, alcohol.	Appreciation of factors affecting drug action or metabolism. Effects of post-mortem changes on the results of laboratory investigations.	May require secondment to a specialist unit.

Subject	Knowledge	Skills and knowledge application	Attitudes
Therapeutic drug monitoring and toxicology (continued)	Poisoning, e.g. lead, mercury, aluminium, carbon monoxide, paraquat, iron, ethylene glycol, methanol, organophosphate compounds. Laboratory investigation of the unconscious and deceased patient.	Awareness of legal procedure surrounding investigation of death.	

5. COMPETENCIES IN THE INTERPRETATION OF LABORATORY DATA

Objectives: ability to advise on the interpretation of laboratory results in diagnosis, treatment and monitoring of patients.

To attain a level of knowledge of clinical practice, giving the ability to conduct a dialogue with clinical colleagues, confidently and competently, in relation to:

- appropriate selection of tests
- interpretation of their results
- initiation of further investigation based on these results
- contribution to the construction, organisation and interpretation of clinical research projects.

Subject	Knowledge	Skills and knowledge application	Attitudes
Interpretation of laboratory data	Basic biochemistry, physiology and chemical pathology of the disease processes under investigation in the laboratory. Nature of biochemical investigations undertaken and provided to other specialties.	Contribute competently at ward rounds and case presentations. Competent to take part in duty biochemist and reporting rota. Competent in the knowledge of other diagnostic disciplines and their relevance to chemical pathology. Appropriate comments when reporting laboratory results. Critical appreciation of the role of biochemical tests. Liaison with clinical colleagues. Follow-up of abnormal investigations.	Act as part of a multidisciplinary team.

6. COMPETENCIES IN RESEARCH AND DEVELOPMENT

Objectives: experience in research and development to develop skills in independent and team-driven problem solving, critical assessment of published work and for gaining analytical expertise.

All trainees to undertake at least one research project during their first three years of training. The project should be consistent with the research and development programme of the laboratory or hospital and should be sufficiently novel and timely to be suitable for presentation at a scientific meeting and publication in a peer-reviewed journal. Research for a higher degree, or for a dissertation for the Part 2 examination may be initiated during this period.

Knowledge	Skills and knowledge application	Attitudes
Scientific and research ability	Formulate research questions and develop appropriate experimental design. Undertake analytically and clinically based research and/or development projects. Design, cost, undertake and evaluate experiments. Troubleshoot methods, make appropriate modifications and test for validity. Statistics appropriate to clinical and laboratory practice. Writing reports. Maintain an enquiring attitude. Obtain consent for the use of patient samples in research.	Maintain a questioning and critical approach to all aspects. Maintenance of probity in research.

Knowledge	Skills and knowledge application	Attitudes
Principles of critical review	Critical review and appraisal of literature. To assess the validity of data, experimental design and problem solving techniques. Implementing evidence-based chemical pathology. Using library and IT facilities.	Use evidence-based medicine in support of patient care.
Research presentation skills **Produce work of publishable quality**	Present a poster and publish a paper in a peer-reviewed journal.	
Data handling and statistical methods Statistical interpretation of: • laboratory and population data • standard deviation and error • median and mean • linear regression and correlation methods • methods of assessing agreement • F-test • analysis of variance • independent events • concept of significance and related statistics • t- test • confidence intervals • non-parametric statistics • predictive value: positive and negative • specificity and sensitivity • receiver operating characteristic curves • odds ratios • relative risk • chi-square tests • curve fitting routines • power calculations.	Computer use within the laboratory: spreadsheets, databases. Correct analysis of results using appropriate statistical tools.	Seek statistical advice before embarking on a project.

Knowledge	Skills and knowledge application	Attitudes
Research and development in the NHS: • framework and funding of NHS R&D • ethical committees • hospital R&D structures • health technology assessment • project grant schemes • research councils • charitable research funding sources.	Understanding of the processes for application for grants to support research projects. Have written at least one local research and ethics committee (LREC) submission for a project approval.	Awareness of the opportunities for research.

7. COMPETENCIES IN DIRECT PATIENT CARE

7.1 Generic aspects of clinical management

Objective: competent in the generic and communication skills required for assessment and treatment of patients, referred for a specialist biochemical opinion within an outpatient setting. Trainees should be competent in at least two of the clinical modalities, and would be expected to have had at least the same clinical experience in these areas as those trainees in chemical pathology/metabolic medicine.

Knowledge	Skills and knowledge application	Attitudes
Physiology, biochemistry, pathogenesis, pathophysiology natural history, epidemiology, presentation, diagnosis, causes, classification, complications, molecular biology, diagnostic methods as set out in part in the theoretical curriculum above, which should be acquired throughout training **Biochemical, haematological and radiological techniques required for the investigations, diagnosis and screening** **Pharmacology of the therapeutic agents required in management**	Elicit a comprehensive history including social, family and dietary aspects. Recognise presenting features and conduct the examination competently. Use appropriate investigations to establish diagnosis. Formulate management and treatment plans. Document clearly in the patient notes. Explain the diagnosis, treatment and side effects to the patient and relatives. Breaking bad news including poor prognosis.	Aware of the impact of the disorder/diagnosis/ chronic disease on the patient and family. Acts with empathy in communicating and managing the disorder and its complications. Explains planned treatment to the patient. Works as part of multidisciplinary team. Recognises the importance of good communication and supportive care for successful patient outcomes.

Knowledge	Skills and knowledge application	Attitudes
(continued) **Molecular biology to identify genetic disorders**	Liaise and communicate with colleagues, teams in primary and secondary care, both verbally and in writing. Role of antenatal diagnosis/family screening/ molecular biology techniques in prenatal and family testing.	Relate theoretical knowledge and laboratory results to patient management and clinical practice.
Principles of clinical governance, clinical risk and clinical audit including the audit cycle	Involvement in ongoing audit. Undertake at least one audit project.	Recognises the benefit of audit to clinical care.
Educating patients about their disease, investigations, lifestyle, treatment	Inform clearly both verbal and in writing. Advising patients about access to patient groups and information.	Involving patients in developing their treatment and care.

7.2 Calcium and metabolic bone disorders

Objective: competent to diagnose and manage patients with disorders of calcium and bone metabolism.

Knowledge	Skills and knowledge application	Attitudes
Calcium, magnesium, phosphate, PTH and vitamin D metabolism **Hyper- and hypo-parathyroidism** **Causes and investigation of hyper- and hypocalcaemia: calcium sensor abnormalities** **Hypo- and hyper-phosphataemia** **Hypo- and hyper-phosphatasaemia** **Disorders of magnesium** **Osteogenesis imperfecta** **Osteomalacia**	Able to interpret bone densitometry and radioisotope scans requested. Able to treat and monitor bone and mineral disorders.	

Knowledge	Skills and knowledge application	Attitudes
Renal osteodystrophy **Paget's disease of bone** **Osteoporosis inc. steroid therapy and chronic malabsorption** **Application, interpretation and theory of bone densitometry** **Investigation of bone turnover including biochemical bone markers** **Acute management hypercalcaemia**	Able to interpret bone densitometry and radioisotope scans requested. Able to treat and monitor bone and mineral disorders.	

7.3 Diabetes mellitus

Objective: competent to manage patients with diabetes mellitus.

Knowledge	Skills and knowledge application	Attitudes
Curriculum for diabetes, lipids, cardiovascular, see above **Diagnostic criteria for diabetes, IGT and IFG** **Principles of management of diabetic ketoacidosis, hyperosmolar non-ketotic state, hypoglycaemia** **Screening for macro- and micro-vascular complications by means of clinical examination and investigations** **Avoid and treatment of complications: eye disease, renal disease, hypertension, neuropathy, foot care.**	Distinguish between the various causes of diabetes. Able to initiate treatment with appropriate hypoglycaemic agent, lipid lowering and anti-hypertensive drugs. Able to give appropriate lifestyle advice: employment, driving, diet, exercise, weight, smoking, alcohol. Review patients after commencement of treatment and adjust treatment as necessary to optimise glucose control and lipid profile. Interpret results of screening: microalbuminuria, retinal photographs.	Working with: diabetes nurse specialists, dieticians, podiatrists, psychologists, ophthalmologists.

Knowledge	Skills and knowledge application	Attitudes
(continued) **Pathophysiology of diabetic foot complications** **Practice of home monitoring inc. continuous overnight glucose monitoring**	Able to refer. Advice on the avoidance of complications. Able to advise, interpret and discuss the use of these with patients.	
Organisation of local diabetes service **Familiar with educational materials**	Organisation of an education programme to health professionals and patients.	

7.4 Inherited metabolic disorders

Objective: competent to manage patients with inherited metabolic disorders.

Knowledge	Skills and knowledge application	Attitudes
Curriculum for inherited metabolic disorders (see above) **Investigation, diagnosis, treatment and management of adult patients with inborn disorders of:** • intermediary metabolism: phenylalanine, ornithine, urea cycle, branched chain amino acids, homocystine, galactose, glycogen, MMA • membrane transport: cystinuria, Fanconi syndrome, RTA, cystic fibrosis • fatty acid oxidation • lysosomal metabolism • metals: Wilson disease, haemochromatosis • mitochondrial metabolism • peroxisomal metabolism • purine and pyrimidine.	Use of specialised laboratory investigations and their interpretation. Use of specialised dietary interventions or treatments. Use of specific treatments and drugs. Able to counsel affected families and offer advice on prophylaxis and treatment. *Able to obtain skin biopsies.*	

Knowledge	Skills and knowledge application	Attitudes
(continued) • previously presenting with: encephalopathy and hyper-ammonaemia • porphyrias		
Prenatal assessment: Down's syndrome, neural tube defects, cystic fibrosis		

7.5 Lipidology and cardiovascular risk assessment

Objective: competent to manage patients with lipids and cardiovascular risk assessment.

Knowledge	Skills and knowledge application	Attitudes
Apolipoproteins, lipid metabolism, inherited and acquired hyper- and hypo-lipoproteinaemias and their metabolic basis **Physiological basis for atheroma, coronary heart disease and associated risk factors and diseases including chronic kidney disease (CKD) and metabolic syndrome** **Classification of patients: familial hypercholesterolaemia, familial combined dyslipidaemia, type III dyslipidaemia, polygenic hypercholesterolaemia, atherogenic lipoprotein phenotypes, secondary causes** **Primary and secondary cardiovascular disease prevention** **Current methods of calculating risk and their shortcomings** **Treatment and pharmacology to include lipid lowering, appropriate oral hypoglycaemic agents, anti-obesity and anti-hypertensive drugs.**	Identify clinical features of genetic dyslipidaemias (xanthalasma, xanthoma- tendon, eruptive and planar, corneal arcus, lipaemia retinalis) and evidence of macro- and micro-vascular disease. Identify factors contributing to athero-sclerosis; including diabetes, obesity, renal disease, hypertension. Identify patients with secondary causes. Classify patients. Give advice on the best dietary and therapeutic approach to the management of the particular form of dyslipidaemia affecting the patient. Aware of the need to screen and offer support to other members of the patient's family in the case of severe familial dyslipidaemias. To lower blood pressure through dietary advice and drugs.	

Knowledge	Skills and knowledge application	Attitudes
(continued) **Appropriate follow-up tests and follow-up times required** **Investigation of hypertension**		

7.6 Nutrition

Objectives: competent to manage patients with nutritional disorders.

Knowledge	Skills and knowledge application	Attitudes
Principles and practical nutritional support: parenteral and enteral **Assessment and management of nutritional requirements** **Types of nutritional support, complications and their detection** **Markers of nutritional status** **Effects and investigation of vitamin and trace element excess and deficiency** **Management of patients with excess fluid/electrolyte losses**	Assessment of nutritional status. Decide and prescribe nutrition support. Clinical and laboratory monitoring of patients receiving nutrition support. Avoid, detect, manage complications. Prescribe nutrition support and care of patients with standard and long-term total parenteral nutrition (TPN). Appropriate use and care of: central and peripheral feeding lines, naso gastric (NG), naso jejunal (NJ), percutaenous endoscopic gastrostomy (PEG), percutaneous endoscopic jejunostomy (PEJ) feeding tubes. Use of anti-emetics, GIT prokinetics.	Working as part of a multidisciplinary team.
Obesity: investigation, classification, treatment, risk factors **Dietary and lifestyle changes** **Therapeutic agents** **Management of complications: diabetes, hypertension, hyperlipidaemia**	Calculate BMI. Measure skin fold thickness, body impedance. Measure total body fat. Appropriate referral for: dietetic advice, surgical treatment	Understand analytical and practical limitations of the techniques.

Knowledge	Skills and knowledge application	Attitudes
Malnutrition, disease-related in: • acute disease: stroke, myocardial infarction, acute renal failure, nephrotic syndrome, acute liver failure • chronic disease: inflammatory bowel disease, coeliac disease, short bowel syndrome, cancer, gall bladder disease, malabsorption • Pre- and post-op nutritional assessment and management for oesophagectomy, malignancy, major abdominal surgery • post trauma for burns, multiple injury, systemic sepsis.	Nutritional management of disease. Assess nutritional deficiencies.	

7.7 Renal stone disease

Objective: competent in the metabolic management of patients with renal stones.

Knowledge	Skills and knowledge application	Attitudes
Renal stones: causes, investigations, diagnosis, treatment, pharmacology Appropriate follow up tests and times	Competent to manage patients with renal stones. Use of biochemical tests to investigate patients. Identify patients with secondary causes. Classify patients.	

7.8 Thyroid disease

Objective: competent to manage patients with thyroid disease.

Knowledge	Skills and knowledge application	Attitudes
Theoretical curriculum for thyroid **Diagnostic criteria for hypo-, hyper-thyroidism, thyroiditis, malignancy** **Principles of management** **Treatment and pharmacology** **Biochemical thyroid function tests** **Appropriate follow up tests and intervals for testing**	Identify clinical features of thyroid disease. Distinguish between the various causes of thyroid disease. Initiate treatment with appropriate drug and monitor response. Sufficient first-hand experience to take clinical responsibility for such procedures. Interpretation and reporting of thyroid function tests.	Good patient and nurse communication.

GOOD MEDICAL PRACTICE

The following table indicates where the *Good Medical Practice* headings can be found in the curriculum. These sections are also cross-referenced with PMETB's *Criteria for Entry to the Specialist Register*.

Good Medical Practice	Page number
Good clinical care	19
Maintaining good medical practice	22
Teaching and training, appraising and assessing	27
Relationships with patients	29
Working with colleagues	33
Health	35
Probity	36

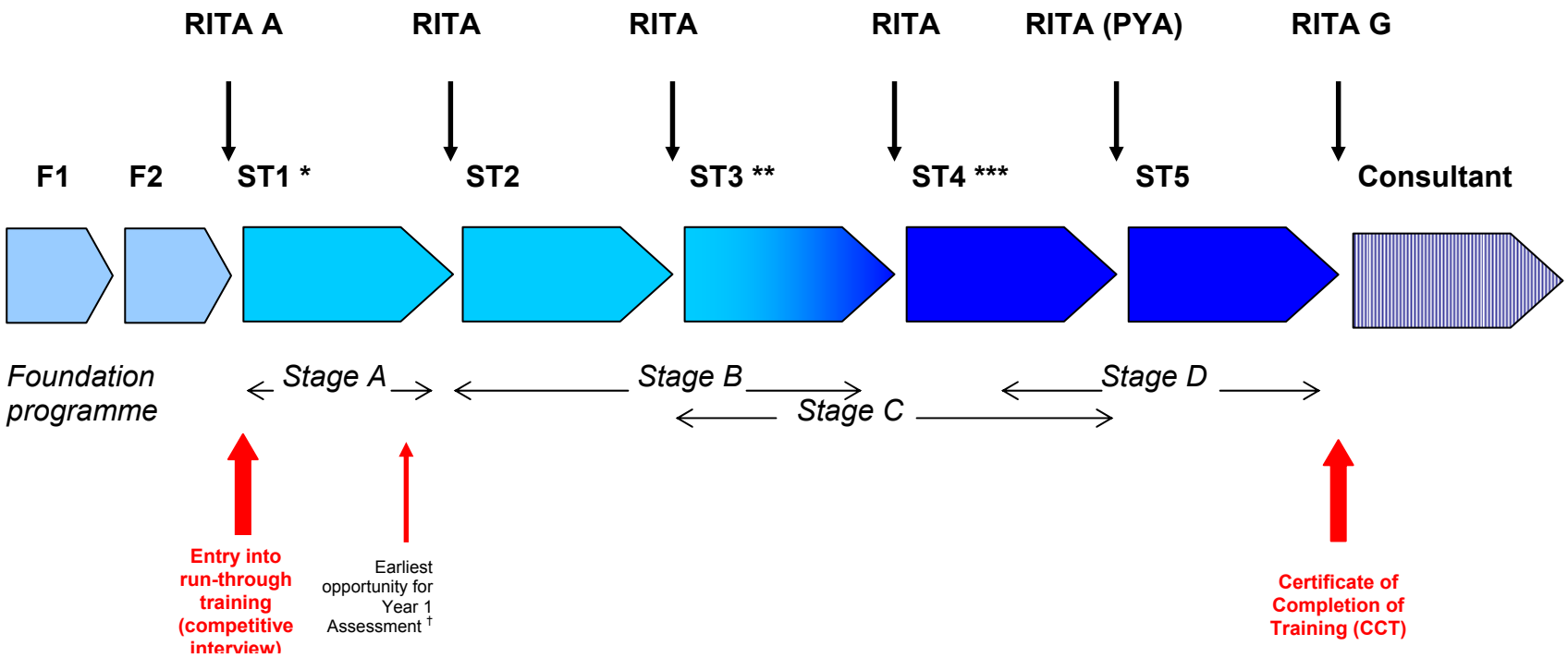
Amendment log from 2006: JLB 18/04/2006, JLB 05/09/2006

APPENDIX 2 ACRONYMS

ACB	Association of Clinical Biochemists
BMA	British Medical Association
BMS	Biomedical scientist
CATT	College Advisory Training Team
CbD	Case-based discussion
CCT	Certificate of Completion of Training
CESR	Confirming eligibility for specialist registration
CKD	Chronic kidney disease
CMT	Core medical training
CPA	Clinical Pathology Accreditation
CPD	Continuing professional development
CSF	Cerebro spinal fluid
DOPS	Directly observed practical skills
ECE	Evaluation of clinical events
EQA	External quality assurance
GC	Gas chromotography
GIT	Gastro-intestinal
GMC	General Medical Council
GP	General practitioner
HCC	Healthcare Commission
HPLC	High pressure liquid chromatography
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
IT	Information technology
JCPT	Joint Committee on Pathology Training
JRCPTB	Joint Royal Colleges of Physicians Training Board
LAC	Lay Advisory Committee
LREC	Local research and ethics committee
MDMA	Methylenedioxy-methamphetamine

MDRD	Modification of diet in renal disease
Mini-CEX	Mini-clinical evaluation exercise
MRCP	Membership of the Royal College of Physicians
MRCP(I)	Membership of the Royal College of Physicians, Ireland
MRCPath	Membership of the Royal College of Pathologists
MSF	Multi-source feedback
NEQAS	National External Quality Assurance Service
NG	Naso gastric
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NJ	Naso jejunal
NPSA	National Patient Safety Agency
NTN	National Training Number
NTN(A)	National Training Number (Academic)
OOPE	Out-of-Programme Experience
PCR	Polymerase chain reaction
PEG	Percutaneous endoscopic gastrostomy
PEJ	Percutaneous endoscopic jejunostomy
PMETB	Postgraduate Medical Education and Training Board
PTH	Parathyroid hormone
R&D	Research and development
RITA	Record of In-Training Assessment
SAC	Specialist Advisory Committee
ST	Specialty training
STC	Specialty Training Committee
TAC	Trainees Advisory Committee
TLC	Thin layer chromotgraphy
TPN	Total parenteral nutrition
UV	Ultra-violet

APPENDIX 3a ILLUSTRATIVE EXAMPLE OF CHEMICAL PATHOLOGY TRAINING



* Trainees must have passed the Year 1 RCPath Assessment by the end of Stage A/ST1.
Failure to pass the Year 1 Assessment will prevent the trainee from progressing to Stage B.

** Trainees must have passed the Part 1 MRCPath examination by the end of Stage B/ST3.
Failure to pass the Part 1 examination by the end of Year 3 will prevent the trainee from progressing to Stage C.

*** Trainees must have passed the Part 2 MRCPath examination by the end of Stage C/ST4.
Failure to pass the Part 2 examination by the end of Year 4 will prevent the trainee from progressing to Stage D.

APPENDIX 3b ILLUSTRATIVE TIMETABLE OF CHEMICAL PATHOLOGY TRAINING

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
ST1	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
	Begin Stage A. NTN awarded							RCPath Year 1 Assessment		RCPath Year 1 Assessment		Earliest opportunity to end Stage A
ST2	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18	Month 19	Month 20	Month 21	Month 22	Month 23	Month 24
	Earliest opportunity to begin Stage B		Part 1 MRCPath opportunity	Part 1 MRCPath results					Part 1 MRCPath opportunity	Part 1 MRCPath results		Earliest opportunity to exit Stage B
ST3	Month 25	Month 26	Month 27	Month 28	Month 29	Month 30	Month 31	Month 32	Month 33	Month 34	Month 35	Month 36
	Earliest opportunity to begin Stage C		Part 1 MRCPath opportunity	Part 1MRCPath results					Part 1 MRCPath opportunity	Part 1 MRCPath results		Last opportunity to exit Stage B
ST4	Month 37	Month 38	Month 39	Month 40	Month 41	Month 42	Month 43	Month 44	Month 45	Month 46	Month 47	Month 48
			Part 2 MRCPath opportunity	Part 2 MRCPath results	PYA if passed Part 2	Earliest opportunity to exit Stage C	Earliest opportunity to begin Stage D		Part 2 MRCPath opportunity	Part 2 MRCPath results	PYA if passed Part 2	Last opportunity to exit Stage C
ST5	Month 49	Month 50	Month 51	Month 52	Month 53	Month 54	Month 55	Month 56	Month 57	Month 58	Month 59	Month 60
												Exit Stage D. CCT awarded

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Training and Educational Standards Department

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