The Royal College of Pathologists

Pathology: the science behind the cure

Curriculum for specialty training in chemical pathology

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Comments	In accordance with the College's publications policy, the original version of this document was placed on the Fellows and Members' area of the College website for consultation from 25 November to 9 December 2009. A total of 14 responses were submitted. The authors considered the feedback and amended the document accordingly. Please email **publications@rcpath.org** if you wish to see the authors' responses to the feedback. This version has had very minor amendments made as a result of suggestions from the CATT, changes to the College's Royal Charter and changes to the College's house style. **Dr Peter Cowling** **Director of Communications**

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CONTENTS

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INTRODUCTION

Chemical pathology (also known as clinical biochemistry) in the UK encompasses both practical laboratory and clinical skills. The award of the Certificate of Completion of Training (CCT) or the Certificate of Eligibility for Specialist Registration (CESR) through the Combined Programme (CP) route 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 of Eligibility for Specialist Registration (CESR) will be evaluated against the Good Medical Practice and core aspects of the curriculum. Good Medical Practice refers to the 2006 guidance document from the General Medical Council (Good Medical Council. *Good Medical Practice*. London, UK: GMC 2006: pp 1–48).

The curriculum and assessment system meets the Postgraduate Medical Education and Training Board's (PMETB) Standards for Curricula and Assessment Systems (July 2008). In addition, the curriculum complies with the training framework described at www.mmc.nhs.uk/specialty_training_2010/gold_guide.aspx (*A Reference Guide for Postgraduate Specialty Training in the UK, The Gold Guide 2009, Third Edition* June 2009, Section 7).

For trainees with an NTN or NTN(A) in an approved UK training programme, the curriculum is integrated with and supported by the following documents in order to produce a coordinated training package for the award of the CCT. The relevant package includes:

- a blueprint for the chemical pathology assessment system (This demonstrates how the College assessments and examinations test the structure of the curriculum)
- regulations and guidelines for workplace-based assessment
- multi-source feedback
- Year 1 Chemical Pathology Assessment
- regulations and guidelines for Fellowship exams
- access to e-learning mapped to the Chemical Pathology curriculum
- Learning Environment for Pathology Trainees (LEPT) which provides an electronic means of recording progress in training
- Annual Review of Competence Progression (ARCP) guidance

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.

Doctors applying for a CESR in chemical pathology must be able to demonstrate equivalence to the requirements for the award of a chemical pathology CCT. Such doctors are strongly advised to read PMETB's *Guidance on applying for a CESR under Article 14*. In addition, the following guidance is available from the College and should also be carefully followed in the preparation of a CESR application:

- general guidance on evidence to submit with applications for a CESR (Article 14) in Chemical Pathology (specialty-specific guidance)
- guidance for CESR applicants in specialties and subspecialties overseen by The Royal College of Pathologists
- CESR curriculum vitae guidance.

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 or CESR(CP) 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 and the minimum training period
- satisfactory outcomes in the requisite number of workplace-based assessments (including multi-source feedback)
- attainment of the College's Year 1 Chemical Pathology Assessment
- FRCPath by examination
- acquisition of Annual Review of Competence Progression (ARCP) outcome 6.

Further detailed information about the annual progression points including assessment requirements that will enable progression at each ARCP, as well as the completion of the CCT or CESR(CP) is available on the College website.

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 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. It is a requirement that trainees who satisfactorily complete subspecialty training in metabolic medicine also satisfactorily complete and obtain the competences of the chemical pathology curriculum.

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

The CCT or CESR(CP) 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 Year 1 Chemical Pathology Assessment
- FRCPath by examination
- acquisition of ARCP Form 6.

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,* 2009.

Training regulations

This section of the curriculum outlines the training regulations for chemical pathology. In line with PMETB, this reflects the regulation that only training that has been prospectively approved by PMETB can lead towards the award of the CCT. Training that has not been prospectively approved by PMETB can still be considered but the trainee's route of entry to the Specialist Register changes to CESR through the CP route.

Less than full-time training

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

Less than full-time trainees must accept two important principles:

- 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*.

PMETB guidance on approval of flexible training states that from 1 December 2007, "deaneries, in conjunction with Royal Colleges/Faculties, will take responsibility for ensuring that all less than full-time training of any kind is undertaken in prospectively approved posts and programmes and that it meets the statutory requirements of the General and Specialist Medical Practice (Education, Training and Qualifications) Order 2003". Prior to beginning their less than full-time training, trainees must inform the Training and Educational Standards Department at The Royal College of Pathologists in order that the Chemical Pathology College Advisory Training Team (CATT) can ensure that their less than full-time training programme will comply with the requirements of the CCT programme. The documentation towards a less than full-time training application will be collected and checked to ensure compliance 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 after entering chemical pathology training as out-of-programme research (OOPR).

Research undertaken prior to entry to a chemical pathology training programme

Trainees who have undertaken a period of research that includes *clinical work directly relevant to the chemical pathology curriculum* prior to entering a chemical pathology training programme can have this period recognised towards an entry on the Specialist Register. However, as the research is unlikely to have been prospectively approved by PMETB, their route of entry to the Specialist Register will be through the CESR.

Research undertaken during entry to a chemical pathology training programme

Trainees who undertake a period of out-of-programme research (OOPR) 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. **In order to be eligible to have this period of research recognised towards the award of the CCT, trainees must have their OOPR approved prospectively by PMETB before beginning their research.** Prior to beginning the period of research, trainees must agree the OOPR with their deanery and 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 work directly relevant to the Chemical Pathology curriculum. The documentation towards a CCT recommendation will be collected by the Training and Educational Standards Department at the College, checked to ensure compliance and a revised provisional CCT date issued. It must be ensured that, following deanery agreement and acceptance from the Chemical Pathology CATT, PMETB prospectively approve the OOPR in order that the period can count towards a CCT. Separate guidance and an application form are available on the College website for this purpose.

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

Trainees who undertake a period of research during their training should, in addition, contact the College's Examinations Department for advice with regard to the written option for the FRCPath examination.

Academic trainees

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

Overseas training undertaken prior to entry to a chemical pathology training programme

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. Trainees can have this period recognised towards an entry on the Specialist Register but their route of entry to the Specialist Register will be through the CESR.

Overseas training undertaken during entry to a chemical pathology training programme

Some trainees may wish to spend a period of training overseas as out of programme training (OOPT) 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 OOPT overseas training approved prospectively by PMETB before beginning their overseas training.** Prior to beginning the period of overseas training, trainees must agree the OOPT with their deanery and 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, checked to ensure compliance and a revised provisional CCT date issued. It must be ensured that, following deanery agreement and acceptance from the Chemical Pathology CATT, PMETB prospectively approve the OOPT in order that the period can count towards a CCT. Separate guidance and an application form are available on the College website for this purpose.

Trainees must have their OOPT agreed by the relevant Deanery, accepted by the Chemical Pathology CATT and approved by PMETB before beginning their training.

Clinical training

Some trainees may have undertaken clinical training in a UK training programme approved by PMETB prior to entering specialty 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 specialty 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 CESR.

RATIONALE

Purpose of the curriculum

The purpose of the curriculum for specialty 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 or CESR(CP) 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). In addition, the curriculum also sets the standards against which CESR applicants will be judged.

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*, May 2007.

The award of a CCT or CESR (CP) 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 originally developed in 2005 (with subsequent review and amendments made in 2007 and 2008) by the Chemical Pathology CATT with input from the Specialty Advisory Committee (SAC) on Chemical Pathology and the Examination Panel of The Royal College of Pathologists, who have also had the same input into this version. In addition, the College's Lay Advisory Committee has been consulted and a draft version of the curriculum was published on The Royal College of Pathologists website for consultation with College Fellows and Registered Trainees on 25 November 2009 for a two- 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 6 October 2009 and the Joint Committee on Pathology Training (JCPT) on 16 October 2009 and approved by the Council of The Royal College of Pathologists on 14 January 2010.

The curriculum was conditionally approved by PMETB on 25 March 2010, fully approved by the General Medical Council (GMC) on 9 June 2010 and formally published in June 2010.

Stages of training and learning

There are four stages in the chemical pathology curriculum. Development of chemical pathology competences are outlined in Appendix 3. 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 4a and 4b (see pages 107–108).

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 55) 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' Year 1 Chemical Pathology 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)

- achieved satisfactory outcomes in the requisite number of workplace-based assessments
- undertaken a multi-source feedback assessment
- passed the Royal College of Pathologists' Chemical Pathology Year 1 Assessment
- obtained a satisfactory outcome in the ARCP.

Trainees who are appointed to chemical pathology (metabolic medicine) programmes must have fully completed the MRCP(UK) before they can progress beyond their ST3 year.

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 FRCPath 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
- achieved satisfactory outcomes in the requisite number of workplace-based assessments
- passed the FRCPath Part 1 examination in clinical biochemistry
- obtained one or more satisfactory outcomes in the ARCP 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 FRCPath 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
- achieved satisfactory outcomes in the requisite number of workplace-based assessments
- passed the FRCPath Part 2 examination in clinical biochemistry
- obtained one or more satisfactory outcomes in the ARCP to indicate satisfactory progress in training.

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 ARCP undertaken towards 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
- achieved satisfactory outcomes in the requisite number of workplace-based assessments
- satisfactorily completed all core and generic areas of the chemical pathology curriculum
- obtained an ARCP outcome 6 to indicate that all clinical (and research where relevant) competences have been achieved, leading to the award of the CCT.

In addition to the above, trainees will also be required to undertake a universal pathology focussed MSF assessment in ST3 and ST5. Depending on the trainees' individual progress the ST3 MSF will normally take place in either Stages B or C. The ST5 MSF will normally take place in Stage D.

Teaching and learning methods

Trainees will achieve the competencies described in the curriculum through a variety of learning methods. There will be a balance of different modes of learning from formal teaching programmes to experiential learning 'on the job'. The proportion of time allocated to different learning methods may vary depending on the nature of the attachment within a rotation and the trainee's individual learning style.
Trainees will learn clinical skills appropriate to their level of training through attachments within the department.
This section identifies the types of situations in which a trainee will learn.

Learning with peers - There are many opportunities for trainees to learn with their peers. Local postgraduate teaching opportunities allow trainees of varied levels of experience to come together for small group sessions. Examination preparation encourages the formation of self-help groups and learning sets.

Work-based experiential learning - The content of work-based experiential learning is decided by the local faculty for education but includes active participation in:

Medical clinics including specialty clinics. After initial induction, trainees will review patients in outpatient clinics, under direct supervision. The

degree of responsibility taken by the trainee will increase as competency increases. As experience and clinical competence increase trainees will assess ‘new’ and ‘review’ patients and present their findings to their clinical supervisor. There should be formal opportunities for the supervisor to review decisions made in the outpatient clinic and opportunity for the trainee to see patients along with the supervisor.

Personal ward rounds and provision of ongoing clinical care on specialist medical ward attachments. Every patient seen, on the ward or in out-patients, provides a learning opportunity, which will be enhanced by following the patient through the course of their illness: the experience of the evolution of patients’ problems over time is a critical part both of the diagnostic process as well as management. Patients seen should provide the basis for critical reading and reflection of clinical problems.

Consultant-led ward rounds. Every time a trainee observes a consultant or fellow trainee seeing a patient or their relatives there is an opportunity for learning. Ward rounds should be led by a consultant and include feedback on clinical and decision-making skills.

Multidisciplinary team meetings. There are many situations where clinical problems are discussed with clinicians in other disciplines. These provide excellent opportunities for observation of, and participation in, clinical reasoning.

Practical laboratory experience. This will be gained by working in the laboratory, to gain familiarity with procedures and techniques, working with various groups of staff within the laboratory, e.g., clinical scientist and biomedical scientists and attending laboratory educational, clinical and management meetings. Emphasis will be placed on liaison with clinicians dealing with the patients from which the samples have been taken whether seen on the wards, in out-patients or in GP surgeries.

Formal postgraduate teaching. The content of these sessions is determined by the local faculty of medical education and will be based on the curriculum. There are many opportunities throughout the year for formal teaching in the local postgraduate teaching sessions and at regional, national and international meetings. Many of these are organised by the Royal Colleges of Physicians, Royal College of Pathologists,
and the Association for Clinical Biochemistry.

Suggested activities include:

- a programme of formal bleep-free regular teaching sessions to cohorts of trainees (e.g. a weekly core training hour of teaching within a Trust)
- case presentations
- journal clubs
- research and audit projects presentations
- lectures and small group teaching
- grand rounds
- clinical skills demonstrations and teaching
- critical appraisal and evidence based-medicine courses and journal clubs
- joint specialty meetings.

Attendance at training programmes organised on a deanery, regional or national basis, which are designed to cover aspects of the training programme outlined in this curriculum.

Independent self-directed learning. Trainees will use this time in a variety of ways depending upon their stage of learning.
Suggested activities include:

- reading, including web-based material
- maintenance of personal portfolio (self-assessment, reflective learning, personal development plan)
- audit and research projects
- reading journals
- achieving personal learning goals beyond the essential, core curriculum
- communication and consultation skills through supervision, observed consultations and formal training
- learning through teaching of medical students, other health care professionals and patient support groups.

Formal study courses. It is encouraged that time be made available to attend formal courses, subject to local conditions of service.
Examples include:

- ACB training courses and training days
- MSc courses in clinical biochemistry
- nutrition courses
- foundation course in diabetes
- advanced diabetes course.

Out-of-hours training

Out-of-hours independent working is a competency required post CCT for chemical pathology. The undergraduate curriculum does not address clinical biochemistry adequately so that the FY1 and FY2s who are working out of hours have limited experience in appropriate requesting and interpretation of results and are in constant need of support from specialists who are properly trained and tested.

Demonstration of the skills required for independent and out of hours practice is a requirement of the curriculum, and the relevant competencies must be assessed and achieved prior to completion of the training programme.

Currently, the most appropriate context in which to train for and achieve the competencies for independent practice is out of hours working, in an "on-call" setting. However, there may be practical alternatives to this training context. If a training programme does not offer the opportunity to develop and demonstrate these skills through out-of-hours working, there must be alternative arrangements agreed by the Training Programme Director in consultation with the local Deanery Specialty Training Committee or Postgraduate School of Pathology Board.

Assessment of these competencies should be undertaken through case-based discussion (CBD) or evaluation of clinical events (ECE) and multi-source feedback (MSF) by the Senior BMS staff on the calibre and ability of trainees.

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 with input from The Royal College of Pathologists.

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.

If there is a breakdown of relationship between a trainee and their educational supervisor, the trainee should, in the first instance seek advice from their training programme director. If the matter is not resolved to the trainee's satisfaction, then he/she should seek further advice from the head of pathology school. As a last resort, trainees can seek advice from the College through the appropriate College specialty advisors.

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). This includes both professional and specialty practice. The professional practice aspect of the curriculum aims to ensure that doctors in the NHS trained to a Royal College of Pathologists' developed curriculum in chemical pathology are developed to be practitioners, partners and leaders. It also aims to ensure an understanding of issues of inequality around health and healthcare. Doctors must take the opportunity to positively influence health determinants and inequalities. 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, the Medical leadership curriculum, common competencies curriculum and the Health Inequalities curriculum (see page 25).

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 or CESR(CP). It is expected that every trainee should undertake the core training outlined in pages 55–101 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 20. The intended outcomes of learning are benchmarked to identifiable stages of training and these are listed on pages 10–12.

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*.

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.

Purpose of assessment

The Royal College of Pathologists' mission is to promote excellence in the practice of pathology and to be responsible for maintaining standards through training, assessments, examinations and professional development.

The purpose of The Royal College of Pathologists' assessment system in chemical pathology is to:

- indicate suitability of choice at an early stage of the chosen career path
- indicate the capability and potential of a trainee through tests of applied knowledge and skill relevant to the specialty
- demonstrate readiness to progress to the next stage(s) of training having met the required standard of the previous stage
- provide feedback to the trainee about progress and learning needs
- support trainees to progress at their own pace by measuring a trainee's capacity to achieve competencies for their chosen career path
- help to identify trainees who should change direction or leave the specialty
- drive learning demonstrated through the acquisition of knowledge and skill
- enable the trainee to collect all necessary evidence for the ARCP
- gain Fellowship of The Royal College of Pathologists
- provide evidence for the award of the CCT
- assure the public that the trainee is ready for unsupervised professional practice.

A blueprint of the chemical pathology assessment system is available on the PMETB website.

Methods of assessment

Trainees will be assessed in a number of different ways during their training. Satisfactory completion of all assessments and examinations will be monitored as part of the ARCP process and will be one of the criteria upon which eligibility to progress will be judged. A pass in the Year 1 Chemical Pathology Assessment and the FRCPath examination are required as part of the eligibility criteria for the award of the CCT or CESR (CP).

Year 1 Chemical Pathology Assessment

Trainees must pass the Year 1 Chemical Pathology Assessment as one of the requirements for satisfactory completion of Stage A of training.

Workplace-based assessment

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

For chemical pathology, these will comprise:

- Case-based discussion (CbD) (minimum of 6 satisfactory outcomes required per year)
- Directly observed practical skills (DOPs) (minimum of 6 satisfactory outcomes required per year in ST1 and ST2)
- Evaluation of clinical events (ECE) (minimum of 6 satisfactory outcomes required per year)
- Mini-clinical evaluation exercise (Mini-CEX) (minimum of 6 satisfactory outcomes required per year)
- Multi-source feedback (MSF) (minimum of 3 during training).

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

FRCPath examination

The major assessments will occur during Stage B of training in the shape of the FRCPath Part 1 examination and summatively towards the end of Stage C of training in the shape of the FRCPath Part 2 examination.

The results of workplace-based assessments and examinations are evaluated by the JCPT as part of their role in monitoring training. Examination results are evaluated after each session and an annual review of validity and reliability is undertaken and reported to the Examinations Committee.

Evidence of competence

Annual Review of Competence Progression

The ARCP is an annual opportunity for evidence gathered by a trainee, relating to the trainee's progress in the training programme, to document the competences that are being gained. Evidence of competence will be judged based on a portfolio of documentation, culminating in an Educational Supervisors Structured Report.

Separate ARCP guidance is available on the College website. A copy of all ARCP 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 an ARCP outcome 3 or 5 and necessitating repeat training to rectify deficiencies will lead to the extension of training. Training leading to the issue of an ARCP 3 or 5 and necessitating repeat training will not be recognised towards the award of the CCT.

Evidence of ARCP outcome 6 is required as part of the evidence for the award of the CCT or CESR(CP).

MODELS OF LEARNING

There are three broad categories of learning which trainees employ throughout run-through training – instructionalist model, constructionist model and the social learning model. 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 departments will encourage independent self-directed learning. It is the trainee's responsibility to seek opportunity for experiential learning. The rotations are also 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.

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
j. e-learning
k. learning with peers
l. work-based experiential learning
m. medical clinics including specialty clinics
n. personal ward rounds
o. consultant-led ward rounds
p. multidisciplinary team meetings

q. practical laboratory experience
r. formal postgraduate teaching
s. independent self-directed learning
t. formal study.

SUPERVISION AND FEEDBACK

Specialty 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 (at least 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 a demonstrated interest in teaching and training, appropriate access to teaching resources, be involved in and liaise with the appropriate regional training committees, be involved in annual reviews and liaise closely with the College Regional Specialty Advisor. 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 as to what is 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. Heads of Pathology School (HOPS) have a strategic overview of training in the Pathology specialties. They are responsible for ensuring that the delivery of education and training meets the College's and PMETB agreed curriculum and is provided to the standards set by the College and 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. The educational supervisor must undertake regular educational appraisal with his/her trainee, at the beginning, middle and end of section of training 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, or a chemical pathology (metabolic medicine) training programme or if they are appointed to a Locum Appointment for Training (LAT) or Fixed Term Specialty Training Appointment (FTSTA). It is the trainee's responsibility to familiarise him/herself with the curriculum and assessment requirements both for the satisfactory completion of each stage of training and the award of the CCT or CESR(CP). They must be familiar with all aspects of the assessment system; workplace based assessment including multi-source feedback, the Year 1 Chemical Pathology Assessment and the FRCPath examination. It is the trainee's responsibility to ensure that they apply in good time for any assessments and examinations that demand an application. Trainees must also make appropriate use of the LEPT system and e-learning.

CURRICULUM REVIEW AND UPDATING

The curriculum will be evaluated and monitored by The Royal College of Pathologists as part of continuous feedback from STCs, Programme Directors, Regional Specialty Advisors, trainers and trainees.

The curriculum will be reviewed in the first instance by the Chemical Pathology CATT within two years of publication. In reviewing the curriculum, opinions will be sought from the College's SAC on Chemical Pathology, the Trainees Advisory Committee, the Lay Advisory Committee and its Fellows and Registered Trainees.

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.

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 and Fellows are available in the College policy.

ACKNOWLEDGEMENTS

Dr Brian Shine (current Chair of the College Advisory Training Team [CATT]), Dr Alan Jones (immediate past CATT Chair), Dr Andrew Day, Dr Jeffrey Barron, Chemical Pathology CATT, Professor Shelley Heard (current Director of Training and Educational Standards), Dr Hani Zakhour (immediate past Director of Training and Educational Standards), Joanne Brinklow (Head of Educational Standards), Sandra Dewar (Acting Head of Educational Standards/Assessment Manager)

PROFESSIONAL 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 needed in day-to-day practice to comply with good medical practice and underpin chemical pathology practice. 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	Attitudes and behaviours
Patient medical (or clinical) history	Define the patterns of symptoms found in patients presenting with metabolic/biochemical disease.	Take and analyse a clinical history in a relevant succinct and logical manner. 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.
Examination	Describe the pathophysiological basis of physical signs. Define the clinical signs found in diseases.	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. Explain the clinical and cost effectiveness of individual investigation.	Interpret the results of investigations. Perform appropriate clinical investigations competently where relevant. Liaise and discuss investigations with colleagues and to advise them appropriately.	Explain 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.	Accurately assess the patient's needs.	Clearly and openly explain treatments and side effects of drugs.

Subject	Knowledge	Skills	Attitudes and behaviours
Note-keeping, letters, etc.	Write summaries, letters, medico-legal reports. Define the structure, function and legal implications of medical records and medico-legal reports. Explain 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. 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	Recognise 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	Explain 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.

Health determinants and inequalities

Subject	Knowledge	Skills	Attitudes and behaviours
Nationality and culture	Recognise that good health includes both mental and physical health Recognise the relationship between health inequalities and wealth inequalities Discuss social and cultural issues and practices such as: • the impact of cultural beliefs and practices on health outcomes • health determinants that affect patients and communities • the effects of social and cultural issues on access to healthcare, including health issues of migrants and refugees Explain the national and international situation regarding the distribution of disease, the factors that determine health and disease, and major population health responses Describe the impact of globalisation on health, major causes of global morbidity and mortality, and effective and affordable interventions to reduce these Discuss the impact on health of armed conflict, natural disasters and other social upheavals.	Communicate effectively with patients from diverse backgrounds and those with special communication needs, such as the need for interpreters etc Communicate effectively and respectfully with parents, carers, etc.	Recognise issues of health that are related to social class

Subject	Knowledge	Skills	Attitudes and behaviours
Inequality and discrimination/stigmatising	Implications of disability discrimination legislation for healthcare Recognise how health systems can discriminate against patients from diverse backgrounds, and how to work to minimise this discrimination. For example in respect of age, gender, race, culture, disability, spirituality, religion, and sexuality Recognise the stigmatising effects of some illnesses and work to help in overcoming stigma Recognise that people can be denied employment opportunities unnecessarily through myths, stigma, dogma and insufficient advocacy and support; be aware of the role of doctors and other services in combating this inequality Recognise the effects of exclusion and discrimination on physical and mental health Be aware of the role that individuals (including patients and carers as well as healthcare professionals) and services can play in combating inequality and discrimination and contribute appropriately to this work.	Respect diversity and recognise the benefits it may bring, as well as associated stigma Be aware of the possible influence of and sensitively include questions about socio-economic status, household poverty, employment status and social capital in taking a medical history Assess the patient's ability to access various services in the health and social system and offer appropriate assistance Help to empower patients and negotiate complex systems to improve health and welfare including, where appropriate, the right to work Where values and perceptions of health and health promotion conflict, facilitate balanced and mutually respectful decision-making Identify and communicate effectively with influential decision-makers/ facilitators of change.	Respect diversity of status and values in patients and colleagues Adopt assessments and interventions that are inclusive, respectful of diversity and patient-centred.

Subject	Knowledge	Skills	Attitudes and behaviours
Personal beliefs and biases	Recognise that personal beliefs and biases exist and their impact (positive and negative) on the delivery of health services Be aware of similarities and distinctions between the beliefs and values of the doctor, the patient and the policy-makers.	Recognise in routine practice the doctor's role as advocate and manager Advocate and facilitate appropriate self-care Recognise and address the social, biological and environmental determinants of health (the bio-psycho-social model or the bio-socio-psycho-existentialist model), and collaborate with other professionals	Be confident and positive in one's own professional values Accept uncertainty Be aware of one's own behaviour and how it might impact on patients' health issues
Values, ethics and law	Ensure that all decisions and actions are in the best interests of the patient and the public good Be familiar with and uphold the rights of children and vulnerable adults Be familiar with and uphold the rights of disabled people to participate in healthy and rewarding employment Practise in accordance with an appropriate knowledge of contemporary legislation Act with appropriate professional and ethical conduct in challenging situations.	Seek out and utilise opportunities for health promotion and disease prevention Based on risk, apply epidemiological principles and public health approaches so as to reduce and prevent disease and improve the health of populations Recognise important issues in preventative healthcare, for example in sexual health, substance abuse etc, and take opportunities to raise these issues in health promotion. For example, explain to parents who smoke the health risk that this poses to their children, including those exposed to the effects of smoking in *utero*.	Respond to people in an ethical, honest, and non-judgmental manner Use appropriate methods of ethical reasoning to come to a balanced decision where complex and conflicting issues are involved

Subject	Knowledge	Skills	Attitudes and behaviours
Policy, research and change	Be aware of current UK screening programmes Be aware of issues that might affect health inequalities that are currently under debate regarding changes in the NHS, including the public policy process Be aware of and maintain an up to date knowledge of research evidence regarding the most important determinants of health Access and use local health data Access resources for community action and advocacy (e**.**g**.** resources, legislation, policy documents).	Access and make use of appropriate population, demographic, socio-economic and health data Conduct an assessment of community health needs, and where appropriate apply these in practice.	

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	Attitudes and behaviours
Overall clinical judgement	Demonstrate ability to integrate clinical and laboratory findings in clinical cases	Correctly interpret test results in the context of available clinical information.	Critically appraise the available clinical and laboratory data in coming to diagnostic/treatment decisions.
Recognise own limitations	Be aware of the extent of one's own limitations and when to ask for advice.		Be willing to consult and to admit mistakes.
Written records	Demonstrate knowledge of the appropriate content of clinical records. Recognise the problems faced by people for whom English is not a first language. Recognise the problems faced by people with educational and/or physical disabilities. Explain the relevance of data protection pertaining to patient confidentiality.	Produce accurate letters/reports and other written correspondence with clear conclusions.	Recognise 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	Recognise the 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	Attitudes and behaviours
Life-long learning	The importance of continuing professional development.	Recognise and use learning opportunities. Use the potential of study leave to keep up to date. 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)	Make appropriate use of email, internet, fax, telephone and other electronic communication technologies. Apply the principles of how to retrieve and utilise data recorded in clinical systems. Apply the principles of literature searching using medical databases. Discuss the possible uses for clinical data and information and 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. Undertake searches (including literature searches) and access websites and health related databases. Apply the principles of confidentiality in the context of IT.	Use new methods of IT during patient consultation Demonstrate appropriate techniques to share information on computer with the patient in a constructive manner. Adopt proactive and enquiring attitude to new technology.

Subject	Knowledge	Skills	Attitudes and behaviours
The organisational framework for clinical governance and its application in practice	Explain 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 Explain the benefits a patient might reasonably expect from clinical governance.	Be an active participant in clinical governance. 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. Show clinical effectiveness (best practice) at all times. Educate self, colleagues and other healthcare professionals. Handle and deal with complaints in a focused and constructive manner. Learn from complaints. 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.	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	Attitudes and behaviours
Risk management	Demonstrate appropriate knowledge of such matters as health and safety policy, policies on needle stick injuries, note keeping, communications and staffing numbers. Demonstrate appropriate knowledge of risk management issues pertinent to laboratory processing. Demonstrate appropriate knowledge of risk assessment, perception and relative risk. Be familiar with the complications and side effects of treatments and investigations.	Confidently and authoritatively discuss relevant risks with patients and to obtain informed consent. Balance risks and benefits with patients.	Respect and accept patients' views and choices. Be truthful and to admit error to patients, relatives and colleagues.
Evidence	Discuss: • the principles of evidence-based medicine • the types of clinical trial • the types of evidence.	Critically appraise evidence. Be competent in the use of databases, libraries and the internet. 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.
Clinical audit	Competently utilise the audit cycle, data sources and data confidentiality. Explain the principles of internal and external quality assurance.	Be involved in ongoing audit. Undertake clinical audit, normally by performing 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	Compare the advantages and disadvantages of guidelines.	Demonstrate the ability to utilise guidelines. Contribute to the evolution of guidelines.	Show regard for individual patient needs when using guidelines. Show willingness to use guidelines as appropriate.

Subject	Knowledge	Skills	Attitudes and behaviours
Structure of the NHS and the principles of management including change management	Describe the structure of the NHS, primary care groups and hospital Trusts. Describe the local Trust's management structure (including chief executives, medical directors, clinical directors and the pathology laboratory). Describe finance issues in general in the NHS, especially budgetary management and commissioning.	Develop skills in managing change and managing people. Develop interviewing techniques and those required for performance reviews. Build a business plan. 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.
Relevance of outside bodies	Discuss the role and relevance to professional life of: • the medical royal colleges • General Medical Council • Postgraduate Dean and deaneries • Postgraduate Medical Education and Training Board (PMETB) • defence unions • British Medical Association (BMA) • specialist societies. Demonstrate knowledge 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.

Subject	Knowledge	Skills	Attitudes and behaviours
Media awareness	Explain 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.
Planning	Demonstrate knowledge of: • the structure, financing, and operation of the NHS and its constituent organisations • ethical and equality aspects relating to management and leadership, e.g. approaches to use of resources/ rationing; approaches to involving the public and patients in decision-making • business management principles: priority setting and how to produce a business plan • the requirements of running of a department, unit or practice relevant to the specialty	Develop protocols and guidelines and implementation of these Analyse feedback and comments and, integrate them into plans for the service	Demonstrate: an awareness of equity in healthcare access and delivery
Managing resources	Demonstrate knowledge of: • efficient use of clinical resources in order to provide care • commissioning, funding and contracting arrangements relevant to the specialty • how financial pressures experienced by the specialty department and organisation are managed	Demonstrate the ability to: • use clinical audit with the purpose of highlighting resources required • manage time and resources effectively in terms of delivering services to patients	Demonstrate: • commitment to the proper use of public money. Showing a commitment to taking action when resources are not used efficiently or effectively • awareness that in addition to patient specific clinical records, clinical staff also have responsibilities for other records (e.g. research)

Subject	Knowledge	Skills	Attitudes and behaviours
Managing people	Demonstrate knowledge of: • relevant legislation (e.g. equality and diversity, health and safety, employment law) and local human resource policies • the duties, rights and responsibilities of an employer, and of a co-worker (e.g. looking after occupational safety of fellow staff) • individual performance review purpose, techniques and processes, including difference between appraisal, assessment and revalidation	Prepare rotas; delegate; organise and lead teams Contribute to the recruitment and selection of staff Contribute to staff development and training, including mentoring, supervision and appraisal.	Demonstrate: • a willingness to supervise the work of less experienced colleagues • commitment to good communication whilst also inspiring confidence and trust
Managing performance	Demonstrate knowledge of • organisational performance management techniques and processes • how complaints arise and how they are managed	Use and adhere to clinical guidelines and protocols, morbidity and mortality reporting systems, and complaints management systems. Take steps to improve services following evaluation / performance management	Respond constructively to the outcome of reviews, assessments or appraisals of performance Demonstrate an understanding the needs and priorities of nonclinical staff

Subject	Knowledge	Skills	Attitudes and behaviours
Identifying the contexts for change	Summarise: • the responsibilities of the various Executive Board members and Clinical Directors or leaders • the function and responsibilities of national bodies such as DH, HCC, NICE, NPSA, NCAS; Royal Colleges and Faculties, specialty specific bodies, representative bodies; regulatory bodies; educational and training organisations	Demonstrate the ability to: • discuss the local, national and UK health priorities and how they impact on the delivery of health care relevant to the specialty • identify trends, future options and strategy relevant to the specialty and delivering patient services	Comply with national guidelines that influence healthcare provision Be willing to articulate strategic ideas and use effective influencing skills
Applying knowledge and evidence	Demonstrate knowledge of: • patient outcome reporting systems within the specialty, and the organisation and how these relate to national programmes. • research methods and how to evaluate scientific publications including the use and limitations of different methodologies for collecting data	Demonstrate the ability to: • compare and benchmark healthcare services • use a broad range of scientific and policy publications relating to delivering healthcare services	Evaluate issues and potential solutions before acting

Subject	Knowledge	Skills	Attitudes and behaviours
Making decisions	Discuss: • how decisions are made by individuals, teams and the organisation • effective communication strategies within organisations	Prepare properly for meetings: reading agendas, understanding minutes , action points and background research on agenda items Work collegiately and collaboratively with a wide range of people outside the immediate clinical setting	Demonstrate: an appreciation of the importance of involving the public and communities in developing health services Be willing to participate in decision making processes beyond the immediate clinical care setting
Evaluating impact	Discuss: • impact mapping of service change • barriers to change • qualitative methods to gather the experience of patients and carers	Evaluate outcomes and re-assess the solutions through research, audit and quality assurance activities Explain the wider impact of implementing change in healthcare provision and the potential for opportunity costs	Show commitment to implementing proven improvements in clinical practice and services Obtain the evidence base before declaring effectiveness of changes Adopt attitudes and behaviours that assist dissemination of good practice

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:

- 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	Attitudes and behaviours
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. Apply the 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.

Subject	Knowledge	Skills	Attitudes and behaviours
Plan and analyse a research project	Apply the principles of performing a research study. Use appropriate statistical methods. Summarise the principles of research ethics and the structure and function of local research ethics committees. Describe the principles of research funding and how to obtain funding.	Undertake systematic critical review of scientific literature. Frame questions to be answered by a research project. Develop protocols and methods for research. Use databases. Accurately analyse data. Write a scientific paper. Demonstrate 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.
Appraisal and assessment	Describe the concepts of appraisal and assessment. Conduct an appraisal interview or assessment.	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	Attitudes and behaviours
Patient safety	Explain 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	Discuss 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.
Informed consent	Gain informed consent. Discuss the principles of consent issues as relating to clinical practice and research. Gain consent for a research project. Discuss the legal issues regarding capability to consent and making decisions in their best interest (e.g. Mental Capacity Act)	Give appropriate information in a manner patients understand and 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.

Subject	Knowledge	Skills	Attitudes and behaviours
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	Discuss 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. 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
Breaking bad news	Discuss 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.	Break bad news in steps appropriate to the understanding of the individual and support distress. Avoid jargon and use familiar language. Encourage questions. Maintain appropriate hope whilst avoiding inappropriate optimism.	Act with empathy, honesty and sensitivity.

Subject	Knowledge	Skills	Attitudes and behaviours
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	Discuss 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.
Educating patients about: • disease • investigations • therapy	Discuss 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	Discuss 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.

Subject	Knowledge	Skills	Attitudes and behaviours
Epidemiology and screening	Describe the methods of data collection and their limitations. Formally notify diseases where this is required Apply principles of primary and secondary prevention and screening.	Assess an individual patient's risk factors. Encourage participation in appropriate disease prevention or screening programmes.	Take account of the: • positive and negative aspects of prevention • importance of patient confidentiality. Respect patient choice.
Ensuring patient safety	Demonstrate knowledge of: • risk management issues pertinent to specialty, • potential sources of risk and risk management tools, techniques and protocols • how healthcare governance influences patient care, research and educational activities at a local, regional and national level	Demonstrate the ability to: • report clinical incidents • assess and analyse situations, services and facilities in order to minimise risk to patients and the public • monitor the quality of equipment and safety of environment relevant to the specialty	Actively seek advice / assistance whenever concerned about patient safety Be willing to take responsibility for clinical governance activities, risk management and audit in order to improve the quality of the service
Critically evaluating	Demonstrate knowledge of: • quality improvement methodologies including a range of methods of obtaining feedback from patients, the public, and staff • the principles and processes of evaluation, audit, research and development, clinical guidelines and standard setting in improving quality	Demonstrate ability to: • undertake an audit project • contribute to meetings which cover audit; critical incident reporting, patient outcomes.	Demonstrate: • listening to and reflecting on the views of patients and carers, dealing with complaints in a sensitive and co-operative manner • acting as an advocate for the service

Subject	Knowledge	Skills	Attitudes and behaviours
Encouraging innovation	Apply a variety of methodologies for developing creative solutions for improving services	Question existing practice in order to improve services Apply creative thinking approaches (or methodologies or techniques) in order to propose solutions to service issues	Be open minded to new ideas Adopt a proactive approach to new technologies and treatments Support colleagues to voice ideas
Facilitating transformation	Demonstrate knowledge of • the implications of change on systems and people • project management methodology	Provide medical expertise in situations beyond those involving direct patient care Make effective written and verbal presentations	Be positive about improvement and change Strive for continuing improvement in delivering patient care services

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
- develop an understanding of leadership possibly by drawing on values, strengths and abilities to deliver high standards of care.

Subject	Knowledge	Skills	Attitudes and behaviours
Working with clinical teams	Describe how a team works effectively. Explain the roles and responsibilities of team members, especially within the department and within multidisciplinary teams. Outline the roles of other clinical specialties and their limitations. Demonstrates knowledge of a wide range of leadership styles and approaches and the applicability to different situations and people	Communicate effectively and seek advice if unsure. Recognise when input from another specialty is required for individual patients. Work effectively with other health care professionals. Respect skills and contribution of colleagues. Recognise when to delegate. Show leadership and supervise safely. Enable individuals, groups and agencies to implement plans and decisions Identify and prioritise tasks and responsibilities including to delegate and supervise safely.	Show respect for others opinions. Be conscientious and work cooperatively. Respect colleagues, including non-medical professionals and recognise good advice. Recognise and work within own limitations. Show recognition of a team approach and willingness to consult and work as part of a team

Subject	Knowledge	Skills	Attitudes and behaviours
Communication with colleagues	Communicate appropriately with other members of the pathology department, other departments and other members of the multidisciplinary team Communicate appropriately in writing, through letters and reports. Justify when and how best to contact to phone a general practitioner (GP) or other healthcare professional.	Use appropriate language. Select an appropriate communication method.	Be prompt and respond courteously and fairly.
Interactions between: • hospital and GP • hospital and other agencies, e.g. social services • medical and surgical specialties	Describe the roles and responsibilities of team members. Explain how a team works effectively. Summarise the roles of other clinical specialties and their limitations.	Delegate, show leadership and supervise safely Communicate effectively. Handover safely. Seek advice if unsure. Recognise when input from another specialty is required for individual patients. Work effectively with GPs, other medical and surgical specialists and other healthcare professionals.	Show respect for others opinions. Be conscientious and work cooperatively. Respect colleagues, including non-medical professionals, and recognise good advice.
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.	

Subject	Knowledge	Skills	Attitudes and behaviours
Self awareness	Demonstrate knowledge of : • ways in which individual behaviours impact on others; personality types, group dynamics, learning styles, leadership styles • methods of obtaining feedback from others	Maintain and routinely practice critical self awareness, including able to discuss strengths and weaknesses with supervisor, recognising external influences and changing behaviour accordingly Show awareness of and sensitivity to the way in which cultural and religious beliefs affect approaches and decisions, and to respond respectfully	Adopt a patient-focused approach to decisions that acknowledges the right, values and strengths of patients and the public Recognise and show respect for diversity and differences in others
Self management	Appropriately apply tools and techniques for managing stress. Recognise the role and responsibility of occupational health and other support networks. Recognise the limitations of self professional competence	Recognise the manifestations of stress on self and others and where and when to look for support Balance personal and professional roles and responsibilities. Prioritise tasks, having realistic expectations of what can be completed by self and others	Be conscientious, able to manage time and delegate Recognise personal health as an important issue
Self development	Describe the local processes for dealing with and learning from clinical errors Acknowledge the importance of best practice, transparency and consistency	Use a reflective approach to practice with an ability to learn from previous experience Use assessment, appraisal, complaints and other feedback to discuss and develop an understanding of own development needs.	Be prepared to accept responsibility Show commitment to continuing professional development which involves seeking training and self development opportunities, learning from colleagues and accepting constructive criticism

Subject	Knowledge	Skills	Attitudes and behaviours
Acting with integrity	Describe the professional, legal and ethical codes of the GMC , e.g. Fitness to Practice and any other codes pertaining to the trainee's specialty Summarise the key issues of prejudice and preferences within self, others, society and cultures	Recognise, analyse and deal with unprofessional behaviours in clinical practice, taking into account local and national regulations Create open and non-discriminatory professional working relationships with colleagues awareness of the need to prevent bullying and harassment	Accept professional regulation Promote professional attitudes and values Act with probity and the willingness to be truthful and to admit errors
Developing networks	Describe the role of team dynamics in the way a group, team or department functions Describe team structures and the structure, roles and responsibilities of the multidisciplinary teams within the broader health context relevant to the specialty, including other agencies	Take on differing and complementary roles within the different communities of practice within which they work Support bringing together different professionals, disciplines, and other agencies, to provide high quality healthcare	Interact effectively with professionals in other disciplines and agencies Respect the skills and contributions of colleagues
Building and maintaining relationships	Use specific techniques and methods that facilitate effective and empathic communication	Develop effective working relationships with colleagues and other staff through good communication skills , building rapport and articulating own view Communicate effectively in the resolution of conflicts, providing feedback, and identifying and rectifying team dysfunction	Recognise good advice and continuously promote values based non prejudicial practice Use authority appropriately and assertively; willing to follow when necessary

Subject	Knowledge	Skills	Attitudes and behaviours
Identifying the contexts for change	Describe the responsibilities of the various Executive Board members and Clinical Directors or leaders Summarise the function and responsibilities of national bodies such as DH, HCC,NICE, NPSA, NCAS; Royal Colleges and Faculties, specialty specific bodies, representative bodies; regulatory bodies; educational and training organisations	Discuss the local, national and UK health priorities and how they impact on the delivery of health care relevant to the specialty Identify trends, future options and strategy relevant to the specialty and delivering patient services	Comply with national guidelines that influence healthcare provision Be willing to articulate strategic ideas and use effective influencing skills
Applying knowledge and evidence	Describe and correctly use patient outcome reporting systems within the specialty, and the organisation and how these relate to national programmes. Based on research methods, evaluate scientific publications including the use and limitations of different methodologies for collecting data	Compare and benchmark healthcare services Use a broad range of scientific and policy publications relating to delivering healthcare services	Evaluate issues and potential solutions before acting

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	Attitudes and behaviours
Personal health	Discus occupational health services. Discuss one's responsibilities to the public. Not treat oneself or one's family.	Recognise when personal health takes priority over work pressures and to take the necessary time off.	Recognise personal health as an important issue.
Stress	The effects of stress. 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 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	Attitudes and behaviours
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 clinical biochemistry disorders
- sufficient understanding of clinical biochemistry to offer basic advice on the interpretation of laboratory results.

1. LABORATORY COMPETENCIES

Introduction to chemical pathology

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

Knowledge	Skills	Attitudes and behaviours
Operation of automated analysers	Discuss the principles of the operation of automated analysers. Interpretation of results generated. Identification of invalid results.	
Specimen collection, handling, transport and sample storage **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.	

Knowledge	Skills	Attitudes and behaviours
Principles of health and safety	Familiar with the principles of health and safety, particularly as they apply to laboratory working	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	Discuss quality control and quality assurance. Explain External Quality Assurance (EQA) and National External Quality Assurance Service (NEQAS) Evaluate internal/external quality assurance data so as to identify the possible cause of aberrant data.	Applies principles to laboratory.
Presentation, diagnosis and management of common clinical biochemistry 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 clinical biochemistry 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 specialties.

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 clinical biochemistry laboratory.

Subject	Knowledge	Skills	Attitudes and behaviours
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 clinical biochemistry. 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	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.	Discuss 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.	

Subject	Knowledge	Skills	Attitudes and behaviours
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	Attitudes and behaviours
Define and discuss the practicability, optimisation of reaction conditions, critical parameters (robustness), bias, imprecision, sensitivity, specificity, investigation of common interferences, assay range, and criteria for acceptability	Contribute to establishing and validating a new method. Write the standard operating procedure for the method and place a copy in your portfolio.	Critically assess 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	Attitudes and behaviours
Clinical governance, investigative protocols, and service quality	Discuss roles, responsibility and accountability. Participate in risk assessment. Monitor/report adverse events. Demonstrate awareness of availability of and adherence to agreed protocols for investigations of common conditions. Define and discuss turnaround time, complaint analysis	Demonstrate that patient care is the prime concern. Share best practice with others. Learn from mistakes and complaints. Maintain probity in clinical and laboratory practice.
Clinical audit Define clinical effectiveness and audit and discuss: • concept of systematic reviews and evidence-based medicine; • role of audit in the hospital; • audit cycle.	Explain the philosophy of clinical effectiveness, the role of clinical audit in achieving this, and 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. Discuss how clinical audit provides evidence. Indicate change needed. Highlight the resources required. Participate in regular clinical audit, within and between departments, at the interface with primary care and at regional level.	Recognise the benefit of audit to clinical care and the multidisciplinary nature of clinical audit. Attend audit meetings in the department, other disciplines where appropriate, and possibly regional and national audit meetings. Take responsibility for an audit.

3. COMPETENCIES IN THE CHEMICAL PATHOLOGY OF DISEASE

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

Subject	Knowledge	Skills	Attitudes and behaviours
Generic aspects	Discuss and explain: • physiology, biochemistry, pathogenesis, pathophysiology natural history, epidemiology, presentation, diagnosis, causes, classification, complications, molecular biology, diagnostic methods required in the curriculum • 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.	Advise 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.	Act 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. Recognise 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	Discuss the theory of 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.	Discuss 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	Attitudes and behaviours
Interpretation of laboratory data	Discuss basic biochemistry, physiology and clinical biochemistry of the disease processes under investigation in the laboratory. Explain the nature of biochemical investigations, especially those provided to other specialties.	Contribute competently at ward rounds and case presentations. Take part in duty biochemist and reporting rota with supervision. Make appropriate interpretative comments when reporting laboratory results. Critically evaluate the role of biochemical tests. Liaise with clinical colleagues. Follow-up 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	Attitudes and behaviours
Principles of critical review	Critically review and appraise literature. Assess the validity of data, experimental design and problem solving techniques. Implement evidence-based clinical biochemistry. Use library and IT facilities.	Use evidence based medicine in support of patient care.
Data handling and statistical methods Discuss the statistical interpretation of: • laboratory and population data • standard deviation and standard error of the mean • 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.	Demonstrate use of computer within the laboratory: spreadsheets, databases. Correctly analyse 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	Attitudes and behaviours
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.
Educate patients about their disease, investigations, lifestyle, treatment	Inform patients clearly both verbally and in writing using appropriate lay language. Advise patients about access to patient groups and information.	Involve 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	Attitudes and behaviours
The principles, development and operation of automated analysers	Explain the principles behind automated analysers. Interpret results-generated identification of invalid results.	
Explain the requirements for specimen collection, handling, transport and sample storage **Discuss the use of specific preservatives and possible interference in assays**	Demonstrate familiarity with the functions of pathology reception, the phlebotomy service. Explain problems associated with 24-hour urine collections.	
Explain principles of health and safety	Discuss all aspects of health and safety in the laboratory. Demonstrate awareness of the pathologist's legal obligations. Discuss Clinical Pathology Accreditation (CPA) standards for laboratory accreditation. Explain the role of the Health and Safety Executive.	Apply principles of health and safety to the working laboratory and avoiding risks.

Knowledge	Skills	Attitudes and behaviours
IT and communication skills **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: the aims of audit, the audit cycle, how to conduct an audit	Familiar with audit through participation in multidisciplinary clinical audit.	Recognise the benefit of audit.
Principles of quality control and assurance	Explain quality control and quality assurance. 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.	Apply principles to laboratory.
Presentation, diagnosis and management of common clinical biochemistry disorders	Recognise disorders in the laboratory and advise on the differential diagnosis and initial management of common clinical biochemistry disorders. Be aware of the need to consult about results that are not understandable.	Work 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	Attitudes and behaviours
Basic laboratory techniques and centrifugation	Explain methods of standardisation and calibration. Identify 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 clinical biochemistry. 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	Discuss the mechanisms by which common interferents affect laboratory assays (haemolysis, jaundice, lipaemia, heterophilic antibodies).	Explain how to investigate assay interference.	
Automated instrumentation	Discuss automated analysers, including random access, immunoassay analysers robotics and modular systems.	Discuss the technology and design of biochemistry analysers and appreciate their limitations and benefits.	

Subject	Knowledge	Skills	Attitudes and behaviours
Spectrometric methods	Discuss spectrometry: visible, UV, reflectance, bichromatic, derivative, linear diode array, infra red. Explain turbidimetry, nephelometry, densitometry, fluorimetry, Outline the principles of nuclear magnetic resonance, mass spectrometry, flame emission spectrometry, atomic absorption (including flame, furnace methods).	Report on experience of the application of some of these methods.	
Osmometry	Explain principle of technique.	Report experience of use of technique.	
Electrometric methods	Explain how Ion selective electrodes operate (Na+, K+, Cl-, H+, pO2, pCO2, Ca2+, NH4+, Mg2+, Li+)		
Enzymology	Discuss measurement of enzyme activity using fixed interval and kinetic assays, differentiation of isoenzymes, and use of enzymes as reagents.		
Radioisotope counting	Describe γ- and β-counting.		
Immunochemical techniques	Discuss methods of Immunoassay, immunometric assays. Describe immunoelectrophoresis, immunofixation, immunodiffusion. Compare different labels such as enzymes, fluorophores, and chemiluminescent labels.		

Subject	Knowledge	Skills	Attitudes and behaviours
Electrophoresis	Discuss cellulose acetate, agarose, PAGE (SDS, gradient), isoelectric focusing.		
Chromatography	Explain thin layer chromatography (TLC), column, ion exchange, affinity, gas chromotography (GC), high pressure liquid chromatography (HPLC). Discuss sample preparation: desalting, liquid extraction, derivatisation.		
Point-of-care testing	Discuss the principles of point-of -care measurements, such as glucose, bilirubin, blood gases, ion-specific electrodes, urinanalysis, cardiac markers.	Undertake and advise on QA schemes, interdisciplinary liaison.	
Solid/dry phase chemistry	Discuss the principles and technology for dipstick tests, thin film chemistry.		
DNA/RNA/chromosomal	Explain the principles of nucleic acid analyses, including PCR, Southern blotting, quantitative RT-PCR, agarose gel electrophoresis, DNA sequencing.	Interpret mutation analysis across a variety of disorders, micro satellite analysis, sequencing reactions. Describe application of these techniques to diagnoses and family studies.	

1.3 Evaluation of an analytical method

Objective: competence to establish and validate a new method.

Knowledge	Skills	Attitudes and behaviours
Discuss the practicability of new methods, optimisation of reaction conditions, recognition of critical parameters (robustness), range, criteria for acceptability **Define terms such as bias, imprecision, sensitivity, specificity** **Discuss investigation of common interferences**	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	Attitudes and behaviours
General	Describe and discuss the request-report cycle including: Request initiation, specimen transport and what contributes to error; Organisation of the analytical and reporting process. Discuss the principles of successful management. Outline the structure and organisation of the NHS, where decision making occurs, process of change and ways of influencing decisions. Discuss business planning, finance, financial control, costing, pricing, contracting, purchasing, resource management. Identify practical aspects of personnel management, industrial relations, team building, staff training, motivation, continuing education, appraisal, dealing with problems, colleagues. Describe how to apply the concepts of accreditation, e.g. CPA, good laboratory practice. Outline legal requirements and Department of Health guidance. Discuss multidisciplinary working patterns.	Report experience and training in reception. Appreciates the place of laboratory automation and IT. Attend management course training. Outline personnel management including industrial relations. Shadow senior departmental staff involved in business planning, writing business case, contracting, finance and resource management. Participate where appropriate in appointment of junior staff. Participate in departmental staff appraisal programme, using appraisal to develop skills. Attend departmental management meetings. Explain mentoring and supervision relative to personal and professional development, prioritising work, time management, delegation, planning, staff motivation. Appreciate that compliance with CPA standards ensures that training facilities are adequate. Undertake accreditation review of a section of the laboratory.	Establish rapport, respect and understanding with laboratory staff. Show respect for others' opinions. Recognise good advice. Recognise own limitations. Develop enthusiasm, integrity, imagination, determination, professional credibility. Develop awareness of equity in health care access and delivery.

Subject	Knowledge	Skills	Attitudes and behaviours
Quality assurance	Discuss how to control the quality of a method Describe internal quality control programmes and quality control rules. Outline external quality assurance programmes. Discuss laboratory accreditation.	Interpret quality control/quality assurance data and advise on subsequent course of action. Act as or assist laboratory quality control officer and attend laboratory quality control meetings. Report how QC and QA apply to point-of-care testing.	
Health and safety	Describe the principles of Health and safety and COSHH. Discuss individual and collective responsibility. Outline the handling of potentially infectious samples and noxious chemicals. Describe radiation protection measures. Outline mechanical, fire and electrical safety. Discuss how to deal with an accident. Outline current safety guidelines.	Attend laboratory safety committee meetings.	Observe safe working practices.
Selection of analytical equipment	Discuss how to specify and evaluate an analytical system. Outline financial issues relating to analyser installation (capital purchase, reagent rental, competitive tendering).	Participate in the local process.	

Subject	Knowledge	Skills	Attitudes and behaviours
IT	Outline the role of IT in delivery and management of service Describe the stages in producing results and problems with turnaround time. Outline the principles of instrument interfaces, and links to other computers. Describe reporting/authorisation procedures. Outline the problems of patient identification and methods of ensuring accuracy. Report how management statistics are compiled and reported. Describe e-mail and intra/internet. Outline the data protection act. Discuss retention of records. Review pathology services. Describe the Freedom of Information act.	Report on the effects of IT on all aspects of clinical biochemistry/clinical biochemistry.	Develop a proactive attitude to new technology.

Subject	Knowledge	Skills	Attitudes and behaviours
Communication skills	Outline the skills required to operate with organisations, scientific and medical communities and the public. Explain the principles of effective negotiation, influencing colleagues.	Resolve technical, scientific, clinical and management problems through leadership skills and promoting morale. Explain laboratory procedures to patients, their relatives and visitors. Work within a team, communicating with clinical, managerial and other health care staff. Prepare, present, explain scientific reviews/data/findings, both orally and in writing. Demonstrate self-understanding. Report conflict resolution.	Involve patients, staff, and colleagues in decision making. 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	Attitudes and behaviours
Summarise the aims, importance, procedures and outcomes of clinical governance, clinical risk management, departmental organisation, investigative protocols, and service quality	Recognise roles, responsibility and accountability. Participate in risk assessment. Monitori/report adverse events. Discuss workload compared with national standards, clarity of lines of responsibility and accountability in pathology, communications within and outside the department. Identify availability and adherence to agreed protocols for investigations of common conditions. Discuss turnaround time, complaint analysis with lesson learning and corrective action taken, out-of-hours service.	Make patient care the prime concern. Share best practice with others. Learn from mistakes and complaints. Maintain probity in clinical and laboratory practice.
Clinical audit Discuss 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.	Discuss 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 clinical biochemistry of screening, diagnosis and monitoring of disease.
N.B. Items in *italics* would probably not be encountered universally.

Subject	Knowledge	Skills	Attitudes and behaviours
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.	Advise 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.	Act 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. Recognise 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	Attitudes and behaviours
Biological variability	Discuss the setting up and maintenance of 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 • effects of age upon reference ranges • significance of changes in serial results.	Discuss 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	Attitudes and behaviours
Liver	Outline functions of the liver. Describe formation of bilirubin. Discuss enterohepatic circulation and bile salts. Discuss the causes of 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*. Summarise hepatic failure and encephalopathy. *Describe Liver transplantation*. Describe assessment of hepatic function: • liver function tests • prothrombin time • ammonia • alpha-fetoprotein.	Take a history concerning possible liver disease, examine a patient for signs of liver disease. Plan the investigation and management of patients with liver disease	Act 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	Attitudes and behaviours
Gastrointestinal tract	Describe the physiology and biochemistry of digestion. Discuss the gut as an endocrine organ and gastrointestinal hormones. Discuss gastrointestinal 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 • elastase.		

Subject	Knowledge	Skills	Attitudes and behaviours
Urogenital tract	Summarise renal physiology: • glomerular filtration • tubular function • salt and water homeostasis • hydrogen ion homeostasis • renin, erythropoeitin, vitamin D. Discuss renal disease: • uraemia: pre, post • acute, chronic, acute-on-chronic • calculi • glycosuria • tubular defects and Fanconi syndrome • metabolic disease and the kidney. Outline normal and abnormal urine composition, including abnormal pigments, urinary deposits, renal stones. Outline the causes of proteinuria: • nephrotic syndrome • differential protein clearances • tubular proteins. Discuss 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	Attitudes and behaviours
Urogenital tract (continued)	Outline renal replacement therapy: • haemodialysis • peritoneal dialysis • assessment of dialysis adequacy • renal transplantation • markers of transplant rejection. Discus prostatic diseases. Summarise semen analysis.		
Gas transport and H+ metabolism	Describe the physiology of normal respiration, O2, CO2, transport, buffers. Summarise respiratory and renal mechanisms in acid-base homeostasis. Discuss respiratory disease. Outline causes and assessment of acid-base disturbances: measurement of H+ pCO2, pO2, saturation. Discus the concept of actual bicarbonate, standard bicarbonate, base excess. Describe the determinants and assessment of tissue oxygenation.	Advise on the investigation of acid-base disorders and management.	
Water and electrolytes	Discuss distribution of water and electrolytes. Describe turnover of body fluids. Outline regulation of extracellular fluid, osmolality and volume: • antidiuretic hormone • renin-angiotensin-aldosterone • natriuretic peptides. Describe the causes, effects and management of water depletion and excess, hypo- and hypernatraemia, hypo- and hyperkalaemia, and metabolic effects of trauma/surgery/stress. Discuss the principles of intravenous fluid therapy.	Advise on management of fluid balance and on investigation of electrolyte disturbances.	

Subject	Knowledge	Skills	Attitudes and behaviours
Proteins	Describe principles of measurement. Outline properties and functions of the principal plasma proteins including: • albumin • protease inhibitors • transport proteins • ceruloplasmin • clotting factors • complement • immunoglobulins • hormone binding proteins. Discuss the causes, investigation and management of hypoalbuminaemia, paraproteinaemias, cryoglobulinaemia. Discuss inflammatory proteins, immunoglobulin deficiencies, alpha-1-antitrypsin deficiency, cytokines. Describe plasmapheresis.	Advise on the laboratory investigation of normality and disease.	
Lipids	Describe apolipoprotein and lipid metabolism. Discuss the metabolic basis of: inherited and acquired hyper- and hypo-lipoproteinaemias; biochemical basis for atheroma, coronary heart disease and associated risk factors Discuss patient classification: familial hypercholesterolaemia, familial combined dyslipidaemia, type III dyslipidaemia, polygenic hyperchol-esterolaemia, atherogenic lipoprotein phenotypes, secondary causes. Outline the principles of primary and secondary cardiovascular disease prevention. Describe the 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.	

Subject	Knowledge	Skills	Attitudes and behaviours
Cardiovascular system	Discuss atheroma, coronary heart disease, stroke and associated risk factors. Outline current methods of calculating risk and their shortcomings. Describe use of biochemical markers for risk stratification in acute coronary syndromes. Discuss biochemical markers of myocardial damage/ventricular function. Discuss the biochemical investigation and management of hypertension.	Advise appropriately on estimation of cardiovascular risk.	
Diabetes mellitus and glucose	Describe glucose metabolism. Discuss classification of diabetes. Outline diagnostic criteria for diabetes, impaired glucose tolerance (IGT), IFG impaired fasting glucose (IFG). Discuss the classification and pathophysiology of diabetes: • insulin-dependent, type 1 diabetes • insulin-resistance, type 2 diabetes secondary. Outline the 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.	Advise on the laboratory diagnosis, investigation and management of diabetes. Distinguish between the various causes of diabetes.	

Subject	Knowledge	Skills	Attitudes and behaviours
Diabetes mellitus and glucose (continued)	Describe 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. Discuss extra laboratory glucose monitoring. Outline the principles and application of glycated haemoglobin, insulin, C-peptide, microalbumin assays. Discuss the causes and laboratory investigation of hypoglycaemia in adults and children.		
Endocrinology: adult and paediatric	Discuss pituitary diseases including: • acromegaly and dwarfism • prolactinoma/macroprolactin • diabetes insipidus • dynamic function testing • isolated hormone deficiency and panhypopituitarism. Outline the functions and pathophysiology of the adrenal cortex including: • steroid production • Cushing's syndrome • insufficiency: assessment of reserve • Conn's syndrome • congenital adrenal hyperplasia: diagnosis, management, intersex, salt-losing. Summarise the structure, function and diseases of the adrenal medulla: • catecholamine metabolism • phaeochromocytoma • neuroblastoma • measurement and interpretation of catecholamines and metabolites.	Interpret and report on results of investigations and monitoring therapy. Describe the role of imaging, scans. Report experience of insulin, TRH, GnRH, glucagon, pituitary function, growth hormone secretion and water deprivation tests, tests of adrenal function Advise on appropriate monitoring of replacement therapy. Advise on the appropriate choice of tests to investigate and monitor thyroid disease, according to clinical circumstances.	

Subject	Knowledge	Skills	Attitudes and behaviours
Endocrinology: adult and paediatric (continued)	Discuss the function and diseases of the 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 Discuss the development, structure, function and pathophysiology of the 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. Discuss inherited endocrine syndromes, such as multiple endocrine neoplasia, polyglandular syndrome. such as MEN-1, MEN-2, von Hippel-Lindau syndrome, familial paraganglioma syndromes and polyglandular autoimmune syndromes	Advise appropriately on the investigation of female andro-genisation. Interpret and report on the results of investigations and monitoring therapy.	

Subject	Knowledge	Skills	Attitudes and behaviours
Calcium, magnesium, bone	Discuss the physiology and biochemistry of calcium, magnesium, phosphate, parathyroid hormone (PTH) and vitamin D metabolism. Discuss abnormalities such as • 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. • Vitamin D deficiency and insufficiency: • renal osteodystrophy. • Paget's disease. Discuss the biochemistry and pathology of collagen. Discuss the causes and treatment of Vitamin D deficiency. Outline and compare 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.	

Subject	Knowledge	Skills	Attitudes and behaviours
Nutrition	Discuss protein-energy malnutrition. Outline the use of markers of nutritional status. Summarise the effects and investigation of vitamin deficiency or excess. Discuss trace element deficiency or excess. Outline principles and practical nutritional support – parenteral and enteral. Summarise re-feeding syndrome. Describe the biochemistry of starvation. Discuss the investigation, classification, risk factors, and complications of obesity. Describe the nutritional management of disease. Discuss protein-energy malnutrition 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, management for oesophagectomy, malignancy, major abdominal surgery. • burns, multiple injury, systemic sepsis.	Advise on the biochemical assessment of nutritional deficiencies, treatment, appropriate clinical and laboratory monitoring of patients receiving nutritional support.	Participate effectively with other professionals in a team approach to management of nutritional problems.
Haemoglobin and porphyrins	Describe haemoglobin metabolism. Discuss anaemia and its investigation, assessment of iron status, detection of abnormal haemoglobins in inherited and acquired disease, the metabolic basis of thalassaemia and sickle cell disease, screening. Describe red cell enzyme defects. Discuss the metabolic basis, investigation, diagnosis, monitoring of porphyria.	Advise on the laboratory investigation of normality and disease.	

Subject	Knowledge	Skills	Attitudes and behaviours
Enzymology	Discuss stability and induction of enzymes. Describe the structural basis, separation, quantitation of isoenzymes. Compare and contrast assays for: • 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.	
Genetics and molecular biology	Discuss structure of nucleic acids, meiosis and mitosis, simple Mendelian and complex diseases, mitochondrial inheritance Summarise protein synthesis, transcription and translation, defects in protein synthesis arising from genetic mutations, molecular pathology of single gene disorders Outline mode of inheritance for genetic counselling, antenatal diagnosis and screening. *Discuss gene therapy*.	Apply Mendelian genetics and Bayes Theorem to calculate pre- and post-test probabilities in genetic counselling.	
Pregnancy	Outline maternal and foetal physiology, complications, detection. Discuss screening: Down's syndrome, foetal malformations, neural tube defects, hydatidiform mole, choriocarcinoma, ectopic pregnancy. Discuss pre-natal investigation of inborn errors Outline monitoring during pregnancy of phenylketonuria, diabetes, thyroid disease, liver disease.	Discuss effects of pregnancy on routine biochemical tests. Outline biochemical, statistical and ethical issues surrounding antenatal screening.	Interact effectively with medical and midwifery staff.

Subject	Knowledge	Skills	Attitudes and behaviours
Newborn	Summarise 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 • congenital adrenal hyperplasia (salt-losing, intersex) • congenital hypothyroidism.	Discuss factors affecting method selection and biochemical results in newborns. Outline appropriate specimen collection.	
Childhood	Summarise the physiology, pathology, investigation and management of disorders seen in childhood, including: • hypoglycaemia. • calcium and phosphate disturbances. • hyperammonaemia. • Reye's syndrome. • lactic acidosis. • renal disorders including Fanconi syndrome and tubular defects.		

Subject	Knowledge	Skills	Attitudes and behaviours
Inherited metabolic disorders	Summarise 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. Discuss analysis of 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). Discuss 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. Discuss effects of metabolic stress upon patients with inborn errors such as PKU, fatty acid oxidation defects, glycogen storage and urea cycle defects.	Collaborate with other professionals (paediatricians, nurses, dieticians) in investigation and management of patients. Interact effectively with patients and relatives.
Neuromuscular system	Outline formation and composition of cerebro spinal fluid (CSF). Discuss the pathology and clinical features of multiple sclerosis, muscular dystrophy, Parkinson's disease. Discuss the biochemistry of psychiatric disease. Outline the biochemistry of muscle disease.	Advise on use of CSF in diagnosis and monitoring disease.	

Subject	Knowledge	Skills	Attitudes and behaviours
Cancer	Outline the nature of malignancy and tumour growth. Outline the biochemical effects and treatment, including the use of tumour markers: prostate, lung, breast, ovary, gastro-intestinal (GIT), pancreas, thyroid, pituitary, adrenal, neuroblastoma, hepatoblastoma, teratoma.	Advise on use of biochemical markers in diagnosis and monitoring tumours.	
Metabolic response to insults	Discuss the body's responses to external insults such as surgery, trauma, burns, shock.	Advise on biochemical investigations, monitoring and management, especially patients in ITU/HTU.	
Therapeutic drug monitoring and toxicology	Outline the principles of pharmacokinetics and its effects on half-life, dosage prediction. Summarise the metabolic effects of ethanol. Discuss monitoring of drug therapy, e.g: digoxin, lithium, antiepileptics, theophylline, caffeine, methotrexate, immunosuppressive, antibiotics. Discuss the diagnosis and management of overdose, e.g: salicylate, barbiturate, paracetamol, tri-cyclic antidepressants, benzodiazepines. Discuss the diagnosis and management of drug addiction: opiates, amphetamine, methylenedioxy-methamphetamine (MDMA), benzodiazepines, cocaine, alcohol. Discuss the diagnosis and management of poisoning, e.g. lead, mercury, aluminium, carbon monoxide, paraquat, iron, ethylene glycol, methanol, organophosphate compounds. Outline the laboratory investigation of the unconscious and deceased patient.	Advise on factors affecting drug action or metabolism. Summarise the effects of post-mortem changes on the results of laboratory investigations. Advise on legal procedure surrounding investigation of death.	May require secondment to a specialist unit.

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	Attitudes and behaviours
Interpretation of laboratory data	Outline basic biochemistry, physiology and clinical biochemistry of the disease processes under investigation in the laboratory. Discuss nature of biochemical investigations undertaken and provided to other specialties.	Contribute competently at ward rounds and case presentations. Take part in duty biochemist and reporting rota. Discuss other diagnostic disciplines and their relevance to clinical biochemistry. Insert appropriate comments when reporting laboratory results. Critically appraise the role of biochemical tests. Follow-up abnormal investigations.	Act as part of a multidisciplinary team. Liaise with clinical colleagues.

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	Attitudes and behaviours
Discuss scientific methods and their application to research	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. Use appropriate statistics for clinical and laboratory practice. Write reports. Obtain consent for the use of patient samples in research.	Maintain a questioning and critical approach to all aspects. Maintenance of probity in research. Maintain an enquiring attitude.
Outlines the principles of critical review	Critically review and appraise the literature. Assess the validity of data, experimental design and problem solving techniques. Implement evidence-based clinical biochemistry. Use library and IT facilities.	Use evidence-based medicine in support of patient care.
Outline research presentation skills **Produce work of publishable quality**	Present a poster and publish a paper in a peer-reviewed journal.	

Knowledge	Skills	Attitudes and behaviours
Outline data handling and statistical methods Discuss 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.	Use computers within the laboratory to manipulate spreadsheets, databases. Correctly analyse results using appropriate statistical tools.	Seek statistical advice before embarking on a project.
Summarise the place of 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.	Summarise the processes for application for grants to support research projects. Write 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	Attitudes and behaviours
Outline the 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 **Discuss the biochemical, haematological and radiological techniques required for the investigations, diagnosis and screening** **Summarise the pharmacology of the therapeutic agents required in management** **Discuss the use of molecular biology techniques to identify genetic disorders**	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. Discuss the role of antenatal diagnosis/family screening/ molecular biology techniques in prenatal and family testing.	Document clinical encounters and management decisions clearly in the patient notes. Explain the diagnosis, treatment and side effects to the patient and relatives. Break bad news including poor prognosis. Liaise and communicate with colleagues, teams in primary and secondary care, both verbally and in writing. Show awareness of the impact of the disorder/diagnosis/ chronic disease on the patient and family. Act with empathy in communicating and managing the disorder and its complications. Explain planned treatment to the patient. Works as part of multidisciplinary team. Recognise the importance of good communication and supportive care for successful patient outcomes. Relate theoretical knowledge and laboratory results to patient management and clinical practice.
Outline the principles of clinical governance, clinical risk and clinical audit including the audit cycle	Undertake at least one audit project.	Discuss the benefit of audit to clinical care.

Knowledge	Skills	Attitudes and behaviours
Educate patients about their disease, investigations, lifestyle, treatment	Inform clearly both verbally and in writing. Advise patients about access to patient groups and information.	Involve 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	Attitudes and behaviours
Outline the principles of: • **calcium, magnesium, phosphate, PTH and vitamin D metabolism** • **hyper- and hypo-parathyroidism** • **hypo- and hyper-phosphataemia** • **hypo- and hyper-phosphatasaemia** • **disorders of magnesium** **Discuss the causes and investigation of hyper- and hypocalcaemia including calcium sensor abnormalities, osteogenesis imperfecta, osteomalacia, renal osteodystrophy, Paget's disease of bone, osteoporosis including steroid therapy and chronic malabsorption** **Outline the theory, application, and interpretation of bone densitometry** **Summarise the investigation of bone turnover including biochemical bone markers** **Outline the acute management of hypercalcaemia**	Interpret bone densitometry and radioisotope scans requested. Treat and monitor bone and mineral disorders.	

7.3 Diabetes mellitus

Objective: competent to manage patients with diabetes mellitus.

Knowledge	Skills	Attitudes and behaviours
Curriculum for diabetes, lipids, cardiovascular, see above **Summarise the diagnostic criteria for diabetes, IGT and IFG** **Outline the principles of management of diabetic ketoacidosis, hyperosmolar non-ketotic state, hypoglycaemia** **Discuss screening for macro- and micro-vascular complications by means of clinical examination and investigations** **Discuss how to avoid and manage complications: eye disease, renal disease, hypertension, neuropathy, foot care.** **Summarise the pathophysiology of diabetic foot complications** **Discuss home monitoring including continuous overnight glucose monitoring**	Summarise the differences between the various causes of diabetes. Initiate treatment with appropriate hypoglycaemic agent, lipid lowering and anti-hypertensive drugs. 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. Refer to other specialists appropriately. Advise on the avoidance of complications. Interpret and discuss the use of home monitoring with patients.	Work with: diabetes nurse specialists, dieticians, podiatrists, psychologists, ophthalmologists.
Discuss the organisation of local diabetes services **Summarise patient educational materials**	Organise an education programme for health professionals and patients.	

7.4 Inherited metabolic disorders

Objective: competent to manage patients with inherited metabolic disorders.

Knowledge	Skills	Attitudes and behaviours
Curriculum for inherited metabolic disorders (see above) **Outline the 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 • previously presenting with: encephalopathy and hyper-ammonaemia • porphyrias	Outline the use of specialised laboratory investigations and their interpretation. Summarise specialised dietary interventions or treatments. Discuss use of specific treatments and drugs. Counsel affected families and offer advice on prophylaxis and treatment. Obtain skin biopsies.	Develop a rapport with patients with inherited metabolic disorders. Negotiate a management plan for inherited metabolic disorders with patients.
Discuss 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	Attitudes and behaviours
Summarise apolipoprotein and lipid metabolism, inherited and acquired hyper- and hypo-lipoproteinaemias and their metabolic basis **Outline the physiological basis for atheroma, coronary heart disease and associated risk factors and diseases including chronic kidney disease (CKD) and metabolic syndrome** **Discuss the classification of patients: familial hypercholesterolaemia, familial combined dyslipidaemia, type III dyslipidaemia, polygenic hypercholesterolaemia, atherogenic lipoprotein phenotypes, secondary causes** **Outline primary and secondary cardiovascular disease prevention** **Compare current methods of calculating risk and their shortcomings** **Summarise treatment and pharmacology to include lipid lowering, appropriate oral hypoglycaemic agents, anti-obesity and anti-hypertensive drugs.**	Advise on appropriate follow-up tests and follow-up times required Advise on investigation of hypertension 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.

7.6 Nutrition

Objectives: competent to manage patients with nutritional disorders.

Knowledge	Skills	Attitudes and behaviours
Outline the principles and methods of nutritional support: parenteral and enteral **Summarise the assessment and management of nutritional requirements** **Distinguish between types of nutritional support, complications and their detection** **Discuss markers of nutritional status** **Discuss the effects and investigation of vitamin and trace element excess and deficiency** **Outline the management of patients with excess fluid/electrolyte losses**	Assess of nutritional status. Decide and prescribe nutrition support. Advise on clinical and laboratory monitoring of patients receiving nutrition support. Avoid, detect, and manage complications. Prescribe nutrition support and care of patients with standard and long-term total parenteral nutrition (TPN). Advise on appropriate use and care of: central and peripheral feeding lines, naso gastric (NG), naso jejunal (NJ), percu-taenous endoscopic gastrostomy (PEG), percutaneous endoscopic jejunostomy (PEJ) feeding tubes. Discuss use of anti-emetics, GIT prokinetics.	Work as part of a multidisciplinary team.
Outline the investigation, classification, and treatment of, and the risk factors associated with obesity. **Discuss management, including dietary and lifestyle changes and therapeutic agents.** **Summarise the management of complications: diabetes, hypertension, hyperlipidaemia**	Calculate BMI. Measure skin fold thickness, body impedance. Measure total body fat. Refer appropriately for: dietetic advice, surgical treatment	Understand analytical and practical limitations of the techniques.

Knowledge	Skills	Attitudes and behaviours
Discuss disease-related malnutrition 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.	Manage nutritional support in management of disease. Assess nutritional deficiencies.	

7.7 Renal stone disease

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

Knowledge	Skills	Attitudes and behaviours
Discuss the causes, investigations, diagnosis, treatment, and pharmacology of renal stones. Describe appropriate follow up tests and times.	Manage patients with renal stones. Use 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	Attitudes and behaviours
Summarise the theoretical curriculum for thyroid **Discuss diagnostic criteria for hypo-, hyper-thyroidism, thyroiditis, malignancy** **Explain principles of management, treatment and pharmacology** **Discuss biochemical thyroid function tests, including 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. Take clinical responsibility for such procedures. Interpret and report thyroid function tests.	Communicates well with patients and nurses

APPENDIX 1

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	25
Maintaining good medical practice	32
Teaching and training, appraising and assessing	41
Relationships with patients	43
Working with colleagues	48
Health	53
Probity	54

APPENDIX 2

ACRONYMS

ACB	Association of Clinical Biochemists
ARCP	Annual Review of Competence Progression
BMA	British Medical Association
BMS	Biomedical scientist
CATT	College Advisory Training Team
CbD	Case-based discussion
CCT	Certificate of Completion of Training
CESR	Certificate of 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
FRCPath	Fellowship of The Royal College of Pathologists
GC	Gas chromotography
GIT	Gastro-intestinal
GMC	General Medical Council
GP	General Practitioner
HCC	Healthcare Commission
HOPS	Head of Pathology School
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
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
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

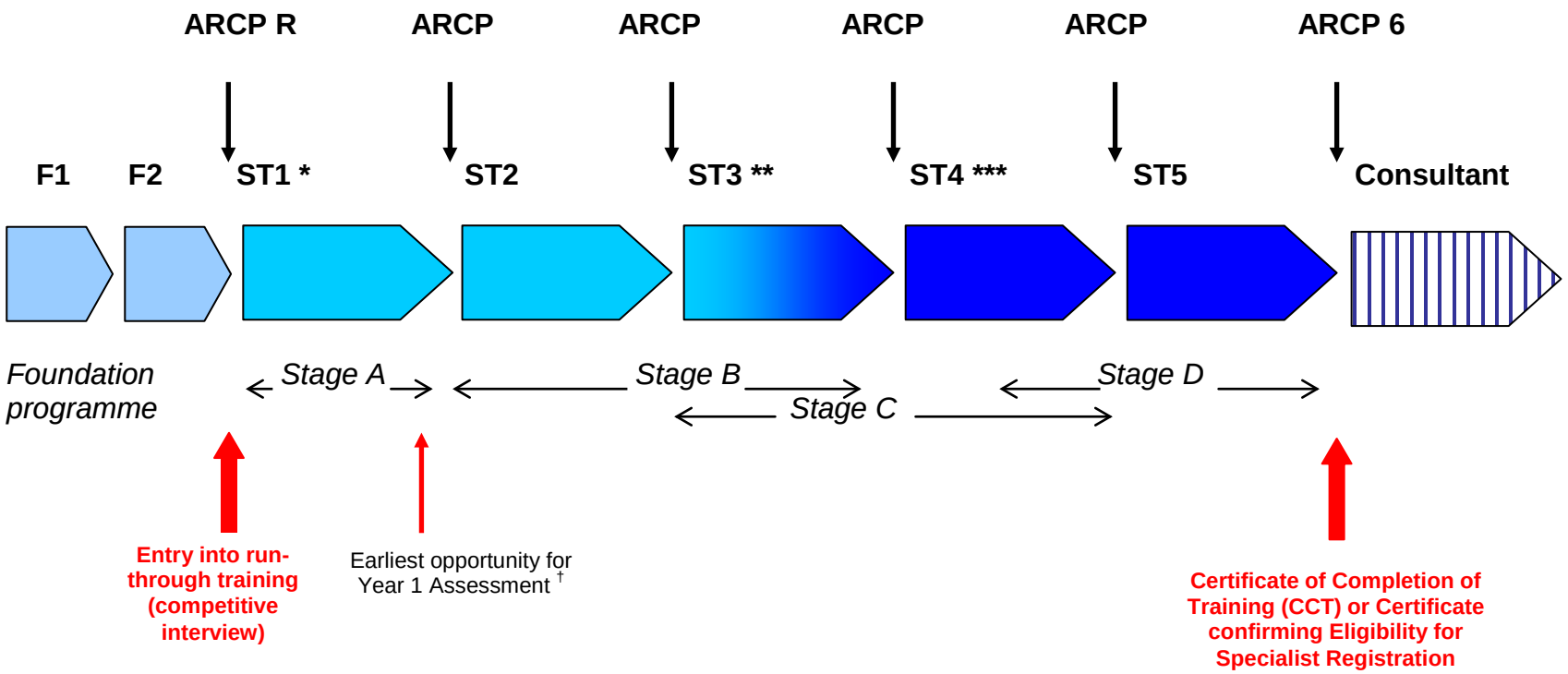
APPENDIX 3

DEVELOPMENT OF CHEMICAL PATHOLOGY COMPETENCES

Stage	Stage A	Stage B	Stage C	Stage D
Expected competences	Trainees should demonstrate: • basic knowledge of laboratory techniques that underpin clinical laboratory practice • basic knowledge of laboratory practice including health and safety and quality assurance • basic knowledge of the presentation, differential diagnosis and natural history of the common clinical biochemistry disorders • sufficient understanding of clinical biochemistry to offer basic advice on the interpretation of laboratory results.	Trainees should develop the knowledge listed under stage A to provide a firm foundation for practice of clinical biochemistry. The trainee should demonstrate 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 clinical biochemistry laboratory to an adequate level but will still require consultant input with regard to complex management and clinical issues. The knowledge required is tested in Part 1 FRCPath examination (written).	This stage of the curriculum enables the trainee to undertake further general clinical biochemistry training. The trainee should demonstrate competence in the practice of laboratory clinical biochemistry and its clinical application. This stage of training will in part be summatively assessed by the FRCPath Part 2 examination.	The trainee should demonstrate an in-depth knowledge and understanding of the principles and practice of laboratory clinical biochemistry and its clinical application. The trainee 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.

Workplace-based assessments	Minimum of satisfactory WPBA: CbD: 6 per year Mini-CEX: 6 per year ECE: 6 per year DOPS: 6 in first 2 years MSF: 1 in first year and minimum of 3 during training	Minimum of satisfactory WPBA: CbD: 6 per year Mini-CEX: 6 per year ECE: 6 per year DOPS: 6 in first 2 years MSF: Minimum of 3 during training	Minimum of satisfactory WPBA: CbD: 6 per year Mini-CEX: 6 per year ECE: 6 per year DOPS: 6 in first 2 years MSF: Minimum of 3 during training	Minimum of satisfactory WPBA: CbD: 6 per year Mini-CEX: 6 per year ECE: 6 per year DOPS: 6 in first 2 years MSF: Minimum of 3 during training
Examinations and assessments	Pass in Year 1 Assessment enables progression to stage B	Pass at FRCPath part 1 enables progression to stage C	Pass at FRCPath part 2 enables progression to stage D	Successful submission of portfolio for CCT marks end of stage D
Audit	Demonstrate basic understanding of role of audit and quality assurance	Participate in laboratory and clinical audits	Evidence of active involvement in audit	Satisfactory portfolio of audit involvement
Management		Evidence of awareness of and participation in some aspect of management	Evidence of participation in managerial activity e.g. by writing a business case, involvement in tendering for equipment, etc.	Satisfactory portfolio of management activities
Research		Evidence of developing research awareness: evidence of critical thinking e.g. participation in journal clubs	Evidence of research competence e.g. preparation for and undertaking Part 2 dissertation module	Evidence of research awareness and competence through pass at part 2 FRCPath
Teaching		Evidence of understanding of principles of adult education	Evidence of participation in teaching e.g. medical students and laboratory staff	Evidence of ongoing evaluated participation in teaching and of implementation of the principles of adult education.
Events giving concern	The following events may trigger review of the trainee's progress and instigation of possible remedial training: aspects of professional behaviour, poor performance in WPBA and MSF, issues arising from the educational supervisors' reports, patient safety issues arising from clinical or laboratory work.			

APPENDIX 4a 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 FRCPath examination by the end of Stage B/ST3.
Failure to pass the Part 1 examination by the end of ST3 will prevent the trainee from progressing to Stage C.

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

APPENDIX 4b 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 FRCPath opportunity	Part 1 FRCPath results					Part 1 FRCPath opportunity	Part 1 FRCPath 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 FRCPath opportunity	Part 1FRCPath results					Part 1 FRCPath opportunity	Part 1 FRCPath 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 FRCPath opportunity	Part 2 FRCPath results		Earliest opportunity to exit Stage C	Earliest opportunity to begin Stage D		Part 2 FRCPath opportunity	Part 2 FRCPath results		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