

**DEVELOPING
WORLD-CLASS
PERFORMANCE IN
HEALTHCARE SCIENCE**

A LEARNING GUIDE

FOR

HEALTHCARE SCIENTISTS

THEME	Life – Sciences – Blood Sciences
PATHWAY	HAEMATOLOGY AND TRANSFUSION SCIENCE

PREFACE

Learning Guide version 1.0 - (2011/12)

This draft Learning Guide document provides initial information relating to trainees recruited onto the **Blood Sciences** theme who are following the Haematology and **Blood Transfusion Science Pathway**. It provides information for providers and trainees for the **first phase** of work based training.

Section 4 contains detailed information on content of rotation modules, experiential learning and competences to be completed in the rotational phase of the programme (Year 1).

Sections 1-3 contain general information about the programme structure and delivery and also an outline of specialist modules for years 2 and 3.

Further development work will be undertaken between December 2011 and April 2012 in conjunction with the Professional Bodies to provide detailed modular information for specialist training and assessment. At that point a further updated copy of this Learning Guide will be produced to include detailed information on structure and content of specialist modules for Years 2 and 3 of the programme.

The Year 1 Learning Guides will also be reviewed and updated based on experience of their use with trainees.

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SECTION 1

Introduction

1.1. Learning and development for Healthcare Scientists

The aim of this programme is to develop world class performance in Healthcare Science

The Healthcare Scientist Training Programme (STP) in Haematology and Blood Transfusion Science is designed to provide the Healthcare Scientist (HCS) with strong science-based, clinical training across all aspects of the specialism with an appropriate level of underpinning scientific knowledge to enable them to perform in a range of healthcare settings. The full curricula for can be found on this link www.networks.nhs.uk/nhs-networks/msc-framework-curricula This Learning Guide describes the Healthcare Scientist work based training programme in Haematology and Blood Transfusion Science and should be read in conjunction with the *Operational Framework for Modernising Scientific Careers (MSC) (planned for publication in December 2011)*, and the manual for the *Online Assessment and Personal Development System*. The training will be delivered both in the work place and in the University and the trainee will also be part of the National School of Healthcare Science for the duration of their training. The National School of Healthcare Science will oversee the trainee performance using the online assessment function and will actively follow progression of all trainees throughout the programme. The National School of Healthcare Science will also work with the Strategic Health Authority Modernising Scientific Careers leads to ensure the smooth delivery of the programme.

At the end of the programme the successful Trainee will receive an MSc in Blood Sciences – Haematology and Blood Transfusion Science and a Certificate of Competence for the work based programme.

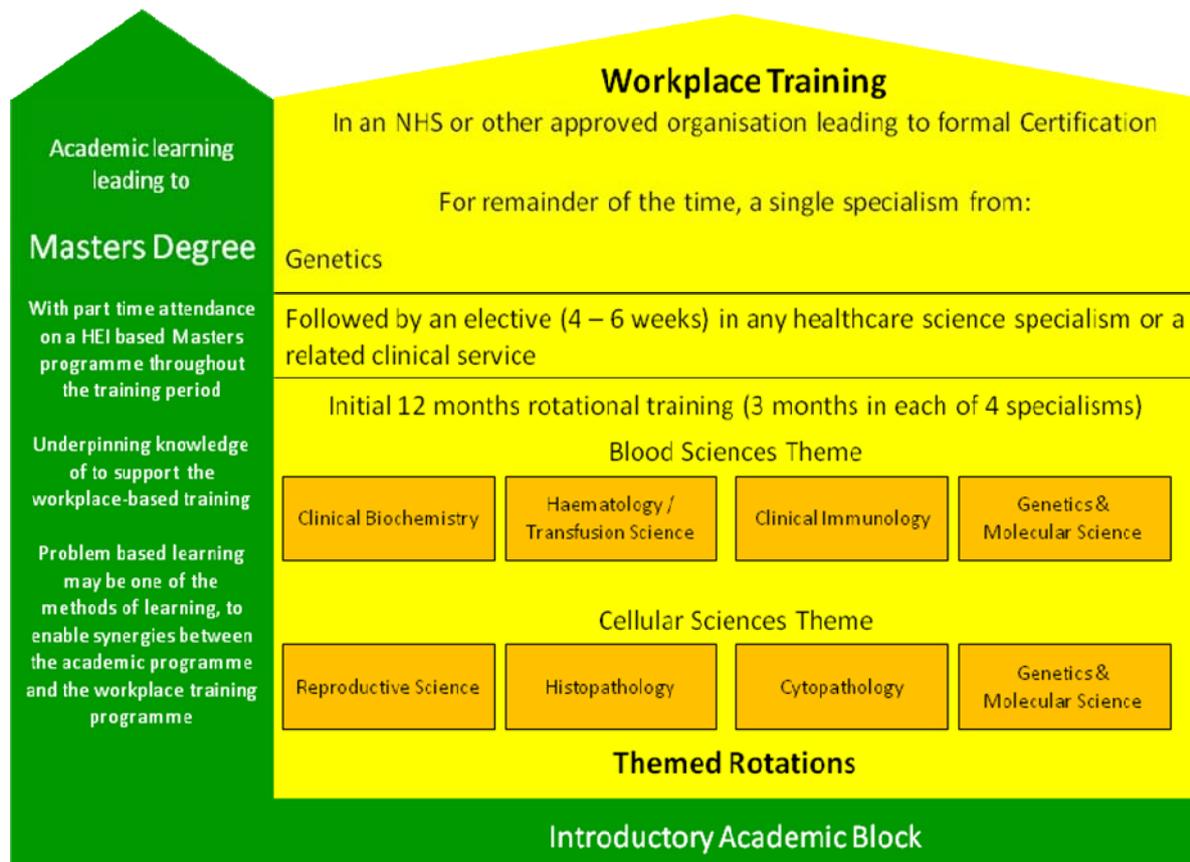
Description of Healthcare Science themed pathways

The Healthcare Science workforce consists of a diversity of specialisms. All involve the application of science, technology, engineering or mathematics to health. Traditionally, these specialisms have been divided into three broad divisional areas: life sciences, physical science and engineering and physiological science. However rapid advances in science and technology and changes in patient needs and service delivery are beginning to blur the lines between these divisions. In recognition of these changes, grouping the more than 45 specialisms into 7 themed pathways is proving to be a helpful way forward:

- Infection sciences
- Blood Sciences – hosts Haematology and Blood Transfusion Science
- Cellular Sciences
- Neurosensory sciences
- Cardiovascular, Respiratory and Sleep Sciences
- Clinical Engineering
- Medical Physics

For Haematology and Blood Transfusion Science the indicative content of the 3 years is shown below. The arrangements for rotational periods will depend on local training availability and the order, and to some extent, the duration of the rotations may vary according to local availability.

Blood Sciences Theme



Broadly, the scheme of the STP includes work based training in 4 specialist pathology rotations over the first period of training, with Genetics being common to all of life sciences.

Each period of training will last for approximately 3 months depending on local arrangements and taking into account any periods of annual leave.

At some point during the specialist training period there will be a 4-6 week elective period arranged by your local department but this may not always follow directly on from the initial rotational period. The aim of the elective period is to allow the trainees to experience other clinical departments, possibly in a different theme that has relevance to Haematology and Blood Transfusion Science.

The remaining time will be spent on specialist Haematology and Blood Transfusion Science training.

This work based component complements and utilises the parallel academic programme of training which results in a Masters degree in Blood Sciences – Haematology and Blood Transfusion Science.

The Scope of Practice of a Healthcare Scientist (HCS)

Healthcare Scientists in Haematology and Blood Transfusion Science will have clinical and specialist expertise underpinned by theoretical knowledge and experience in the specialism, and by broader knowledge and experience within the healthcare themes. They will undertake complex scientific and clinical roles, defining and choosing investigative and clinical options, making key judgements about complex facts and clinical situations for patients who require expert genetic advice. They will work directly with medical colleagues, within the multidisciplinary team, to consult and advise patients. They will be involved, often in lead roles, in innovation and improvement, Haematology and Blood Transfusion Science research and development and education and training. Some will pursue explicit academic career pathways, which combine clinical practice and activity in research, innovation and education.

Good Scientific Practice

Good Scientific Practice [GSP] sets out the principles and values on which good practice within Healthcare Science is founded. It makes explicit, for Healthcare Scientists, the public and healthcare providers, the standards of behaviour and practice that must be achieved and maintained in the delivery of work activities and clinical care. *GSP* is designed to contextualise the standards of practice and proficiency set down by the Health Professions Council (HPC) in a way that is accessible to the profession and the public. It therefore uses as its basis the HPC Standards of Proficiency and HPC Standards of Conduct, Performance and Ethics, which have been further elaborated for Healthcare Scientists in Good Scientific Practice, details of which can be found in the Appendices to this Guide.

1.2 How to use this learning guide

1.2.1 Providers of work based-learning

Section 2 provides an initial reference tool to assist providers with the provision of the training programme. Use of this reference tool will facilitate planning for the delivery of the programme, including the management of the required rotational experience within, or external to the main provider. Following review of this reference tool, providers should ensure that they obtain and are fully familiar with details in several specialist areas of training, e.g.

- requirements for training work based trainers
- assessment processes
- quality assurance and monitoring requirements
- the providers' role in supporting *equivalence* programmes for individual trainees

This information will be available in the *Operational Framework for Education and Training in Healthcare Science*, due to be published in December 2011.

Section 3 contains an overview of the Haematology and Blood Transfusion Science programme and its delivery.

Section 4 contains detail on the work based learning outcomes, suggested clinical experience, competences, knowledge base and outcome performance measures (assessment criteria) and associated behaviours for each module associated with the Haematology and Blood Transfusion Science programme.

Appendices provide further reference materials related to development and assessment in skills, behaviours and expectations of Healthcare Scientists.

1.2.2 Healthcare Science Trainees

Section 3 contains an overview of the Haematology and Blood Transfusion Science programme and its delivery.

Section 4 is the Learning Framework, which provides the training details of the programme. This is presented in a modular format and represents, as measures of successful completion of the programme and its learning outcomes:-

- clinical experience/assessment criteria for development of competence
- recommended assessment tools/methods/criteria
- competences associated with successful work performance
- associated knowledge the trainee will be able to apply
- skills and behaviours associated with effective performance

Appendices provide further reference materials related to development and assessment in skills, behaviours and expectations of Healthcare Scientists.

Other reference materials are available through the Learning and Development Manager at the providing institution/location e.g. assessment of training details, equivalence (of prior learning and experience) processes, and monitoring and quality assurance of training programmes. By December 2011 it is anticipated that this information will be available in the *Operational Framework for Education and Training in Healthcare Science*.

SECTION 2

Guidance for providers of work based learning in Haematology and Blood Transfusion Science

2.1 Programme structure and rotations

2.1.1 Programme Structure

The work based element of the Healthcare Scientist Training Programme (STP) in Haematology and Blood Transfusion Science takes place over the three years of the Programme. It commences with 4 rotations taken from those shown in the Blood Sciences Theme diagram; one of these rotational placements will be in Haematology and Blood Transfusion Science and will form the introduction to the specialist modules.

The timings of these modules will depend on local availability and will be organised locally in conjunction with your Strategic Health Authority Modernising Scientific Career leads.

In the second phase of the work based training trainees specialise in Haematology and Blood Transfusion Science based in the host Trust.

The Healthcare Scientist training programme also includes a specific research module which will be a combination of training in research methodology and a research project carried out in conjunction with the academic provider.

The Professional Practice element of the curriculum underpins both the academic and the workplace training and is based on *Good Scientific Practice* (see Appendices)

This Guide describes in detail for trainees and providers the work based training for the 4 rotational placements and for the specialist programme in Haematology and Blood Transfusion Science, in particular the curriculum content of the work based training, the details of the assessment programme and the e- portfolio structure.

It is the role of the providers of work based training to take responsibility for organising their own delivery timetables, in conjunction with the academic providers.

It is important to recognise that in the delivery of these new training programmes trainees are essentially supernumerary to service provision and will need identified and protected time to undertake their academic studies. However an equally important part of this programme is clinical competence, wherever possible and under appropriate supervision trainees should be involved directly in clinical and laboratory practice.

Each trainee should be assigned a trainer for the duration of the programme.

Throughout the early implementation of these new training programmes the National School of Healthcare Science will provide a national co-ordinating function to support departments in delivery. Assistance will be available in terms of organising specialist rotations that might

need national coordination, successful implementation of the assessment tool and the provision of a train the trainer programme. The National School for Healthcare Science will continue to function with a high level of oversight of all the Haematology and Blood Transfusion Science trainees and co-ordinate mid term and final work based assessments in collaboration with relevant professional bodies. The National School for Healthcare Science will also liaise with the relevant academic institution to ensure the timely delivery of the academic programme.

2.2. Requirements for delivery - Quality Objectives and Measures for providers of work-based training

All training departments are responsible for the delivery of the work based training quality standards detailed in the Learning and Development Agreement (LDA) issued by their local Strategic Health Authority Modernising Scientific Careers Lead.

This section provides a reference tool for work based training providers to assist with decision-making to deliver the full content of this training programme. Providers may need to include plans for working with other approved providers in order to meet the rotation and elective components, although the host provider continues to hold the responsibility for the overall quality of training provision for trainees, by regular contact e.g., weekly catch up sessions.

The table below draws providers' attention to some of the challenging issues that must be addressed in the Haematology and Blood Transfusion Science training programme.

RESOURCE OBJECTIVES

Quality objective	Requirements
<p><u>Staff resources</u></p> <p>The delivery and assessment of the Haematology and Blood Transfusion Science Healthcare Science programme requires an appropriate programme faculty across each component of the programme, all of whom have undertaken appropriate training for the role</p>	<ul style="list-style-type: none"> • Trainers are appropriately trained and qualified in training and assessment • Trainers are vocationally competent to train and assess trainees in the learning outcomes of the curriculum. • Trainers are given sufficient time to effectively fulfil all aspects of the role and ensure the quality of the programme
<p><u>Physical Resources</u></p> <p>The provider will ensure that sufficient physical resources are available, operational and approved for the required training</p>	<ul style="list-style-type: none"> • There are sufficient physical resources to ensure that trainees can undertake the required rotations.
<p><u>Rotations</u></p> <p>The range of clinical services to be available in each rotational site can be found by reference to the rotational modules in section 4</p>	<ul style="list-style-type: none"> • This may require arrangements with other providing institutions – with responsibility for ensuring quality and consistency of provision remaining with the originating provider
<p><u>Electives</u></p> <p>The provider will ensure that sufficient resources and locations are available for the elective component for 4-6 weeks</p>	<ul style="list-style-type: none"> • Available resources for electives in any Healthcare Science specialism or related clinical service
<p><u>Specialist Haematology and Blood Transfusion Science training</u></p> <p>The provider will ensure that sufficient physical resources are available for specialist training in Haematology and Blood Transfusion Science</p>	<ul style="list-style-type: none"> • Available resources for single specialism training in Haematology and Blood Transfusion Science, including the research module

SECTION 3

Guidance for Healthcare Scientist trainees in Haematology and Blood Transfusion Science

3.1 The role of the Healthcare Scientist in Haematology and Blood Transfusion Science

Healthcare Scientists in Haematology and Blood Transfusion Science fulfil all elements of the generic Scope of Practice for the specialism. They must use knowledge and experience across a wide range of clinical pathways in Haematology and Blood Transfusion Science.

The following roles will be developed throughout the training programme by a combination of work based competences, underpinning academic knowledge and clinical experience. They are not exhaustive, but are indicative of the multi-layered role of the Healthcare Scientist in Haematology and Blood Transfusion Science

Clinical Role

- Advise on patient investigation
- Interpret results and offer clinical advice on follow up and management
- Investigate the possible haematology causes and potential management of disease across a range of patient pathways including;
 - HT2 - Clinical Haematology
 - HT3 - Transfusion 1
 - HT4 – Haemostasis
 - HT5 - Haematological Malignancy
 - HT6 - Transfusion 2
- Recognise the role and importance of the multidisciplinary team environment for optimum patient care.

Managerial Role

- Provide an appropriate, modern range of services in a patient focussed environment

- Understand the legal framework for genetic testing including ethical, legal and social implications
- Conduct clinical audit

Research/Training and Education

- Participate in relevant collaborative research
- Contribute to evidence based good practice guidelines
- Research the application of scientific investigation to one or more clinical situations in Haematology and Blood Transfusion Science
- Lead or develop or participate in training and education of Healthcare Scientists in Haematology and Blood Transfusion Science

Professional Practice

- Be a role model in excellent professional behaviours and practice as described by Good Scientific Practice

3.2 About the programme – what the trainee will do

Healthcare Scientists in Haematology and Blood Transfusion Science work within the multidisciplinary clinical team to perform a number of functions. The following pages provide a broad overview of the role and functions related to the specialist Haematology and Blood Transfusion Science and rotational components of the work based part of this programme.

The detailed performance measures are included in **Section 4**, which serves as the basis for programme design, delivery and assessment.

Induction

Each time a trainee begins work based training in a new clinical or laboratory environment, an induction will be provided and will include.

- Local hospital induction – local policies
- Review of local service and functioning of the laboratory and any related operations
- Review of clinical users of the laboratory service
- Review and more detailed description of health and safety, pertinent to the modules and to the local department.
- Basic knowledge about the function, operation of equipment appropriate to the section(s) of the laboratory in which the trainee will be working

Rotational Programme

The aim of the rotational programme is to introduce the breadth of underpinning knowledge necessary to fulfil the role of a Healthcare Scientist in Haematology and Blood Transfusion Science.

Within the Haematology and Blood Transfusion Science Programme the following rotational placements operate.

The following provides a broad outline of the aims of each rotation. Detailed learning outcomes, workplace competences and knowledge specification are included in the Learning Framework in section 4.

The corresponding academic components of these modules will be delivered by the relevant academic institution, using a blended learning approach described in the Handbook for the MSc in Blood Sciences

Rotational Placements in Blood Sciences	Aim
Principles and practice OF Clinical Biochemistry	<ul style="list-style-type: none"> • Application of knowledge and understanding of the normal physiology of the major organs and the biochemical parameters in common use for the investigation and management of major organ dysfunction • The performance of common methods used in the investigation of major organ function and experience of the interpretation of patient results in a variety of clinical settings.
Principles and Practice of Haematology and Transfusion Service	<ul style="list-style-type: none"> • Application of knowledge and understanding of the formation of red blood cells • The mechanism of haemostasis and the relevance of blood group antigens and antibodies • the principles and practice of common methods used in haematology, haemostasis and blood transfusion and performance of a specified range of investigations in the laboratory • understanding of common clinical disorders associated with abnormal haematology and haemostasis and some experience of the interpretation of patient results in a variety of clinical settings • knowledge of blood transfusion in a variety of settings, and understanding of how to provide patients with safe and effective transfusion support
Principles and Practice of Clinical Immunology	<ul style="list-style-type: none"> • An introduction to the immune system and immune responses. • understanding of the organisation and delivery of a Clinical Immunology laboratory service • performance of a specified range of common methods used in Clinical Immunology • Understanding of the interpretation of patient results in a variety of clinical settings.
Principles and Practice of Genetics and Molecular Science	<ul style="list-style-type: none"> • An introduction to human Genetics and Molecular Science. • Understanding of the organisation and delivery of a Genetics laboratory service. • Performance of a defined range of common methods used in Genetics • Understanding of the interpretation of patient results in a variety of clinical settings

Aims of Specialist training in Haematology and Blood Transfusion Science

The Healthcare Scientist Programme in Haematology and Blood Transfusion Science provides work based training to complement the academic learning programme provided through the MSc in Clinical Science (Haematology and Blood Transfusion Science).

Clinical Module	Aim
Modules under development	
Research project in Haematology and Transfusion Science	<p>The overall aim of this module, building on the Research Methods module is for the trainee to undertake research that shows originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret new information in a specialism of Healthcare Science.</p> <p>During Years 2 and 3 the trainee will undertake an original piece of research involving the application of scientific investigation to one or more clinical situations.</p> <p>The trainee will also be expected to complete three shorter health services research projects to gain an understanding of the health services contexts within which clinical research is undertaken.</p> <p>One each in:</p> <ul style="list-style-type: none"> • Evidence-based practice • Clinical audit • Supporting professional service users

Trainees will complete a research project in Haematology and Blood Transfusion Science to show originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret new information in Haematology and Blood Transfusion Science. The research project will be carried out in conjunction with the relevant academic provider.

The generic 'Professional Practice' module underpins training and performance across the whole programme.

3.3 About the Programme - how you will be assessed

Assessment

There will be continuous assessment during the workplace-based training using a series of validated workplace based assessment tools. Trainees will be expected to keep a record of all assessments and competences in their e-training portfolio.

The overall workplace based assessment programme comprises a number of assessment tools.

- *Case based discussion (CbD)*
 - This tool is designed to demonstrate the trainee's knowledge and understanding of any aspect of an 'output' for which they have been wholly or partially responsible. This can range from discussion of the science behind the 'output' to ethical and communication issues arising in context.
- *Direct observation of practical skills*
 - This tool records an observation of a skill or procedure. Feedback is given and learning needs identified. Each discipline will have a core list of skills with documentation of what is expected at the relevant stage of training
- *Multi-source feedback*
 - The tool enables feedback to be given to trainees by different colleagues who work with them. The trainee and trainer nominate a range of colleagues who will be invited in accordance with agreed guidelines for who is eligible.
 - Research has shown that 8-10 raters are necessary to achieve reliability.
 - The trainee also rates him/herself.
 - This tool is also entirely on-line and there is no local paperwork. A report is generated which should be discussed with the trainee by a trainer who has been trained in giving feedback. The report is placed in the online training portfolio.
- *Observation of clinical events (based on Mini-Cex)*
 - A clinical event is defined as any occasion when the trainee/student is present with a patient as part of the clinical team. This is true for all patient-facing occasions whether the trainee only observes, or speaks to, touches, positions or examines a patient.
 - The tool records aspects of the trainee's communication and clinical skills as relevant. It also records professionalism

The assessment programme is an integral part of the curriculum. The curriculum in turn is based on *Good Scientific Practice*. This linkage is crucial to standard setting and to support review of the satisfactory progression of trainees through the programme. The assessment tools taken together therefore provide evidence/information about the trainee's ability in relation to all aspects of the curriculum.

The evidence provided by the work place based assessments taken together provide evidence/ information about the trainee's ability, demonstrated in the workplace, in relation to all aspects of the curriculum.

Assessment Tool	DOPS	MiniCex	CbD	MSF
Purpose	Observation Observe and assess the conduct of a practical procedure	Observation Observe and assess a clinical encounter	Conversation/ discussion Discuss an outcome/ output from workplace activity using a record, result,	Review by others/colleagues Professionalism Interpersonal skills/Team working Communication
Takes place	Process Reviewed and documented with feedback in the moment/ as it is happening	Process Reviewed and documented with feedback in the moment/ as it is happening	Outcome/output Discussing, explaining, justifying aspects of the report/record/result. Including aspects of professionalism	Reflecting on comments of others within the framework of constructive feedback

There is a requirement for each trainee to engage with the assessment process and to complete a minimum numbers of the different types of assessments within each module; these will be detailed in the assessment manual and on the tool.

Online assessment and personal development management system

An online assessment and personal development management system provides an electronic medium for completion and logging of all of the personal assessments related to the workplace elements for the Modernising Scientific Careers (MSC) training programmes and is available for the work place elements of the programme.

The electronic portfolio provides support to the trainees with their continuous professional development throughout the training programme and provides a mechanism through which their development and progress can be monitored and managed.

Progression

Maintaining the electronic portfolio is an integral part of the workplace based programme and its maintenance by the trainees is essential for progression. Trainees are responsible for maintaining their portfolio and keeping keep a record of all assessments and competences and information relating to their progression through the programme up to date.

The National School of Healthcare Science will use the assessment tool to consider the trainee's progression at any time within the programme and to provide feedback around areas of development. The successful completion of the online assessments will form the main body of evidence for the School and the Professional bodies to award the Certificate of Competence.

Rotation Assessment

During the rotational periods there should be one DOP and one CBD completed for each rotation.

The clinical experiential learning should be recorded on the online tool as reflective learning and will form an important part of your portfolio.

The trainees must complete all competences by the end of the rotation.

SECTION 4

The Learning Framework

The following section provides the framework for the design, delivery and assessment of learning and performance outcomes and associated knowledge and skills.
The framework provides a specification for each rotation and then for the specialist component of the programme
All of the underpinning academic knowledge will be taught as part of the Masters programme delivered by the academic provider

Rotational Modules

GENETICS AND MOLECULAR SCIENCE

MODULE TITLE	Genetics and Molecular Science	COMPONENT	Rotation
AIM	This module will provide the trainee with an introduction to human Genetics and Molecular Science. They will understand the organisation and delivery of a Genetics laboratory service. They will perform some common methods used in Genetics and gain an understanding of the interpretation of patient results in a variety of clinical settings.		
SCOPE	The investigation, interpretation and reporting of chromosomal abnormality and molecular disease, using the correct sampling and laboratory techniques and including application of principles of quality control principles and use of IT systems		

LEARNING OUTCOMES

On successful completion of this module the trainee will achieve the following learning outcomes;

1. Assist with the investigation of chromosomal abnormality, the correct sampling technique and the use of ISCN.
2. Understand and observe cell culture, slide making and G-band staining techniques used in the investigation of chromosome anomalies.
3. Assist with the investigation of the molecular basis of disease, the correct sampling technique and relevant quality parameters
4. Understand perform DNA extraction techniques, PCR reactions and sequencing reactions used in the investigation of the molecular basis of disease.
5. Apply the principles of internal quality control and external quality assessment and draw conclusions about assay performance.
6. Assist with the interpretation and reporting of laboratory results in the context of named genetic disorders.
7. Participate in activities that involve working in partnership with other clinical specialisms in the investigation of genetic disorders.

The following section provides detail of expected achievements in both practical and knowledge based learning outcomes for this module.

Required achievements are cross-referenced to the above Learning Outcomes to ensure application of competence across all activities within this module and thus maintain an integrated and holistic approach to development and assessment.

CLINICAL EXPERIENTIAL LEARNING

The recommended examples of clinical experiential learning for this module are:

Attendance at multidisciplinary meetings

Attendance at specialist Genetics clinics

Observation of cell culture and chromosome preparation techniques

The trainee will gain experience of;

- investigation of chromosomal abnormality, the correct sampling technique and the use of ISCN
- investigation of the molecular basis of disease, the correct sampling technique and relevant quality parameters
- interpretation and reporting of laboratory results in the context of named genetic disorders
- the partnership of Genetics to other clinical specialisms in the investigation of genetic disorders

All of these experiences should be recorded in your e- portfolio as reflective learning and discussions with your training officers.

Requirements for Professional Practice are contextualised to ensure the application and assessment of broad descriptors contained within Good Scientific Practice.

KEY LEARNING OUTCOMES	COMPETENCES	KNOWLEDGE AND UNDERSTANDING
1,3,5	Receive, label and store specimens for chromosome investigation and understand referral patterns.	<ul style="list-style-type: none"> • Minimum data set required for identification and samples and the importance of ensuring that this is complete and correct. • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Use of laboratory and hospital information systems to identify and record patient demographics, clinical details and relevant laboratory results • How to generate a unique sample identifier • The importance of maintaining correct and unique labelling, including transfer of labels throughout the preparation • Process documentation relevant to sample preparation and its importance • Retention policy for diagnostic materials, and records of analysis • Ethical guidelines for storage of diagnostic materials • An understanding of the common reasons for referral for cytogenetic investigations
1	Perform a basic chromosome analysis on a minimum of 5 cases that demonstrate different chromosomal syndromes or anomalies	<ul style="list-style-type: none"> • Understand basic chromosome identification • Understand karyotype construction • Basic understanding of numerical and structural anomalies and normal variation • Relationship of basic chromosomal anomalies to clinical features in patients
2	Use microscopy and digital imaging to	<ul style="list-style-type: none"> • Procedures for manual, digital and photographic storage and retrieval of data from cytogenetic investigations

	perform a basic chromosome analysis	
3	Receive, label and store specimens for molecular diagnostic testing and understand the reasons for referral.	<ul style="list-style-type: none"> • Minimum data set required for identification and samples and the importance of ensuring that this is complete and correct. • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Use of laboratory and hospital information systems to identify and record patient demographics, clinical details and relevant laboratory results • How to generate a unique sample identifier • The importance of maintaining correct and unique labelling, including transfer of labels throughout the preparation process • Documentation relevant to sample preparation and its importance • An understanding of the common reasons for referral for molecular testing • Policy for authorisation and disclosure of results
1-4	Observe and perform both manual and automated DNA extraction techniques	<ul style="list-style-type: none"> • The purpose, process, capabilities and limitations of extraction procedures and associated equipment • Relevant protocols and their application including health and safety considerations • Requirements for containment levels • The quality and quantity of DNA/RNA required for each test to be performed • Factors affecting the quality of extractions • The range and requirements for records and documentation associated with extractions

3	Observe and perform PCRs and a basic sequencing reaction and fragment analysis	<ul style="list-style-type: none"> • Correct mutation nomenclature • Principles and applications of relevant methods and techniques • The principles of PCR • The significance of contamination and sensitivity of PCR • Hazards and risks associated with PCR • Relevant current QC procedures • Characteristics of sub-standard reactions • Factors affecting the integrity of samples and reagents including lability and contamination • Factors affecting integrity of reagents used in the tests conducted and relevant sensitivities to conditions of cold, heat and light • Principles of electrophoresis of nucleic acids • Principles of radioactive and fluorescent image detection • Principles of mutation detection and DNA sequencing • Limitations and sensitivity of each test method • The nature and effect of possible artefacts
4	Perform a basic molecular analysis on 5 cases demonstrating common molecular Genetics syndromes.	<ul style="list-style-type: none"> • Ethical guidelines for testing • The clinical background and molecular pathology of the disorder being investigated • The range of tests available for the individual or the family • Professional and local guidelines for tests appropriate to each disorder • Significance of previous results in relation to the current sample • Relevant professional guidelines and correct interpretation
5	Apply internal quality control and external quality assessment methods used in cytogenetics and molecular Genetics	<ul style="list-style-type: none"> • The importance of IQA during the testing process • Importance of EQA
6	Apply microcomputer software for tasks related to Genetics. To include an	<ul style="list-style-type: none"> • Access, use and limitations of omim, genome and mutation databases • Importance of maintaining records for extended time because of implications for heritable cytogenetic disorders to future generations,

	introduction to bioinformatics	<p>and karyotype changes within an individual associated with a clinical disorder</p> <ul style="list-style-type: none"> • Limits and performance characteristics of each test, including instrumentation and software packages for data analysis
7	Understand the preparation of reports and the reporting process for patients being investigated for named genetic disorders	<ul style="list-style-type: none"> • Range of reporting formats and options • Relevant professional guidelines for reporting • Policy for authorisation and disclosure of results • Factors involved in evaluation of clinical risk to patient and their family • Procedures for issuing written results, verbal results, for faxing or • Patterns of inheritance (Mendelian and non Mendelian) including imprinting • Requirements for disclosure and confidentiality

Associated Behaviours and Professional Practice

*The Healthcare Scientist operates to high standards of professionalism and demonstrates essential behaviours and personal qualities These are specified within **Good Scientific Practice** and map to the professional standards needed for registration with the appropriate Regulatory Bodies.*

*These include areas such as communication and Health and Safety that complement and test application of the academic learning. These qualities need to be assessed throughout the work based assessment programme and will be demonstrated using appropriate assessment tools (DOPs and CBDs). Appendix 1 contains the summary of these professional qualities
The application of key professional qualities in this module is contextualised below.*

- ✓ Communicate complex and technical information to colleagues and those with limited technical knowledge in terms that facilitate understanding of issues relating to investigation of acquired and inherited cancer
- ✓ Ensure validation of data, through use of appropriate sources of information including relevant databases and consultation with senior colleagues
- ✓ Evaluate data from a range of analysis, information and personal support sources to assist with judgements and decisions on interpretation, extended testing, reporting and communicating results
- ✓ Make use of suitable range of diagnostic, investigative and/or monitoring procedures when undertaking investigation into chromosomal abnormality
- ✓ Produce a range of written reports in accordance with personal level/sphere of responsibility for investigation of chromosomal abnormality
- ✓ Use the appropriate range of IT platforms and software to ensure effective and comprehensive data collection and analysis in relation to the investigation of chromosomal abnormality
- ✓ Audit scientific practice within all areas of practice associated with investigation of to ensure application of ethical and governance regulations
- ✓ Accept the responsibilities of the role of the Healthcare Scientist in relation to other health care professionals and with empathy and sensitivity to patients, carers and families when working within the sphere of acquired and inherited cancer
- ✓ Prioritise and organise workload and duties with due regard for urgency, patient care, safe practice and the optimisation of genetic laboratory workload.
- ✓ Work effectively and efficiently within a multi-disciplinary team with due regard for the needs, wishes, dignity and privacy of patients and their families
- ✓ Present Quality Assurance data in compliance with principles of internal Quality Control and external Quality Assurance

SECTION 4

The Learning Framework

The following section provides the framework for the design, delivery and assessment of learning and performance outcomes and associated knowledge and skills.
The framework provides a specification for each rotation and then for the specialist component of the programme
All of the underpinning academic knowledge will be taught as part of the Masters programme delivered by the academic provider

Rotational Modules

CLINICAL BIOCHEMISTRY

Rotation Module

MODULE TITLE	Clinical Biochemistry – Investigation of Major Organ Function	COMPONENT	Rotation
AIM	This module will provide trainees with the knowledge and understanding of the normal physiology of the major organs and the biochemical parameters in common use for the investigation and management of major organ dysfunction. They will perform a selection of common methods used in the investigation of major organ function and gain experience of the interpretation of patient results in a variety of clinical settings		
SCOPE	Biochemical investigation, interpretation and reporting of major organ disease in the patient pathway, using a range of laboratory and point of care techniques and including application of quality control principles, use of relevant IT systems		

LEARNING OUTCOMES

On successful completion of this module the trainee will achieve the following work based learning outcomes

1. Perform a range of laboratory and point of care techniques used in the workplace to investigate major organ function.
2. Apply the principles of internal quality control and external quality assessment and draw conclusions about assay performance.
3. Use laboratory IT systems for handling, processing and storage of patient data.

The following section provides detail of expected achievements in both practical and knowledge based learning outcomes for this module.

Required achievements are cross-referenced to the above Learning Outcomes to ensure application of competence across all activities within this module and thus maintain an integrated and holistic approach to development and assessment.

CLINICAL EXPERIENTIAL LEARNING

The recommended examples of clinical experiential learning for this module are

- Attend multidisciplinary review meetings at which biochemical results of major organ function are presented as part of the clinical record
- Attend a clinical unit where POCT for major organ function is performed. Discuss the method(s) with trained users
- Demonstrate an understanding of the preparation of reports and the reporting process for patients being investigated for major organ function by observing technical and clinical validation. Record case overviews observed.

The trainee will gain experience of:

- The biochemical investigation of major organ disease in the patient pathway, the correct sampling technique and the use and validity of reference range
- The interpretation and reporting of laboratory results in the context of common clinical disorders.
- The partnership of Clinical Biochemistry to other clinical specialisms in the investigation of disorders of major organs

All of these experiences should be recorded in your e-portfolio as reflective learning and discussions with your training officers

Requirements for Professional Practice are contextualised to ensure the application and assessment of broad descriptors contained within Good Scientific Practice.

KEY LEARNING OUTCOMES	COMPETENCES	KNOWLEDGE AND UNDERSTANDING
1	<p>Receive, label and store a routine Clinical Biochemistry sample</p> <hr/> <p>Recommend the most appropriate test for two example clinical presentations e.g.: diabetes</p>	<ul style="list-style-type: none"> • Minimum data set required for identification and samples and the importance of ensuring that this is complete and correct. • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Types and implications of hazards and risks associated with handling of specimens and relevant control measure • The quality management process that ensures the correct location and storage of documentation and specimens at each stage of process • Legal and ethical considerations and requirements in respect of examination selection of control material and disposal of specimens • Infection risk from samples • Safe laboratory practices including principles of decontamination of equipment and work areas • Quality Assurance procedures and their application • Local and National Health and Safety policies and procedures and their application <hr/> <ul style="list-style-type: none"> • Relevant records, their importance and how to complete these correctly • The application of common biochemical markers of major organ function to a range of frequently encountered clinical disorders • The repertoire, specimen requirements, storage, ordering, reference ranges and turnaround times of the methods used to investigate major organ function
1,2	<p>Select appropriate instrumentation in your training laboratory. To include</p> <ul style="list-style-type: none"> • ISE • Spectrophotometry 	<ul style="list-style-type: none"> • Scientific basis of the following techniques: spectrophotometry, osmometry, ion selective electrodes, enzymology, immunochemical techniques, electrophoresis, chromatography, and solid phase

	<ul style="list-style-type: none"> • Immunoassay • Enzymology • Plus one other from • Fluorimetry • Nephelometry / turbidimetry • Densitometry • Osmometry • Enzymology • Ion selective electrodes 	<p>chemistry</p> <ul style="list-style-type: none"> • The biological and statistical basis of biological variation, reference values and action limits • Use of calibration and control materials
1,2	<p>Specify standard test profiles associated with the following analyser platforms</p> <ul style="list-style-type: none"> • Modular systems • Elementary robotics • Automated immunoassay analysers 	<ul style="list-style-type: none"> • Design, operation and performance of automated analytical platforms, including random access, modular, robotics etc. • Principles and practice of internal quality control and external quality assessment • Risks associated with performance of standard profiles and how to manage these e.g. contamination, interferences, age of sample etc • Performance of analysis in accordance with appropriate standard
1,2	<p>Use manual methods to specified quality standard to include;</p> <ul style="list-style-type: none"> • Spectrophotometry • Osmometers • Urine analysis (e.g. dipsticks, or pregnancy tests) 	<ul style="list-style-type: none"> • Design, operation and performance of point of care testing devices supported by the Clinical Biochemistry laboratory • How to recognise when incorrect procedures have been applied
1,2	<p>Use <u>one</u> of the following POCT methods/devices to specified quality standards:</p> <ul style="list-style-type: none"> • Blood gas analysers • Co-oximetry • Blood glucose meters 	<ul style="list-style-type: none"> • Technical validation procedures for analytical results • Relevant Standard Operating Procedures and their application

1,2	Perform analysis using the following methods: <ul style="list-style-type: none"> • HbA1c • Albumin • Creatinine calcium • Bilirubin • Transaminases • Troponin • Glucose • IonSelletine electrode • TSH • Free T4 • Cortis 	<ul style="list-style-type: none"> • Presentation, diagnosis and management of common clinical biochemical disorders of major organ function • The clinical and scientific basis of common biochemical markers of function of the kidney, liver, heart, lungs, bone and pancreas • The information to be included in an interpretative report • How to refer specimens for further analysis
3	Use microcomputer software associated with the LIMS and laboratory equipment	
1,2,3	Produce a basic interpretative report on biochemistry investigations	<ul style="list-style-type: none"> • The information to be included in an interpretative report • How to construct an interpretative report and the format required for presentation • Limits of responsibility in the authorisation and issue of interpretative reports • Clinical conditions which may require urgent action and how to instigate such action • Normal and abnormal results and their significance to clinical question or condition

Associated Behaviours and Professional Practice

*The Healthcare Scientist operates to high standards of professionalism and demonstrates essential behaviours and personal qualities These are specified within **Good Scientific Practice** and map to the professional standards needed for registration with the appropriate Regulatory Bodies.*

*These include areas such as communication and Health and Safety that complement and test application of the academic learning. These qualities need to be assessed throughout the work based assessment programme and will be demonstrated using appropriate assessment tools (DOPs and CBDs). Appendix 1 contains the summary of these professional qualities
The application of key professional qualities in this module is contextualised below.*

- ✓ Communicate complex and technical information to service users, patients and those with limited technical knowledge in terms that facilitate understanding of issues
- ✓ Ensure validation of data, through use of appropriate sources of information including relevant databases and consultation with senior colleagues
- ✓ Evaluate data from a range of analysis, information and personal support sources to assist with judgements and decisions on interpretation, extended testing, reporting and communicating results
- ✓ Make use of suitable range of diagnostic, investigative and/or monitoring procedures when undertaking investigations
- ✓ Produce a range of written reports in accordance with personal level/sphere of responsibility
- ✓ Use the appropriate range of IT platforms and software to ensure effective and comprehensive collection and analysis of pathology data
- ✓ Audit scientific practice within all areas of practice associated with investigation of to ensure application of ethical and governance regulations
- ✓ Understand the responsibilities of the role of the Healthcare Scientist in relation to other health care professionals
- ✓ Prioritise and organise workload and duties with due regard for urgency, patient care, safe practice and the optimisation of laboratory workload.
- ✓ Work effectively and efficiently within a multi-disciplinary team with due regard for the needs, wishes, dignity and privacy of patients and their families
- ✓ Present Quality Assurance data in compliance with principles of internal Quality Control and external Quality Assurance

SECTION 4

The Learning Framework

The following section provides the framework for the design, delivery and assessment of learning and performance outcomes and associated knowledge and skills.
The framework provides a specification for each rotation and then for the specialist component of the programme
All of the underpinning academic knowledge will be taught as part of the Masters programme delivered by the academic provider

Rotational Modules

HAEMATOLOGY AND TRANSFUSION SCIENCE

MODULE TITLE	Haematology and Transfusion Science	COMPONENT	Rotation
AIM	This module will provide trainees with the knowledge and understanding of the formation of red blood cells, the mechanism of haemostasis and the relevance of blood group antigens and antibodies		
SCOPE	On completion of this module the trainee will understand the formation of red blood cells, the mechanism of haemostasis and the relevance of blood group antigens and antibodies. They will be able to apply the principles and practices of common methods used in haematology, haemostasis and blood transfusion and perform a specified range of investigations in the laboratory. They will have gained an understanding of common clinical disorders associated with abnormal haematology and haemostasis and have some experience of the interpretation of patient results in a variety of clinical settings. They will have attached a basic knowledge of blood transfusion in a variety of settings, and understanding of how to provide patients with safe and effective transfusion support		

LEARNING OUTCOMES

On successful completion of this module the trainee will achieve the following work based learning outcomes

1. Perform a range of laboratory techniques used in screening and investigating haematological disorders.
2. Perform the range of laboratory and point of care techniques used in the investigation of disorders of haemostasis.
3. Perform blood group serology in the context of pre-transfusion testing.
4. Select safe and appropriate blood and blood components for patients with a range of clinical conditions.
5. Apply the principles of internal quality control and external quality assessment and draw conclusions about assay performance.
6. Use laboratory IT systems for handling, processing and storage of patient data.

The following section provides detail of expected achievements in both practical and knowledge based learning outcomes for this module.

Required achievements are cross-referenced to the above Learning Outcomes to ensure application of competence across all activities within this module and thus maintain an integrated and holistic approach to development and assessment.

CLINICAL EXPERIENTIAL LEARNING

The recommended examples of clinical experiential learning for this module are:

- Participate in the local programme for monitoring anticoagulation therapy
- Under supervision, prepare 1 report for patients being investigated for one of the following
 - Basic haematological disorders
 - Haemostasis
 - Blood transfusion
- Attendance at MDT clinics

The trainee will gain experience of;

- The scope of the hospital haematology laboratory in the investigation of basic haematological disorders, haemostasis and blood transfusion
- A range of blood components and products in common use and their correct storage
- The investigation of basic haematological disorders, the correct sampling technique and the use and validity of reference ranges
- The interpretation and reporting of laboratory results in the context of common clinical disorders
- The partnership of haematology and transfusion science to other clinical specialisms in the investigation and management of common disorders
- Blood film preparation, staining and interpretation in normal and pathological conditions including parasites

All of these experiences should be recorded in your e-portfolio as reflective learning and discussions with your training officers.

Requirements for Professional Practice are contextualised to ensure the application and assessment of broad descriptors contained within Good Scientific Practice.

KEY LEARNING OUTCOMES	COMPETENCES	KNOWLEDGE AND UNDERSTANDING
1,2,5,6	Receive process and store common haematology specimens	<ul style="list-style-type: none"> • Minimum data set required for identification and samples and the importance of ensuring that this is complete and correct • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Types and implications of hazards and risks associated with handling of specimens and relevant control measures • The quality management process that ensures the correct location and storage of documentation and specimens at each stage of process • Infection risk from blood samples • Safe laboratory practices including principles of decontamination of equipment and work areas • Quality Assurance procedures and their application • Local and National Health and Safety policies and procedures and their application • Relevant records, their importance and how to complete these correctly • The repertoire, specimen requirements referral patterns and storage, ordering, reference ranges and turnaround times of the methods used to investigate the specified range of disorders and requests listed • Principles, scientific basis and clinical application of commonly performed analytical procedures in haematology • Significance and importance of bottle and anticoagulant types
1,2,3,5,6	<p>Interpret request forms and recommend the most appropriate investigation strategy to investigate:</p> <ul style="list-style-type: none"> • Basic haematological disorders • Haemostasis • Patients for blood transfusion 	<ul style="list-style-type: none"> • Minimum data set required for identification and samples and the importance of ensuring that this is complete and correct • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Types and implications of hazards and risks associated with handling of specimens and relevant control measures • The quality management process that ensures the correct location and storage of documentation and specimens at each stage of process • Infection risk from blood samples • Safe laboratory practices including principles of decontamination of equipment and work areas • Quality Assurance procedures and their application • Local and National Health and Safety policies and procedures and their application • Relevant records, their importance and how to complete these correctly • The repertoire, specimen requirements referral patterns and storage, ordering, reference ranges and turnaround times of the methods used to investigate the specified range of disorders and requests listed • Principles, scientific basis and clinical application of commonly performed analytical procedures in haematology • Significance and importance of bottle and anticoagulant types

1.2.3	<p>Interpret laboratory data in the light of clinical details and prepare basic interpretive written reports on patients with <u>at least two</u> of the following</p> <ul style="list-style-type: none"> • Iron deficiency anaemia and iron overload • Haemolytic anaemia • Megaloblastic anaemia /folate deficiency • Polycythemia • Abnormal haemoglobin and thalassaemia (initial tests) • Haematological malignancy (blood cell abnormalities) 	<ul style="list-style-type: none"> • The clinical features of iron deficiency and iron overload and of the anaemia of chronic disease. • Relevant specific national/international guidelines. • The information to be included in an interpretative report • How to construct an interpretative report and the format required for presentation • The lines of communication and responsibility for reporting reactions or complications both in the clinical management of the reaction and the documentation and reporting of the incident • Limits of responsibility in the authorisation and issue of interpretative reports • Normal and abnormal results and their significance to clinical question or condition, clinical conditions which may require urgent action and how to instigate such action • Reference values and the significance of abnormal results • Limitations of interpretation and reporting • How to deal with out of range quality control values
1	<p>Identify <u>one</u> case requiring urgent intervention and describe relevant clinical advice on follow up and /or further management</p>	
1,2,5	<p>Perform <u>at least three</u> of the following methods to specified quality standards:</p> <ul style="list-style-type: none"> • Automated analysers to quantify erythrocytes, leucocytes, platelets, 	<ul style="list-style-type: none"> • Principles and scientific basis of automated analysers • Point of care testing in haematology • Principles and methods of laboratory investigations and clinical findings in testing of suspected inherited platelet disorders • The effect of medication on results of testing

	<p>reticulocytes and white cell differentiation</p> <ul style="list-style-type: none"> • Erythrocyte sedimentation rate <p>Prepare blood and bone marrow aspirate films</p> <p>- Peripheral blood cell microscopy</p> <p>Recognition of malarial parasites</p>	<ul style="list-style-type: none"> • Bone marrow aspiration, trephine biopsy, preparation and staining techniques for the morphological identification of cells in bone marrow in normal and pathological conditions • Collection of trephine and bone marrow aspirates and their correct application • Methods and techniques for preparation of bone marrow cells for microscopy • Principles of microscopy • The principles of staining and the application of staining techniques • The pre-analytical variables that will affect the appearance of cells
1,5,6	<p>Interpret laboratory data in the light of clinical details and prepare written reports on patients <u>with one</u> of the following;</p> <ul style="list-style-type: none"> • Common bleeding disorders • Common thrombotic disorders • Lupus anticoagulation 	<ul style="list-style-type: none"> • Principles and correct use of the instrumentation, reagents and methodology to assess a specific coagulation factor deficiency • Reference values and the significance of abnormal results • Interpretation of lupus results and the importance of confirmation tests • Interpretation of lupus results and the importance of confirmation test • Relevance and significance of linearity and parallelis • Common clinical findings and laboratory investigation of suspected haemophilia A, B and von Willebrands disease • Laboratory findings in acquired coagulation disorders • Laboratory investigations of suspected factor inhibitors • Principles of replacement therapy • Effects of liver disease and vitamin K deficiency on coagulation factors

1.2.5.6	Perform the following range of investigations; <ul style="list-style-type: none"> • Prothrombin time (PT) • Activated partial thromboplastin time (APTT) • Anticoagulation therapy monitoring (INR) • POCT • D-Dimer 	<ul style="list-style-type: none"> • Appropriate time to investigate following a thrombotic event • Laboratory investigations of VTE and arterial thrombosis • The effect of medication on results of testing • The principles of anticoagulant therapy, therapeutic ranges and laboratory monitoring of warfarin, unfractionated heparin and low molecular weight heparin • The use of d-dimer for the investigation of a suspected venous thromboembolism • The relationship between abnormal anticoagulation screening and other laboratory tests such as full blood count and liver function tests
3.5.6	Perform: <ul style="list-style-type: none"> • ABO and RhD typing • Investigation of commonly encountered Red cell antibodies 	<ul style="list-style-type: none"> • ABO and RhD blood group Genetics • The range of tests appropriate to investigations and their selection • Clinical significance of red cell antibodies • Serological identification of red cell antigens and antibodies • Antibody mediated intra and extra vascular red cell destruction & the role of complement • Selection of reagents, controls and techniques for antibody identification • Relevant current Guidelines
3,5,6	Perform routine Blood Transfusion tests- pre-issue of blood components	<ul style="list-style-type: none"> • Selection of appropriate phenotype of blood for transfusion • Current guidelines for pre-transfusion testing • The limitations of the testing repertoire available in-house and options for referral • Relevant current Guidelines • The legal requirements and local guidelines that must be followed prior to the issue of blood components and/or products • The range and purpose of tests performed prior to validation • Protocols and procedures for dealing with non-conforming products

		<ul style="list-style-type: none"> and components or equipment failure • How deviations from processing procedures may influence the quality of blood products and components • Principles of pre-transfusion testing • Normal ranges and predictive values for pathology tests used to inform transfusion support • Aetiology and clinical features of conditions requiring transfusion support • Overview of legislation / guidelines relevant to blood transfusion practice • The local system for stock checking and management and the role of the Blood Stocks Management Scheme • Methods and conditions of storage of the products and component • When, how and why to quarantine the products and components • Factors influencing the quality, integrity and suitability of blood products and components • The key clinical indications of transfusion/transplantation reactions or complications • The importance of an audit trail • How to manage autologous donations
1,2,3,5	Produce a basic interpretative report on haematological investigations	<ul style="list-style-type: none"> • The information to be included in an interpretative report • How to construct an interpretative report and the format required for presentation • Limits of responsibility in the authorisation and issue of interpretative reports • Clinical conditions which may require urgent action and how to instigate such action • Normal and abnormal results and their significance to clinical question or condition

Associated Behaviours and Professional Practice

*The Healthcare Scientist operates to high standards of professionalism and demonstrates essential behaviours and personal qualities These are specified within **Good Scientific Practice** and map to the professional standards needed for registration with the appropriate Regulatory Bodies.*

These include areas such as communication and Health and Safety that complement and test application of the academic learning.

*These qualities need to be assessed throughout the work based assessment programme and will be demonstrated using appropriate assessment tools (DOPs and CBDs). Appendix 1 contains the summary of these professional qualities
The application of key professional qualities in this module is contextualised below.*

- ✓ Communicate complex and technical information to patients and those with limited technical knowledge in terms that facilitate understanding of issues
- ✓ Ensure validation of data, through use of appropriate sources of information including relevant databases and consultation with senior colleagues
- ✓ Evaluate data from a range of analysis, information and personal support sources to assist with judgements and decisions on interpretation, extended testing, reporting and communicating results
- ✓ Make use of suitable range of diagnostic, investigative and/or monitoring procedures when undertaking investigations
- ✓ Produce a range of written reports in accordance with personal level/sphere of responsibility, including interpretation of results
- ✓ Use the appropriate range of IT platforms and software to ensure effective and comprehensive data collection and analysis Audit scientific practice within all areas of practice associated with investigations to ensure application of ethical and governance regulations
- ✓ Audit scientific practice within all areas of practice associated with investigation of to ensure application of ethical and governance regulations
- ✓ Accept the responsibilities of the role of the Healthcare Scientist in relation to other health care professionals and with empathy and sensitivity to patients, carers and families
- ✓ Prioritise and organise workload and duties with due regard for urgency, patient care, safe practice and the optimisation of laboratory workload.
- ✓ Work effectively and efficiently within a multi-disciplinary team with due regard for the needs, wishes, dignity and privacy of patients and their families
- ✓ Present Quality Assurance data in compliance with principles of internal Quality Control and external Quality Assurance

SECTION 4

The Learning Framework

The following section provides the framework for the design, delivery and assessment of learning and performance outcomes and associated knowledge and skills.
The framework provides a specification for each rotation and then for the specialist component of the programme
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Rotational Modules

CLINICAL IMMUNOLOGY

MODULE TITLE	Immunity and the Principles and Practice of Clinical Immunology	COMPONENT	Rotation
AIM	This module will provide trainees with an introduction to the immune system and immune responses		
SCOPE	Trainees will understand the organisation and delivery of a Clinical Immunology laboratory service. They will perform some common methods used in Clinical Immunology and gain an understanding of the interpretation of patient results in a variety of clinical settings		

LEARNING OUTCOMES

On successful completion of this module the trainee will achieve the following learning outcomes;

1. Use laboratory IT systems for handling, processing and storage of patient data
2. Perform a range of laboratory techniques used in the workplace in Clinical Immunology
3. Apply the principles of internal quality control and external quality assessment and draw conclusions about assay performance

The following section provides detail of expected achievements in both practical and knowledge based learning outcomes for this module.

Required achievements are cross-referenced to the above Learning Outcomes to ensure application of competence across all activities within this module and thus maintain an integrated and holistic approach to development and assessment.

CLINICAL EXPERIENTIAL LEARNING

The recommended examples of clinical experiential learning for this module are

Participate in review meetings at which results from patients with at least two of the following are reviewed;

- Protein disorders
- Autoimmune disease
- Immunodeficiency
- Allergy

The trainee will gain experience of

- The investigation of the immune response, correct sampling technique and the use and validity of reference ranges
- The role of the immune response in common clinical disorders where the immune system is dysfunctional
- The interpretation and reporting of laboratory results in the context of common clinical disorders where the immune system is dysfunction
- The partnership of Clinical Immunology to other clinical specialisms in the investigation and management of disorders of the immune system

All of these experiences should be recorded in your e-portfolio as reflective learning and discussions with your training officers.

Requirements for Professional Practice are contextualised to ensure the application and assessment of broad descriptors contained within Good Scientific Practice.

KEY LEARNING OUTCOMES	COMPETENCES	KNOWLEDGE AND UNDERSTANDING
1,3	Receive, label and store of a wide range of immunological specimens	<ul style="list-style-type: none"> • Minimum data set required for identification of samples and the importance of ensuring that this is complete and correct. • Factors affecting sample integrity and appropriate corrective action • Procedures for handling samples which may contain category 2,3, and 4 pathogens • Types and implications of hazards and risks associated with handling of specimens and relevant control measures • The quality management process that ensures the correct location and storage of documentation and specimens at each stage of process • Safe laboratory practices including principles of decontamination of equipment and work areas • Local and National Health and Safety policies and procedures and their application • Relevant records, their importance and how to complete these correctly • Correct use of manual and computerised systems for generating labels for the products and component • The repertoire, specimen requirements, referral pattern and storage, ordering, reference ranges and turnaround times of the methods used in Clinical Immunology • The range of investigative techniques used in Clinical Immunology and their application • Selection and use of suitable and appropriate control materials • Use and application of reagents for analysis • Correct conditions and locations for storage of test reagents • Specimen preservation, distribution, separation, storage and disposal procedures

2,3	Select and apply appropriate control materials	<ul style="list-style-type: none"> • Capabilities and limitations of methods, techniques and equipment • Use, care, monitoring, calibration and routine maintenance of Clinical Immunology laboratory equipment to include (relevant to automated methods available) from the following list:
2,3	<p>Use automated methods, techniques and instrumentation to include <u>at least four</u> of the following:</p> <ul style="list-style-type: none"> • Protein analysis • Immunoassay • Nephelometry/turbidimetry • Electrophoresis • Immunofixation • Iso-electric focussing • Densitometry • Immunoblotting • Immunodiffusion • Immunofluorescence • Microscopy • Agglutination assays • Flow cytometry • Allergy testing 	<ul style="list-style-type: none"> • Pipettes • Balances • Centrifuges • Refrigerators • Water baths • Incubators • pH meters • freezers • radioactive counters, • sample preparation units • automated analysers

2,3	<p>Interpret laboratory data in the light of clinical details on patients with common disorders where the immune system is dysfunctional including <u>at least 2</u> of the following;</p> <ul style="list-style-type: none"> • Protein disorders • Autoimmune disorders • Immunodeficiency disorders • Basic allergy testing 	<ul style="list-style-type: none"> • Organisation and components of the immune system • Immunoglobulins, complement and opsonins • Inflammatory markers , • Ranges and values needed for interpretation of results • Cellular components (lymphocytes; granulocytes; monocytes/macrophages) • Humoral components (Autoantibodies , the range of Autoantibodies and the role they play in autoimmune disease, immunoglobulins; importance of their levels and their absence, complement; importance of their levels and their absence,) • Central molecules of the immune system (major histocompatibility molecules class I & II; CD molecules/cell surface markers; receptor molecules; recognition molecules; adhesion molecules; effector molecules): Majority are used in conjunction with flow cytometry. It will be important to have a basic knowledge of their use in a Clinical Immunology laboratory and in which diseases their levels and absence is crucial. • Antigen presentation • Innate immune response (endothelial cells; neutrophils; macrophages; natural killer cells; complement). Have a basic working knowledge of which of the components of the innate immune system routine assays can be usefully examined in a Clinical Immunology laboratory and in which suspected key diseases such assays are performed • Adaptive immune response (antigen processing; dendritic cells; T cell responses; B cell responses; primary and secondary responses; vaccination/immunisation)). Have a basic working knowledge of which
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		<p>of the components of the adaptive immune system routine assays can be usefully examined in a Clinical Immunology laboratory and in which suspected key diseases such assays are performed</p> <ul style="list-style-type: none">• Outcome of immune responses (immunity/immunological memory; direct & indirect functions of antibodies; incidental tissue damage; hypersensitivity and allergy).• Causes of and physiological basis of allergy caused by IgE involvement. Have a good basic working knowledge of the major assay performed in Clinical Immunology laboratories that aid the diagnosis of suspected allergic reactions• Hypersensitivity causes and physiological factors. Have a good basic working knowledge of the major assays performed in a Clinical Immunology laboratory that will aid in the diagnosis of severe hypersensitivity reactions
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1-4	Produce a basic interpretative report on immunological investigations	<ul style="list-style-type: none">• The information to be included in an interpretative report• How to construct an interpretative report and the format required for presentation• Limits of responsibility in the authorisation and issue of interpretative reports• Clinical conditions which may require urgent action and how to instigate such action• Normal and abnormal results and their significance to clinical question or condition
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Associated Behaviours and Professional Practice

*The Healthcare Scientist operates to high standards of professionalism and demonstrates essential behaviours and personal qualities These are specified within **Good Scientific Practice** and map to the professional standards needed for registration with the appropriate Regulatory Bodies.*

These include areas such as communication and Health and Safety that complement and test application of the academic learning. These qualities need to be assessed throughout the work based assessment programme and will be demonstrated using appropriate assessment tools (DOPs and CBDs). Appendix 1 contains the summary of these professional qualities

The application of key professional qualities in this module is contextualised below.

- ✓ Communicate complex and technical information to patients and those with limited technical knowledge in terms that facilitate understanding of issues
- ✓ Ensure validation of data, through use of appropriate sources of information including relevant databases and consultation with senior colleagues
- ✓ Evaluate data from a range of analysis, information and personal support sources to assist with judgements and decisions on interpretation, extended testing, reporting and communicating results
- ✓ Make use of suitable range of diagnostic, investigative and/or monitoring procedures when undertaking investigations
- ✓ Produce a range of written reports in accordance with personal level/sphere of responsibility
- ✓ Use the appropriate range of IT platforms and software to ensure effective and comprehensive data collection and analysis
- ✓ Audit scientific practice within all areas of practice associated with investigations to ensure application of ethical and governance regulations
- ✓ Accept the responsibilities of the role of the Healthcare Scientist in relation to other health care professionals and with empathy and sensitivity to patients, carers and families
- ✓ Prioritise and organise workload and duties with due regard for urgency, patient care, safe practice and the optimisation of laboratory workload.
- ✓ Work effectively and efficiently within a multi-disciplinary team with due regard for the needs, wishes, dignity and privacy of patients and their families
- ✓ Present Quality Assurance data in compliance with principles of internal Quality Control and external Quality Assurance