Modernising Scientific Careers Programme

Scientist Training Programme

Curriculum

NEUROSENSORY SCIENCES

2013/14
CONTENTS

READERSHIP .................................................................................................................. 4
Section 1: Introduction to Modernising Scientific Careers (MSC) and the Scientist Training Programme (STP) ........................................................................................................ 5
  1.1 Introduction to Modernising Scientific Careers (MSC) ............................................. 5
  1.2 Introduction to the Scientist Training Programme (STP) ............................................. 5
  1.3 Scientist Training Programme Outcomes: 2013/14 ..................................................... 6
  1.4 Overview of the MSc Clinical Science Programme ..................................................... 8
Section 2: Entry Routes, Award Title, Delivery, Accreditation of Prior Learning .......... 10
  2.1 Entry Routes ................................................................................................................ 10
  2.2 Progression .................................................................................................................. 10
  2.3 Award Titles ................................................................................................................ 10
  2.4 Mode of Delivery ......................................................................................................... 11
  2.5 Relevant Quality Assurance Agency (QAA) Code(s) of Practice ................................ 11
  2.6 Awarding Body .......................................................................................................... 11
  2.7 Accreditation of Prior Learning .................................................................................. 11
  2.8 Programme Delivery and Monitoring ....................................................................... 11
Section 3: The MSc Clinical Science Curriculum ............................................................ 13
  3.1 Purpose ....................................................................................................................... 13
  3.2 Curriculum Development and Maintenance ............................................................... 13
  3.3 Tender Process and Monitoring ................................................................................ 14
  3.4 MSC Accreditation ................................................................................................. 14
  3.5 Programme Delivery ............................................................................................... 14
  3.6 Academic Induction ............................................................................................... 15
  3.7 Teaching and Learning ............................................................................................. 15
  3.8 Interprofessional Learning ....................................................................................... 17
  3.9 Patient and Public Involvement ................................................................................ 17
Section 4: Assessment ...................................................................................................... 18
  4.1 Purpose of Assessment ............................................................................................. 18
  4.2 Key areas that must be covered by the Assessment Strategy include ....................... 19
Section 5: Trainee Supervision, Support and Mentoring ................................................ 20
  5.1 Fitness to Practise ....................................................................................................... 20
Section 6: Progression, Annual Monitoring of Progress, Equality and Diversity, Curriculum Review and Updating ................................................................. 21
  6.1 Progression ............................................................................................................... 21
  6.2 Annual Monitoring of Progress ............................................................................... 21
  6.3 Equality and Diversity ............................................................................................. 21
  6.4 Curriculum Review and Updating ........................................................................... 22
Section 7: Relationships and Partnerships ................................................................. 23
  7.1 National School of Healthcare Science .................................................................... 23
  7.2 The Academy for Healthcare Science ....................................................................... 23
Section 8: Professional Practice ......................................................................................... 25
Section 9: MSc Clinical Science (Neurosensory Sciences) ............................................. 27
  9.1 Overview of STP in Neurosensory Sciences .............................................................. 27
Section 10: Generic Modules .......................................................................................... 29
  Introduction to Healthcare Science, Professional Practice and Clinical Leadership ... 29
  Research Methods ......................................................................................................... 35
Section 11: Division/Theme-Specific Modules ........................................................... 38
  Introduction to Neurosensory Sciences ........................................................................ 38
Section 12: MSc Clinical Science Specialist Modules for Audiology.................................51
Section 12.1: Associated Work Based programme for Audiology.................................54
Section 13: MSc Clinical Science Specialist Modules for Neurophysiology..................60
   Neurophysiology 2 & 3..............................................................................................61
Section 13.1: Associated Work Based Programme for Neurophysiology.......................62
Section 14: MSc Clinical Science Specialist Modules for Ophthalmic and Vision Science
........................................................................................................................................72
   Section 14.1: Associated Work Based programme for Ophthalmic and Vision Science
........................................................................................................................................75
Appendix 1: Contributor List ........................................................................................84
Appendix 2: Programme Amendments..........................................................................86
   Amendment – March 2013.........................................................................................86
Appendix 3: Good Scientific Practice............................................................................87
Appendix 4: Glossary.....................................................................................................94
READERSHIP

This Scientist Training Programme (STP) MSc Clinical Science curriculum describes the MSc Clinical Science programmes that, together with the work based learning guide, provide the details of each themed STP in the UK for:

- academic and administrative staff, including external examiners within Higher Education Institutions (HEIs);
- trainees, host departments and managers of services that employ healthcare science staff;
- work based trainers, including all those involved in supervising, mentoring, coordinating, assessing and delivering STP education and training;
- Local Education and Training Boards (LETBs) and all healthcare science education and training commissioning organisations in the UK;
- patients and the public;
- Modernising Scientific Careers (MSC) accreditation panels.

A glossary of terms used is provided in the Appendices.
Section 1: Introduction to Modernising Scientific Careers (MSC) and the Scientist Training Programme (STP)

1.1 Introduction to Modernising Scientific Careers (MSC)

1. The healthcare science (HCS) workforce plays a central role in safe and effective patient care across all pathways of care from health and wellbeing to end of life. There are approximately 55,000 employees in the healthcare science workforce in the NHS in the UK, and approximately 80% of all diagnoses can be attributed to their work.

2. Healthcare science involves the application of science, technology and engineering to health. *Good Scientific Practice* (GSP) [Appendix 3] sets out the principles and values on which good practice within healthcare science is founded. It makes explicit the professional standards of behaviour and practice that must be achieved and maintained by all those who work in healthcare science. GSP and the Education and Training Standards of the Health and Care Professions Council (HCPC) together form the basis for all MSC training curricula which contextualise the Standards of Proficiency set down by the HCPC in a way that is accessible to the profession and the public.

3. The healthcare science workforce and services have traditionally been grouped into three broad areas called divisions, namely: Life Sciences/Clinical Laboratory Sciences, Physical Sciences/Medical Physics and Biomedical Engineering, and Physiological Sciences/Clinical Physiology Sciences. Within each division there are a number of healthcare science specialisms. With advances in scientific technology, changes to the delivery of healthcare scientific services and the development of MSC, the boundaries between these divisions have been shifting. MSC recognises this important change and to date has identified twelve STP themes within healthcare science, which enables training across a total of 28 healthcare science specialisms, with curricula for additional specialisms still under development.

1.2 Introduction to the Scientist Training Programme (STP)

4. The STP is designed to provide healthcare scientist trainees with strong science-based, patient-centred clinical training in a specialist area of healthcare science. Initial rotational training provides a broad base of knowledge, skills and experience across a group of related cognate specialisms reflective of the evolving clinical and scientific changes and requirements followed by specialisation in a single HCS specialism. STP is a three-year pre-registration postgraduate academic (MSc Clinical Science) and work based programme.

5. Recruitment to the programme is competitive, and in England a national recruitment process is led by the National School of Healthcare Science (NSHCS). Following induction, workplace training commences with a rotational training programme in a themed group of up to four healthcare science specialisms, followed by training in a specific specialism.

6. The STP is an integrated training programme combining academic study leading to the award of a specifically commissioned MSc in Clinical Science and a work based
training programme. Completion of both will lead to the award of a Certificate of Completion of the Scientist Training Programme (CCSTP) by the NSHCS. Graduates are eligible to apply to the Academy for Healthcare Science for a Certificate of Attainment and will then be eligible to apply to HCPC for registration as a Clinical Scientist.

1.3 Scientist Training Programme Outcomes: 2013/14

Graduates of the STP will possess the essential knowledge, skills, experience and attributes required of a newly qualified Clinical Scientist. STP graduates will have clinical and specialist expertise in a specific healthcare science specialism, underpinned by broader knowledge and experience within a healthcare science division or theme. They will be competent to undertake complex scientific and clinical roles, defining and choosing investigative and clinical options, and making key judgements about complex facts and clinical situations within a quality assurance framework. Many will work directly with patients and all will have an impact on patient care and outcomes. They will be involved, often in lead roles, in innovation and improvement, research and development, and/or education and training.

On completion of the STP all graduates should be able to demonstrate the following.

**Professional Practice**

1. Professional practice that meets the professional standards of conduct, performance and ethics defined by *Good Scientific Practice* and the regulator (HCPC), and is safe, lawful and effective, and within the scope of practice for the role undertaken, while maintaining fitness to practise.
2. Personal qualities that encompass communication skills, self-management, self-awareness, acting with integrity and the ability to take responsibility for self-directed learning, maintaining their own health and wellbeing, critical reflection and action planning to maintain and improve performance.
3. The ability to be an independent self-directed learner acting autonomously in a non-discriminatory manner when planning and implementing tasks at a professional level, contributing to the education and training of colleagues and providing mentoring, supervision and support as appropriate.
4. The ability to work, where appropriate, in partnership with other professionals, often as part of a multidisciplinary team, supporting staff, service users and their relatives and carers while maintaining confidentiality.
5. The ability to work with public, service users, patients and their carers as partners in their care, embracing and valuing diversity.

**Scientific and Clinical Practice**

6. A systematic understanding of relevant knowledge, and a critical awareness of current problems, future developments and innovation in health and healthcare science practice, much of which is at, or informed by, the forefront of their professional practice in a healthcare environment.
7. High-quality clinical and scientific practice that applies basic, core scientific knowledge, skills and experience in a healthcare setting, places the patient and the
public at the centre of care, prioritising patient safety and dignity and reflecting NHS/health service values and the NHS Constitution.

8. The ability to perform quality assured appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely and skilfully, adhering to applicable legislation and in compliance with local, national and international guidelines.

9. The ability to deal with complex scientific and clinical issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences, including patients and the public.

10. The ability to define and choose investigative and scientific and/or clinical options, and make key judgements about complex facts in a range of situations.

11. 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 knowledge in healthcare and healthcare science and their specialism.

Research, Development and Innovation

12. A comprehensive understanding of the strengths, weaknesses and opportunities for further development of healthcare and healthcare science as applicable to their own clinical practice, research, audit, innovation and service development, which either directly or indirectly leads to improvements in patient experience, clinical outcomes and scientific practice.

13. Conceptual understanding and advanced scholarship in their specialism, enabling them to critically evaluate and critique current research and innovation methodologies and, where appropriate, propose new research questions and hypotheses.

Clinical Leadership

14. Scientific and clinical leadership based on the continual advancement of their knowledge, skills and understanding through the independent learning required for continuing professional development.

15. The ability to critique, analyse and solve problems, define and choose investigative and scientific and/or clinical options, and make key judgements about complex facts in a range of situations.
1.4 Overview of the MSc Clinical Science Programme

7. This document sets out the proposed structure, high-level learning outcomes and indicative content for the proposed three-year, part-time Masters in Clinical Sciences that forms part of the Scientist Training Programme (STP). The programme combines and integrates the generic professional practice learning, themed learning in a group of specialisms and individual specialist programmes.

8. Figure 1 depicts the overall structure and timing of each STP programme while Figure 2 depicts the broad framework around which all MSc Clinical Science programmes must be structured. However, each division within the Modernising Scientific Careers Programme (MSC) has interpreted and adapted this framework.

Figure 1: Modernising Scientific Careers: Scientist Training Programme (STP): Diagrammatic representation of employment-based, pre-registration, three-year NHS-commissioned education and training programme
### Figure 2: High-Level Framework for MSc Clinical Science

<table>
<thead>
<tr>
<th>Year 3 Specialist Practice</th>
<th>Healthcare Science</th>
<th>Research Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specialist Learning with integrated Professional Practice</td>
<td>Students would usually begin a work based research project in Year 2 and complete the project in Year 3</td>
</tr>
</tbody>
</table>

**Specialism**

<table>
<thead>
<tr>
<th>Year 2 Specialist Practice</th>
<th>Research Methods</th>
<th>Healthcare Science</th>
<th>Research Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[10]</td>
<td>Specialist Learning with integrated Professional Practice</td>
<td>Students would usually begin a work based research project in Year 2 and complete the project in Year 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1 Core Modules</th>
<th>Healthcare Science</th>
<th>Healthcare Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Integrating science and Professional Practice</td>
<td>Integrating underpinning knowledge required for each rotational element with Professional Practice</td>
</tr>
</tbody>
</table>

**Generic Divisions/Themes**

- **Generic Modules:** Common to all divisions of healthcare science
- **Division/Theme-Specific Modules:** Common to a division or theme
- **Specialist Modules:** Specific to a specialism
Section 2: Entry Routes, Award Title, Delivery, Accreditation of Prior Learning

2.1 Entry Routes

9. In England there are two routes of entry into STP. Through the direct entry route, the trainee will be competitively appointed. Alternatively, some STP trainees may enter into training with support of their employers through an in-service training route, as long as employers can demonstrate the ability to support STP training by meeting work based accreditation standards. In both cases potential STP applicants must participate in the national recruitment/assessment process and meet the minimum entry requirements for the academic and work based programme. For direct entry applicants, this will be a competitive process, whereas in-service trainees will be required to go through the national recruitment process to ensure that they meet the standards for entry into STP.

2.2 Progression

10. No condonement/compensation of modules and no aggregation of marks are permitted. Students must pass all modules to be eligible for the final award.

2.3 Award Titles

11. The title of the degree programme should be consistent with current MSC terminology. The award titles are:

Life Sciences
MSc Clinical Science (Blood Sciences)
MSc Clinical Science (Cellular Sciences)
MSc Clinical Science (Genetics)
MSc Clinical Science (Infection Sciences)

Physical Sciences and Biomedical Engineering
MSc Clinical Science (Medical Physics)
MSc Clinical Science (Clinical Engineering)
MSc Clinical Science (Reconstructive Science)
MSc Clinical Science (Clinical Pharmaceutical Science)

Physiological Sciences
MSc Clinical Science (Cardiac, Critical Care, Vascular, Respiratory and Sleep Sciences)
MSc Clinical Science (Gastrointestinal Physiology and Urodynamic Science)
MSc Clinical Science (Neurosensory Sciences)

Across all Divisions
MSc Clinical Science (Clinical Bioinformatics)

In accordance with their own discretion and regulations, HEIs may be able to seek a variation in the award title to enable the specialism to be identified. This should be raised as part of MSC Accreditation and discussed with the commissioner.
2.4 **Mode of Delivery**: Part-time

2.5 **Relevant Quality Assurance Agency (QAA) Code(s) of Practice**

12. HEIs should adhere to the current QAA Code of Practice for the Assurance of Academic Quality and Standards in Higher Education. At the time of preparing this document the QAA is in the final stages of a major review of the Code of Practice and is expected to publish ‘The UK Quality Code for Higher Education’. Further details can be found on the QAA website: [http://www.qaa.ac.uk/Pages/default.aspx](http://www.qaa.ac.uk/Pages/default.aspx)

2.6 **Awarding Body**

13. While the full programme could be delivered and awarded by a single university provider, equally a collaborative partnership between a number of universities may be preferable. It would be expected that where collaborative provision is proposed a memorandum of agreement or understanding is in place. The delivery arrangements must be clearly defined, including the academic and logistical responsibilities of each partner and the financial arrangements between the university and its partner. The awarding university must satisfy itself that the partner is able to discharge its responsibilities satisfactorily and will be responsible for the quality assurance of the programme.

2.7 **Accreditation of Prior Learning**

14. A process for Accreditation of Prior Learning (APL) that conforms to the guidelines below must be defined by each HEI provider. This must clearly define the minimum and maximum level of APL that will be awarded, the timing, costs and process, and align to statutory requirements for healthcare science. Good practice supports the view that such prior learning should only be used once, double counting is not recommended.

   QAA ‘Higher education credit framework for England: guidance on academic credit arrangements in higher education in England’, August 2008

   QAA ‘Guidelines on the accreditation of prior learning’, September 2004

   HCPC ‘Standards of education and training’, September 2009

2.8 **Programme Delivery and Monitoring**

15. The tender and subsequent MSC accreditation process will require an HEI to provide a detailed description of the content of each module and the teaching
and learning and assessment strategy to demonstrate how the programme and module aims/learning outcomes will be met.
Section 3: The MSc Clinical Science Curriculum

3.1 Purpose

16. The purpose of the STP MSc curriculum is to clearly set out the expectations of graduates from the programme, including the academic skills, knowledge and understanding that each trainee will be expected to gain, develop and apply during work based training. Set within an integrated academic and work based programme the expectations of all MSc programmes should be read alongside the work based learning guides.

Additionally, the purpose is to signal the importance of providers being aware of the current structure, strategic direction and priorities of healthcare delivery in the UK, for example the NHS Constitution. The requirement to prioritise patients and their care and ensure that the patient and service provided by healthcare science is at the centre of all learning, assessment and work based practice is equally important.

3.2 Curriculum Development and Maintenance

17. Curriculum development began in 2010 and has been led by the Modernising Scientific Careers (MSC) team working with NHS and higher education colleagues and patients. Since 2012 the NSHCS has also contributed to curriculum development and maintenance via the professional leads and each of the NSHCS themed boards. Professional bodies have been represented in some curriculum working groups and have also been invited to provide feedback as the work developed, either directly or via the NSHCS themed boards.

All programmes have also been reviewed and approved by Health Education England via the Healthcare Science Professional Board Education and Training Working Group. External feedback from a review undertaken in 2012 by the Institute of Education has been incorporated into all programmes from 2013 onwards. All of the latest versions of the MSc Clinical Science programmes and work based learning guides can be found on the NHS Networks website by following the link: http://www.networks.nhs.uk/nhs-networks/msc-framework-curricula

All MSC curricula will be subject to regular review, with all stakeholders given the opportunity to contribute to each review. This process is currently being set out in an MSC long-term curriculum maintenance plan.

18. STP MSc Clinical Science programmes leading to an academic award must be aligned to current NHS policy and strategy, and at the time of writing this guide should consider the recommendations of:

- Strategy for UK Life Sciences (December 2011)
- Strategy for UK Life Sciences One Year On (2012)
HEIs should ensure they keep abreast of future strategic direction and policy.

3.3 Tender Process and Monitoring

19. Local Education and Training Boards are responsible for the commissioning of MSc Clinical Science programmes and the quality of each programme. The lead commissioner function for MSC programmes sits within the West Midlands.

3.4 MSC Accreditation

20. All MSc Clinical Science programmes must hold MSC Accreditation to confirm that commissioned MSc in Clinical Science programmes delivered by an HEI meet the requirements of the MSC Scientist Training Programme outlined in Modernising Scientific Careers: The UK Way Forward (DH, 2010). This accreditation process is currently the responsibility of the MSC Accreditation team, with advice given by the Health Education England Healthcare Science Professional Board (HEE HCSPB) and its Education and Training Working Group (HEE HCSPB ETWG).

3.5 Programme Delivery

21. HEIs are expected to ensure that all teaching, learning and assessment is up to date and informed by research to ensure that at graduation, Clinical Scientists meet the Framework for Higher Education Qualifications (FHEQ) descriptor at level 7 (http://www.qaa.ac.uk/). By undertaking a substantive research project bearing 60 credits, students should become aware of the major contribution the healthcare science workforce makes to research and innovation to benefit patients and the delivery of healthcare.

22. The key principles include:
programmes must deliver the MSC learning outcomes and indicative content, which the HEE HCSPB Education and Training Working Group has advised meets the requirements of Modernising Scientific Careers: The UK Way Forward;

wherever possible, delivery of the principles and knowledge underpinning practice should occur before the work based learning;

programmes must meet current NHS education quality metrics and current Health and Care Professions Council (HCPC) Standards of Education and Training;

the NSHCS, host departments, patients and the public should be involved in the design, implementation, delivery and review;

assessment programmes must be fair, valid and reliable, and clearly articulated for all modules, and the timing and content should consider and complement the work based assessment programme;

a robust student support and mentoring system must be in place and arrangements to support students in difficulty agreed with the NSHCS;

a high-quality teaching and learning environment with appropriate resources and facilities to support teaching and research;

teaching staff who are research active with a track record of undertaking high-quality research of national and international standing that is relevant to the practice of healthcare science and the NHS;

evidence that each MSc programme meets the equivalent of the relevant HCPC Standards of Education and Training.

23. The Professional Practice and Good Scientific Practice underpin the MSc and work based programme. Key professional practice learning outcomes are included in the MSc programme and it is important that the MSc programme embeds the standards of professionalism set out in Good Scientific Practice in all aspects of the delivery and assessment of the programme. Trainees should be encouraged to develop a range of skills to support their professional life, and continuing professional development spanning communication, leadership, personal reflection, duty of care, duty of candour, critical reflection, giving and receiving feedback, career planning, commitment to lifelong learning.

HEIs should ensure that all staff involved in each MSc programme have read and are aware of the requirements of Good Scientific Practice, a copy of which can be found in the Appendices.

3.6 Academic Induction

24. It is expected that there will be a period of academic induction at the start of each MSc programme.

3.7 Teaching and Learning

25. It is expected that a blended learning approach will be adopted, based on a model of student-centred adult learning that balances and integrates face-to-face teaching, e-learning, etc., and considers the broader requirements of each STP. It is expected that a broad range of teaching and learning activities will be
utilised, appropriate to the learning outcomes. Trainees should be enabled to
gain the skills necessary to manage their own learning, and to exercise initiative
and personal and professional responsibility. The learning strategy matrix and
proformas outlined in ‘Liberating Learning’\(^1\) describe a range of activities that
may be appropriate to this MSc programme; they are likely to include:

- Advanced library study
- Case study/discussions
- Debate
- Discussion forum
- Expert briefings
- Individual tutoring
- Interactive lectures
- Personal critical reflection and action planning
- Problem-based learning
- Role play
- Student-led and tutor-led seminars
- Skills teaching
- Simulation
- Self-assessment
- Self-directed learning activities
- Team projects
- Tutor-led small group learning

26. It is also expected that e-learning and m-learning\(^2\) opportunities will be available to
enable students to be active participants in a range of learning activities. Work
based learning will also contribute to the academic educational experience of the
trainees, for example seminars, journal clubs, local, national and international
scientific and education meetings.

All contributors to the MSc should have up-to-date knowledge of the requirements
of the programme, current healthcare science and education practice.

---

\(^1\) Liberating Learning, The Report of the Conference of Postgraduate Medical Deans’ ad hoc Working
Group on the Educational Implications of the European Union Working Time Directive and the

\(^2\) JISC TechDis: see [http://www.jisctechdis.ac.uk/technologymatters/mobilelearning](http://www.jisctechdis.ac.uk/technologymatters/mobilelearning) for further information
with respect to mobile (m) learning.
3.8 Interprofessional Learning

27. Opportunities to enable interprofessional and interdisciplinary learning, within and outside healthcare science, should be a fundamental part of each programme.

3.9 Patient and Public Involvement

28. The HEI programme team should have mechanisms in place to ensure that there is meaningful patient and public involvement in the design, delivery, development and quality assurance of each programme. It is expected that patients will be represented on course committees at all levels and contribute to teaching, learning and assessment.

Descriptions of MSc programmes need to make clear and explicit links to new models of service delivery, care and patient pathways. The delivery of high-quality, compassionate, patient-centred care should be an integral part of each degree programme, with the emphasis on the contribution of the healthcare science workforce to ensure trainees are aware that their actions have an impact on the patient and the patient’s family. The responsibility of all staff in the NHS to maximise quality and productivity and efficiency and to continually strive to improve services should be stressed. Equally important is the ability of graduates from the STP to communicate with the general public with respect to healthcare science, leading to a better educated public that is encouraged to take responsibility for its own health and wellbeing and has a greater understanding of the role that science plays in society.
Section 4: Assessment

4.1 Purpose of Assessment

29. The purpose of assessment is to enable the trainee to demonstrate that they have the requisite knowledge, skills, attitudes and beliefs to work as a Clinical Scientist and, together with the successful graduation from the work based element of the STP, that they meet the HCPC standards of education and training, professional skills, conduct performance and ethics to provide reassurance to the public.

30. The MSc Clinical Science assessment programme should support assessment for learning, and in particular:

- help clarify what good performance is (goals, criteria, standards);
- encourage ‘time and effort’ on challenging learning tasks;
- deliver high-quality feedback information that helps learners to self-correct;
- encourage positive motivational beliefs and self-esteem;
- encourage interaction and dialogue around learning (peer and teacher–student);
- facilitate the development of self-assessment and reflection in learning;
- involve students in decision making about assessment policy and practice;
- support the development of learning communities;
- integrate and complement the work based assessment programme;
- help teachers adapt teaching to student needs.

31. The HEI must have in place a clear, overarching strategic and systematic approach to assessment that fits with the curriculum and delivers assessment methods that are valid, reliable/generalisable, feasible, fair, acceptable and defensible, and is led by assessment experts. The approach to the assessment of the MSc Clinical Science should also be cognisant of and complement the work based assessment programme.

32. The assessment programme should be designed to enable the trainee to obtain regular constructive feedback on progress and achievement. It should encourage critical reflection and action planning, identifying both strengths and areas for development and improvement.

33. The approach to assessment should include and be overseen by a central coordinating leadership group or assessment-focused group who oversee, advise and scrutinise assessment across modules and years in order to build a consistent approach to assessment across the whole programme, involving module/programme leaders as appropriate. The overall assessment strategy should be documented in a clear and accessible manner with accountabilities clearly allocated. The strategy should also demonstrate how the approach is

---

3 Quality Assurance Agency Code of Practice.

based on a sound understanding of the evidence base, academic literature and good practice in assessment.

4.2 **Key areas that must be covered by the Assessment Strategy include:**

- A clear statement of accountabilities, including the governance structure for assessment.
- The balance between formative and summative assessment.
- The assessment of each module, including the contribution of individual assessments and examinations within the module.
- Progression criteria.
- The range of valid, reliable and appropriate assessment techniques that will be utilised across the programme and for each module.
- The process for providing clear and timely information for students.
- How all examiners will be trained (including refresher training) and the guidelines that will be given.
- The mechanisms in place to ensure comparability of standards and to share good practice, including external examiners.
- How standard setting is undertaken.
- How student feedback will be given, including time lines.
- The arrangements for assessment of students with a disability.
- An assessment blueprint demonstrating the relationship between each assessment and the learning outcomes of the programme.
- Exemplar criteria and marking scheme, including critical reflective writing.
- The process of appointing external examiners.
- A defined role for external examiners that includes contributing to the review and development of assessment strategies and providing advice from an overarching perspective.
Section 5: Trainee Supervision, Support and Mentoring

34. The trainee supervision, support and mentoring systems will span the academic and work based elements of STP, and the relationship between the two systems must be clear to trainees, work based staff and HEI staff. The trainee supervision, support and mentoring system must be designed to encourage safe and effective practice, independent adult learning, appropriate professional conduct of the trainee and the safety of the patient. Those undertaking the role of supervisor or mentor must have relevant qualifications and experience and have undertaken appropriate and up-to-date training. The HEI will be expected to have an academic supervisory, support and mentoring scheme in place and to provide access to student support services.

**Academic supervisor(s):** Responsible, usually as part of a supervisory team, for guiding and assisting students during their period of academic study, including the research module.

**Work based education supervisor:** Responsible for monitoring, supporting and assessing the trainee on a day-to-day basis in their scientific, clinical and professional work and may take on the role of co-supervisor of the research project as part of the academic supervisory team.

5.1 Fitness to Practise

35. The HEI must have a clear policy with respect to Fitness to Practise, which must clearly articulate how staff and students are made aware of the policy and how the policy is implemented. Alongside this must be a clear policy on how student whistleblowers are supported. Breaches of professional practice and behaviour identified by the HEI or during HEI activities must be reported and investigated in accordance with this Fitness to Practise policy and accurate records maintained within the HEI. The NSCHCS should be informed of any issues with respect to fitness to practise and professional suitability.
Section 6: Progression, Annual Monitoring of Progress, Equality and Diversity, Curriculum Review and Updating

6.1 Progression

36. All trainees will usually be expected to complete the requirements for the MSc Clinical Science award within three years after initial registration (periods of suspension will not lead to an automatic extension of this period). This aligns with the duration of the STP and it is expected that successful STP graduates will be required to attain both an MSc in Clinical Science and certification of completion of STP work based training.

6.2 Annual Monitoring of Progress

37. The programme governance must include annual monitoring of progress that considers the outcome of the review of each module (including student and lay evaluation) and the handling and consideration of the external examiner’s report. This process should enable the programme leaders to identify and propose changes to the programme in response to feedback.

6.3 Equality and Diversity

38. All programmes should reference and be able to demonstrate evidence of adherence to the Disability Discrimination Act 1995 (DDA) which was extended to education in September 2002, following amendments introduced by the Special Educational Needs and Disability Act (SENDA) 2001. Additionally evidence should be demonstrated to show adherence to the Disability Discrimination Act (2005) which includes the Disability Equality Duty and the QAA Code of Practice on Students with Disabilities should be available. All degree programmes should also include evidence of adherence to the 2010 Equality Act and any superseding legislation with respect to equality.

As part of this commitment to equality staff should be committed to inspiring and supporting all those who work, train and provide training in healthcare science to operate in a fair, open and honest manner. The approach taken is a comprehensive one and reflects all areas of diversity, recognising the value of each individual. This means that no one is treated less favourably than anybody else on the grounds of ethnic origin, nationality, age, disability, gender, sexual orientation, race or religion. This reflects not only the letter but also the spirit of equality legislation, taking into account current equality legislation and good practice.

Key legislation includes:

- Race Relations Act 1976 and the Race Relations Amendment Act (RRAA) 2000
- Disability Discrimination Act 1995 and subsequent amendments
• Human Rights Act 1998
• Employment and Equality (Sexual Orientation) Regulations 2003
• Employment and Equality (Religion or Belief) Regulations 2003
• Gender Recognition Act 2004
• Employment Equality (Age) Regulations 2011.

6.4 Curriculum Review and Updating

39. The review and updating of the doctoral level academic award curriculum will be part of the long-term MSC curriculum maintenance programme currently being developed.

If you have any feedback with respect to this programme please contact: msc.hee@nhs.net
Section 7: Relationships and Partnerships

7.1 National School of Healthcare Science

40. The NSHCS provides a national coordinating and oversight function to support trainees and host departments in the delivery of STP training. It is responsible for:

- national recruitment into STP, enabling a transparent and robust selection of the very best science graduates;
- providing national oversight of STP trainees throughout their training by managing and monitoring their progress through the Online Learning and Assessment Tool (OLAT), supporting trainees in difficulty as well as coordinating national structured assessments both during and at the end of STP training;
- evaluation of ongoing work based assessment outcomes through the OLAT, enabling the School to benchmark training programme delivery for early identification of programme issues that may need to be addressed and resolved, and reporting these as part of agreed MSC governance arrangements;
- liaising with each HEI’s MSc Clinical Science programme director to ensure the integration and coordination needed to deliver the academic and work based programmes that form the STP; liaising with MSC Strategic Health Authority (SHA) leads (and education and quality leads in the future arrangements) on local issues and problems and their resolution;
- working closely with workplace training departments and providing support as appropriate;
- organising national ‘Train the Trainer’ programmes to ensure common standards of delivery and content, and recommending ongoing training activities to support the continuing professional development of work based trainers.

41. Professional Leads in each of the scientific divisions within the NSHCS will provide help and support with respect to organising rotations and/or specialist training that might require national coordination. In order to optimise the educational benefit and value of OLAT and the e-learning Portfolio, Professional Leads will also work with and support training departments in its use.

The School can be contacted on the following email: nshcs@Westmidlands.nhs.uk and at www.nshcs.org.uk.

7.2 The Academy for Healthcare Science

41. The Academy for Healthcare Science (AHCS provides the professional voice for the healthcare science workforce. Its functions are to:

- act as a strong and coherent professional voice;
- be able to influence and inform a range of stakeholders on all matters relating to healthcare science and scientific services;
• act as the overarching body for professional issues related to education, training and development in the UK health system including the provisions of UK wide quality assurance across education and training arrangements;
• provide the infrastructure to support the professional regulation/registration of the healthcare science workforce including:

  o establishing a system of professional accreditation of education and training programmes for the regulation/registration of the healthcare science workforce;
  o setting the professional standards for the delivery of accredited registers as required by CHRE (to be renamed the Professional Standards Authority for Health and Social Care) to ensure consistency and coherence across all MSC programmes;
  o taking the central role in the sponsorship of the voluntary registers to achieve ‘accredited’ status as set out by CHRE (to be renamed the Professional Standards Authority for Health and Social Care);
  o becoming an HPC education provider for the statutory regulation of clinical scientists;
  o establishing a system for equivalence across the whole of the healthcare science workforce.

http://www.academyforhealthcarescience.co.uk/

The following sections of this MSc Curriculum provide an overview of the STP for the specialisms within this theme. This is followed by the Generic, Division and Themed Learning Outcomes and Indicative Content, together with the high-level work based learning outcomes.
Section 8: Professional Practice

Professional practice spans the whole of the three-year training programme, underpinning both work based training and the MSc in Clinical Science and is described in the document Good Scientific Practice. This document sets out the principles and values on which good practice undertaken by the Healthcare Science workforce is founded. Wherever possible teaching should be contextualised to patients and patient care recognising that the work of all members of the healthcare science workforce have an impact on patients and their care.

*Good Scientific Practice* sets out for the profession and the public the standards of behaviour and practice that must be achieved and maintained in the delivery of work activities, the provision of care and personal conduct.

*Good Scientific Practice* uses as a benchmark the Health Professions Council (HPC) Standards of Proficiency and Standards of Conduct, Performance and Ethics, but expresses these within the context of the specialities within Healthcare Science, recognising that three groups of the workforce, Biomedical Scientists, Clinical Scientists and Hearing Aid Dispensers are regulated by the HPC. The aim is that the standards are accessible to the profession and understandable by the public.

*Good Scientific Practice* represents standards and values that apply throughout an individual's career in healthcare science at any level of practice. The standards will be contextualised by the role within Healthcare Science that an individual undertakes. This means that the standards must be interpreted based on the role that an individual performs. For example, in supervised roles where individuals work within defined procedures, rather than autonomously, some standards will need to be interpreted appropriately for the context of the specific role. There will, however, always be a requirement for an individual to work within the limits of their scope of practice and competence.

Students and trainees will be expected to be working towards meeting the expectations set out in this document. However, if an individual is undertaking further training and development following qualification from a professional training programme, he or she will be expected to be able to meet the standards in this document within their scope of practice.

The standards have been used to support curriculum development and will be used to underpin the process of judging individual equivalence, particularly for emerging specialisms.

The standards have been divided into five domains. The domains of *Good Scientific Practice* detailed in section 2 are:

1. Professional Practice
2. Scientific Practice
3. Clinical Practice
4. Research and development
5. Clinical Leadership
Further details including the content of each domain can be found in Appendix 3.

Within the MSc Clinical Sciences (Neurosensory Sciences) key outcomes for trainees are for all modules are shown below.

<table>
<thead>
<tr>
<th>Learning Outcomes: Associated Personal Qualities and Behaviours (Professionalism)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On successful completion of this module the trainee will:</td>
</tr>
<tr>
<td>1. Use correct terminology when discussing scientific issues.</td>
</tr>
<tr>
<td>2. Work safely in relevant areas.</td>
</tr>
<tr>
<td>3. Communicate appropriately with patients presenting a professional and considerate manner.</td>
</tr>
<tr>
<td>4. Recognise the unique challenges and care required when dealing with patients in audiology.</td>
</tr>
<tr>
<td>5. Present complex scientific principles in simple terms in both oral and written formats.</td>
</tr>
<tr>
<td>6. Consistently operate within a sphere of personal competence and level of authority.</td>
</tr>
<tr>
<td>7. Actively seek accurate and validated information from all available sources.</td>
</tr>
<tr>
<td>8. Select and apply appropriate analysis or assessment techniques with attention to methodological detail.</td>
</tr>
<tr>
<td>9. Work in partnership with colleagues, other professionals, patients and their carers to maximise patient care.</td>
</tr>
</tbody>
</table>
Section 9: MSc Clinical Science (Neurosensory Sciences)

9.1 Overview of STP in Neurosensory Sciences

The diagram below provides an overview of the STP each trainee in Neurosensory Sciences will follow.

**Figure 1: Modernising Scientific Careers: Scientist Training Programme (STP): Diagrammatic representation of employment-based, pre-registration, three-year NHS-commissioned education and training programme**

9.2 Neurosensory Science MSc Route Map

The route map overleaf shows how the high-level framework has been interpreted for the MSc in Clinical Science (Neurosensory Sciences) for each of the three specialisms, namely:

i. Audiology
ii. Neurophysiology
iii. Ophthalmic and Vision Science
# MSc Clinical Sciences: Route Map: Audiology, Neurophysiology, Ophthalmic and Vision Science

## Year 1
- **Introduction to Healthcare Science, Professional Practice and Clinical Leadership [20]**
- **Introduction to Neurosensory Sciences – underpinning knowledge for rotational work based training [40]**

## Year 2
- **Research Methods [10]**

## Year 3

### Audiology
- **Audiology 2 [20]**
- **Audiology 3 [30]**
- **Research Project [30]**
- **Research Project [30]**

### OR

#### Neurophysiology
- **Neurophysiology 2 [20]**
- **Neurophysiology 3 [30]**
- **Research Project [30]**
- **Research Project [30]**

### OR

#### Ophthalmic and Vision Science
- **Ophthalmic and Vision Science 2 [20]**
- **Ophthalmic and Vision Science [30]**
- **Research Project [30]**
- **Research Project [30]**

## Credits

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generic</strong></td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td><strong>Division</strong></td>
<td>40</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Specialism</strong></td>
<td>60</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

Route map of STP in Neurosensory Sciences with specialisms in Audiology, Neurophysiology and Ophthalmic & Vision. In Year 1, trainees begin by following the generic curriculum which spans all divisions (blue) together with division/theme-specific modules to support the rotational work based programme (yellow). In Year 2 of the MSc, trainees begin to study in their specialist area (orange) and by Year 3 the entire curriculum is focused on the specialisms.
Section 10: Generic Modules

Generic Curriculum

The generic STP MSc Clinical Science curriculum followed by all trainees comprises three modules:

- Introduction to Healthcare Science, Professional Practice and Clinical Leadership: Year 1
- Research Methods: Year 2
- Research Project: Years 2 and 3

The generic STP work based programme generic curriculum modules are:

- Professional Practice: Years 1, 2 and 3
- Elective: following completion of the rotational training programme

These modules align to Good Scientific Practice (see Appendix).

Year 1: Generic Module
Introduction to Healthcare Science, Professional Practice and Clinical Leadership
[20 credits]

The overall aim of this introductory module is to provide all trainees with a broad knowledge and understanding of science and scientific knowledge, contextualised to the practice of healthcare science and the services provided by their healthcare science division/specialism. Central to this is the contribution of healthcare science to patient care, patient safety, service delivery, research and innovation, often at the cutting edge of science, for example genomics and bioinformatics. All members of the healthcare science workforce must understand the impact of their work on patients and patient care and remember that their work has a direct or indirect impact on patient care.

It is recognised that some of the learning within this module will not be at master’s level, as allowed for in university regulations, but achievement of each learning outcome provides the building blocks for the division- and specialism-specific learning to follow, ensuring a common starting point for all trainees. While some of the learning may be at a lower level, the application of that knowledge in the divisional and specialist modules will be at master’s level.

As an introductory module it is expected to provide an overview and reinforcement of key concepts with respect to the organisation, structure and function of the body, and important areas such as the psychosocial aspects of health and disease, clinical pharmacology and therapeutics, genomics and bioinformatics.
A major focus of this module is professional practice. This module will introduce and critically review the frameworks and academic literature underpinning professional practice and enable trainees to gain the knowledge, skills, experience and tools to develop, improve and maintain high standards of professional practice at all times.

**Learning Outcomes: Knowledge and Understanding**

On successful completion of this module the trainee will:

**Scientific Basis of Healthcare Science**

1. Describe the cellular, tissue and systems responses to disease and discuss those body systems and processes relative to your division/specialism.
2. Explain the main principles and core concepts of clinical genetics and genomics and discuss in the context of patients referred to services provided by your division/specialism.
3. Explain the main principles and core concepts of the sociology of health and illness and discuss those relevant to patients and the role of your division/specialism.
4. Explain the basis of epidemiology, public health and health protection and discuss in relation to patients and the safety of patients referred to services provided by your division/specialism.
5. Explain the basic principles of clinical pharmacology and therapeutics and discuss in relation to patients and the safety of patients referred to services provided by your division/specialism.
6. Explain the basic principles of physics that underpin healthcare science and discuss in relation to patients and the safety of patients referred to services provided by your division/specialism.
7. Discuss and justify how bioinformatics, including large biological datasets, contributes to patient safety, patient care and the practice of healthcare science and defend the governance and ethical frameworks within which bioinformatics can be used.

**Professional Practice**

8. Discuss and appraise the ethical foundations of professionalism, including critical reflection, and how these relate to the clinical scientist, the patient, the practice of healthcare science and the wider healthcare environment.
9. Explain and critically evaluate the structures, processes and methodologies that underpin the quality of the service provided by the NHS and quality improvement initiatives to promote high quality patient care and enhance patient safety, and discuss the quality mechanisms relevant to your division/specialism.
10. Explain the principles of effective written and verbal communication and feedback, considering the needs and dignity of patients, the public, health professionals and scientists.
11. Describe and evaluate the basic principles and structures underpinning history taking, clinical examination and clinical decision making and discuss their role in your division.
Clinical Leadership

12. Discuss, compare and contrast a range of leadership models, including those that underpin current NHS Leadership and Competency Frameworks, and identify and critically evaluate how your personal values, principles and assumptions affect your personal leadership style.

13. Explain the current structure and management of health and social care systems and services at a national (UK-wide) and local level and the way in which the voice of patients and the public is embedded in all aspects of healthcare and healthcare education.

Learning Outcomes: Practical Skills

On successful completion of this module the trainee will:

1. Practise the skill of history taking.
2. Practise the skill of giving and receiving meaningful feedback.

Indicative Content

Review of the organisation, structure and function of the body
- Chemical, cellular and tissue level of organisation of the body
- Metabolism
- Function of blood as a tissue, blood cells (types and life times)
- Anatomy and physiology:
  - skin
  - skeletal system
  - respiratory system
    - ventilation
    - gas exchange
    - blood gas transport
  - heart, blood vessels and lymphatic system
- Central, peripheral and autonomic nervous system
- Vision, hearing and equilibrium
- GI tract, including digestion and absorption of food, the liver and liver function tests
- Renal system
- Endocrine system
- Electrolyte and acid-base balance
- Hormonal mechanisms and control
- Abdomen, pelvis and perineum, including male and female reproductive tract

Review of pathophysiology: cellular, tissue and systems responses to disease
- Review of the pathological processes underpinning common diseases:
  - cell death
  - inflammation
  - neoplasia
  - hypertrophy
  - hyperplasia

Page | 31
STP MSc Neurosensory Sciences final version 3.0 for 2013 14.doc
Introduction to the main principles and core concepts of clinical genetics and genomics
- Meiosis and Mendelian inheritance
- Nucleic acid structure and function
- Chromosome structure and function
- Nomenclature used to describe the human genome
- Common genetic disorders
- Impact of genetic disorders on the patient and their families
- Genomic technology and role of the genome in the development and treatment of disease

Introduction to sociology of health and illness
- Factors affecting health and their contribution to inequalities in health between populations
- Basis of health protection, including principles of surveillance
- Patients’ responses to illness and treatment, including the impact of psychological and social factors including culture, on health and health-related behaviour
- Health belief models
- Diversity of the patient experience
- Disability, including learning disabilities
- Potential health inequalities
- Self-care
- Impact of life-threatening and critical conditions
- Patient involvement in decisions regarding their healthcare

Introduction to epidemiology, public health and health protection
- Health and disease in population terms
- The importance of population factors in individual health/disease processes
- Data interpretation, including the variability of biological data and application of statistics
- Investigating disease, epidemiology and natural history, including mathematical modelling
- Role of local, national and international bodies associated with health protection
- Principles of surveillance, the characteristics of different surveillance systems and key current policies and programmes used to protect health
- Screening programmes, including design, strengths and weaknesses

Introduction to clinical pharmacology and therapeutics
- Overview of the basic principles of pharmacokinetics
- Overview of the basics of drug metabolism and excretion
- Basic mechanisms and clinical importance of drug interactions

Basic principles of physics underpinning common measurement techniques used in healthcare science
- Structure of matter (atomic and nuclear models)
Radiation: nature and its measurement and radiation safety
Physics and mathematics of image formation
Basic electricity and magnetism as it relates to the measurement of physiological signals
Viscous and inertial flow of simple liquids

**Ethical foundations of professionalism and the patient at the centre of care**
- Defining professionalism within health and healthcare science
- Characteristics (personal traits) that impact on professionalism and professional practice in the workplace
- Ethical, legal and governance requirements arising from working at the level of the Clinical Scientist

**Critical Reflective Practice**
- Evidence base
- Reflection as a structure for learning
- Frameworks that support critical reflective practice
- Reflection to improve professional practice
- Reflection as a model for developing deep learning
- Reflection as a means of improving patient care, service delivery and scientific investigation

**Introduction to quality, quality improvement**
- Patient safety
- Definition of terms
- Quality management
- Quality control
- Quality assurance
- Quality improvement
- Quality methodologies
- Quality processes and procedures
- Clinical governance
- Current NHS quality management and improvement systems
- Quality assurance to protect patients and assure high-quality healthcare science services, and deliver safe and effective services

**Introduction to history taking, clinical examination**
- Importance of patient-centred care, treating patients with respect, honesty and compassion, maintaining patient dignity and confidentiality and putting the patient first
- Duty of candour and the importance of this in healthcare
- Informed consent
  - Principles, guidance and law with respect to informed consent
  - Introduction to the patient, including role of the Clinical Scientist
  - Explanation to the patient
- Structured models for presenting a patient history
- Process of patient-centred interviewing and the features of a good consultation
  - Initiating the session
  - Gathering information
Building the relationship
Explaining and planning
Closing the session

Link between the patient history and examination and development of clinical investigation and management plans
Shared clinical decision making
How information from a history and examination is used to develop clinical management plans

Introduction to communication skills
Principles of effective communication, including:
  written and electronic
  verbal
  non-verbal
Importance of:
  signposting
  listening
  paraphrasing
  language
  commonly used questioning techniques
  non-verbal behaviour
  ideas
  beliefs
  concerns
  expectations
  summarising
  communication
Range of question types that can be used in a communication
Key features of effective patient interviews and information giving
Adapting communication methods for people/groups/culture
Feedback
  The role of feedback in clinical education and continuing professional development
  Feedback models
  Characteristics of effective feedback

Introduction to leadership within the NHS
Theories and models of leadership
Concept of shared leadership
Associated personal qualities and behaviours that promote shared leadership
Overview of the NHS Leadership Framework and Clinical Leadership Competency

Introduction to the structure of the NHS
Structure of the NHS across the four UK countries
  Structure
  Accountabilities
  Funding arrangements
  Working relationships
• NHS Constitution  
  o The seven key principles that guide the NHS in all it does  
  o NHS Values  
    ▪ Respect and dignity  
    ▪ Commitment to quality of care  
    ▪ Compassion  
    ▪ Improving lives  
    ▪ Working together for patients  
    ▪ Everyone counts  
• Quality improvement structures and processes within the NHS  
• Patient safety and the requirement to protect patients from avoidable harm  
• Patient focus  
  o Shared decision making with patients  
  o Access to information  
  o Choice  
  o Personalised care  
  o Safeguarding patients

Year 2:  
Generic Module  
Research Methods  
[10 credits]

The overall aim of this module is to ensure that the trainee has the knowledge, skills and experience of the role of research, development and innovation in the NHS in improving patient care, including prevention, diagnostics, treatment and service delivery. On completion of this module and the research project, trainees should be able to generate ideas; assess, plan, conduct, evaluate, interpret and report research and innovation projects, which includes original research; and disseminate the findings and, where appropriate, the adoption of the findings. Trainees should also be able to use research to improve practice.

Learning Outcomes: Knowledge and Understanding

On successful completion of this module the trainee will:

1. Discuss and critically evaluate the context within which research, development, innovation and audit are undertaken to improve patient care, promote innovation and improve service delivery.
2. Describe, compare and contrast a range of research methods/approaches, including cohort studies, qualitative, quantitative, systematic review, sampling techniques and clinical trials.
3. Explain and justify current UK ethical and governance frameworks and processes spanning the conduct of human and animal research, innovation and audit.
4. Critically evaluate the literature/evidence base to identify a research question and create a new approach or technique to improve patient care or service delivery.
5. Discuss and justify the research, audit and innovation process from idea generation to dissemination/implementation, including patient/user involvement and intellectual property.

6. Describe and evaluate a range of data analysis techniques to ensure the validity, reliability and appropriateness to the research aim, design and conclusion.

7. Describe how clinical guidelines are produced and the concept of evidence-based practice, including the role of current statutory and advisory regulatory bodies.

8. Identify potential sources of research and innovation funding for healthcare science/Clinical Scientists.

**Learning Outcomes: Practical Skills**

On successful completion of this module the trainee will:

1. Undertake an evidence-based literature review, critically appraise the output, draw appropriate conclusions and report the findings, and where appropriate, use the findings to inform a research project.

2. Identify, discuss and critically evaluate a research, innovation or audit project that has resulted in an improvement in patient care, diagnostics or service delivery.

**Indicative Content**

**Research methods/approaches**
- Differentiation between audit and research
- Cohort studies
- Qualitative
- Quantitative
- Systematic review
- Meta-analysis
- Sampling techniques
- Clinical trials (pre-clinical to translational)
- Epidemiological studies
- Study design
- Hypothesis generation and testing

**Ethical and governance research frameworks**
- Good Clinical Practice (GCP)
- Human research
- Animal research
- Innovation
- Audit

**Research, audit and innovation process**
- Literature searching and referencing
- Innovation pathway (Invention, Evaluation, Adoption and Diffusion)
- Idea generation
- Patient/user involvement
- Peer/expert review
- Practical and financial criteria and constraints affecting research
- Dissemination/implementation
- Intellectual property
- Quality assurance
- Monitoring and reporting
- Archiving
- Roles and responsibilities of the research/innovation team

**Data analysis techniques**
- Data validity, reliability and appropriateness
- Application and interpretation of statistical techniques
- Power calculations
- Intention-to-treat analyses

**Clinical guidelines**
- Evidence-based practice
- Statutory and advisory regulatory bodies

**Research and innovation funding**
- Sources of funding including research councils and charities
- Grant applications
Section 11: Division/Theme-Specific Modules

Introduction to Neurosensory Science

This section covers the modules that will be studied by all trainees undertaking the Neurosensory Scientist Training Programme.

The overall aim of this module is to provide trainees with the knowledge that underpins the rotations in Audiology, Neurophysiology, Ophthalmic and Vision Science, and Clinical Assessment and Investigations. This 40-credit module may be subdivided into specialisms with an overarching module considering the pathophysiology of frequently occurring Audiological, Neurophysiological, and Ophthalmic and Vision Science conditions.

A high-level description of the work based learning is included to provide providers of the academic programme with information on how the academic and work based elements of each STP programme should be integrated.

This academic module will provide trainees with:

- an applied understanding of the pathophysiological processes affecting Neurosensory systems
- an understanding of the underpinning principles of the methods and techniques used to assess disorders of the Neurosensory systems.

For ease of understanding the module has been broken down into four modules each of 10 credits. It is recognised that these four modules need not be delivered as separate entities.

A high-level description of the work based learning is included to provide MSc Clinical Science providers with information on how the academic and MSc elements of each STP integrate. The full work based Learning Guide can be found at:


Division: Physiological Sciences  
Theme: Neurosensory Sciences  
Year 1: [40 credits in total]

Introduction to Neurosensory Sciences
- Introduction to Audiology (A-1) [10 credits]
- Introduction to Neurophysiology (N-2) [10 credits]
- Introduction to Ophthalmic and Vision Science (O&V-3) [10 credits]
- Clinical Assessment and Investigation (CG-1) [10 credits]

This academic module should deliver the learning outcomes in the context of the neurosensory patient pathway.
Learning Outcomes: Knowledge and Understanding

On successful completion of this module the trainee will have an understanding of the application of theory to practice within the clinical environment and will:

1. Explain the essential structures, functions and pathologies of neurosensory pathways involving auditory, visual and neural domains.
2. Explain the range and function of the different recording components of neurosensory equipment, various electrode derivations and the requirements for the internal and external calibration of auditory, neurophysiology, ophthalmic and visual devices.
3. Explain how to evaluate the type of patient recordings, stimulus and recording parameters used in the recording of all modalities of evoked potentials (visual, auditory and somatosensory).
4. Describe the fundamental principles of the psychophysical assessment of neurosensory pathologies.
5. Describe the essential principles of electrophysiological measurements used to assess neurosensory systems in patients.
6. Discuss the effect of cognitive changes across the lifespan and on the need to adapt assessment and management protocols with patients attending a neurosensory clinical service.
7. Describe the underlying principles of appropriate neurosensory rehabilitative models.
8. Discuss the different measurement techniques of imaging used by neurosensory services.
9. Discuss the role and function of a multiprofessional approach to the assessment and management of patients.

Audiology

10. Explain and evaluate the range and basic function of routine audiological equipment and its routine clinical use in the assessment of hearing, tinnitus and balance.
11. Discuss the fundamental principles of aural rehabilitation with reference to the underpinning evidence base.
12. Evaluate the investigations and treatment of routine otological and audiological disorders.

Neurophysiology

13. Explain the internal and external calibration requirements of neurophysiological equipment and the effects of the recording characteristic of the equipment components.
14. Describe how to recognise, measure and label, using the correct nomenclature, the major components of all modalities of evoked potentials used in the assessment of patients attending neurophysiology.
15. Critically evaluate the causes of error encountered and the non-pathological effect in the recording of evoked potentials and their elimination.

Ophthalmic and Vision Science
16. Describe, compare and contrast a range of methods and ophthalmic equipment used for the routine psychophysical assessment of vision.
17. Describe the principles and equipment used for imaging and measurement of eye and ocular adnexae.
18. Assess the principles and methods used for the electrophysiological assessment of vision.

Clinical Assessment and Investigation
19. Describe how different auditory, visual, central and peripheral neurological and other related specialist assessments and investigations can contribute to a holistic patient approach in the diagnosis, management, prognosis and care.
20. Describe how different assessments and investigations are used by non-specialist neurosensory centres in the assessment of patients who have auditory, visual, central and peripheral neurological disorders, e.g. healthcare for older people, neonatal care (NICU and SCBU), integrated care, critical care, primary care, independent sector.
21. Describe how different auditory, visual, central and peripheral neurological assessments and investigations can be combined in differential diagnosis of disease, or disability.

Imaging and Pathology Diagnostics
22. Explain the basis of ionising and non-ionising imaging using screening and diagnostic applications to assess pathologies in neurosensory referrals to a Radiology service, e.g. head CT/MRI; ultrasound.
23. Explain the legislation and physical principles behind radiation with matter.
24. Discuss and evaluate the digital processing of 2D and 3D images in neurosensory pathologies.
25. Describe the key anatomical landmarks of the auditory, visual, central and peripheral neurological pathways using imaging media.
26. Describe and evaluate the current local, national and international standards used for imaging and pathology equipment.
27. Discuss the need for and processes used in safety testing and quality assurance of imaging equipment.

Patient Pathways
28. Describe the patient pathways relating to common pathological conditions associated with auditory, visual, central and peripheral neurological health issues.
29. Discuss the major contributor and risk factors in auditory, visual, central and peripheral neurological health issues.
30. Describe the normal function and major abnormalities, or common pathologies of physiological control mechanisms that give rise to referrals for imaging in patients undergoing neurosensory pathway treatment[s] and/or care.
31. Describe the common diseases and the basis of common infections arising in auditory, visual, central and peripheral neurological disorders.
32. Discuss the role of inter-professional team working in the diagnosis and treatment of patients.
**Indicative Content**

- Function and structure of the ear, vestibular system, eye and neural pathways based on established and emerging theory
- Psychophysical methods and basic principles of assessment of vision and hearing, including visual and auditory acuity, contrast sensitivity, colour vision, field of hearing and vision, optical properties of the eye, and physical characteristics of sound/light and the corresponding perceptual domains
- Psychophysical methods and statistical basis of discrimination and detection in the hearing and visual systems
- Pathophysiology of neurosensory systems (ear, vestibular system, eye and neural pathways) covering common diseases and disorders
- Consequences of physiological dysfunction in relation to features of ear, vestibular, eye and neural pathways
- Basis of assessment, diagnosis, management and prognosis of neurosensory infection, disease and trauma of hearing, vision and neural pathways
- Fundamental principles of electrophysiology and use of standard evoked responses (ERG(s), EOG, VEP, AEP) of the ear, vestibular system, eye and neural pathways
- The range of normal neurosensory function values used to evaluate individual cases to identify and describe deviations from normality
- Nomenclature for measuring all modalities of normal evoked potentials
- Types of recording derivation, stimulus and recording parameters used for the recording of all modalities of evoked potentials
- The use of transducers, stimulators, electrodes, stimuli, basic signal processing, instrumentation and internal/external calibration in the measurement of biological signal generated potentials used in neurosensory departments
- Psychosocial aspects of neurosensory systems (ear, vestibular, eye and neural pathways) and its effect on the patient’s rehabilitative care
- Non-pathological effects on all types of evoked potential (i.e. contrast and luminance, stimulus rate and duration, age and gender)
- Basic principles of imaging and measurement in neurosensory sciences
- Screening and diagnostic radiology equipment,
  - Technology developments and advances of differential diagnosis
  - Daily/routine calibration of imaging equipment
  - Diagnostic imaging, e.g. lasers, X-rays and ultrasound
  - Image reconstruction techniques
  - Clinical application and basics of normal and pathological appearances within the image
  - The physics and mathematics of image formation, radiological image, CT scanning
  - Patient safety management in imaging
- Techniques in the central nervous system (CNS) MRI assessment
• Digital imaging, different forms of scanning laser, e.g. optical coherence tomography
• Quality assurance, image quality and artefacts
• Theatre safety
• Neurosensory equipment calibration, traceable standards
• Equipment life cycle: specification, procurement, installation and commissioning
• Risk assessment techniques: electrical safety, laser safety, biological safety, physical effects of radiation

**Division:** Physiological Sciences  
**Theme:** Neurosensory Sciences  
**Year 1:** Introduction to Neurosensory Sciences

**Rotation A:** Introduction to Audiology  
**Rotation B:** Introduction to Neurophysiology  
**Rotation C:** Introduction to Ophthalmic and Vision Science  
**Rotation D:** Clinical Assessment and Investigation

This gives a high-level description of the work based learning that accompanies the academic module. Further details are contained within the work based learning guide.

HEIs may use clinical skills laboratories to ensure trainees are exposed a range of different neurosensory equipment, basic techniques and skills to maximise learning while in or prior to attending practice.

**Rotation A  
Introduction to Audiology**

This work based module will provide the trainee with an opportunity to apply their knowledge and understanding of Audiology.

**Learning Outcomes: Knowledge and Understanding**

On successful completion of this module the trainee within the clinical environment will:

1. Explain and evaluate the range and basic function of routine audiological equipment and its use in the everyday assessment of hearing, tinnitus and balance on patients.
2. Discuss the fundamental principles of patient aural rehabilitation with reference to the underpinning evidence base.
3. Evaluate the investigations and treatment of routine otological and audiological disorders with patients.
4. Describe patient’s special needs and circumstances as applied to audiology services, such as people with learning difficulties, cognitive and sensory impairment, physical disabilities, older people, paediatrics, and intensive care.
5. Discuss the ways that non-NHS or external statutory, voluntary, charitable agencies, or services in the community can assist with patient care in audiology services, e.g. social services.

### Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Perform the daily checks of equipment used in adult rehabilitation, e.g. audiometers, tympanometers, in a safe manner in accordance with standard procedures.
2. Obtain accurate and reproducible non-masked pure tone audiograms from adult patients.
3. Perform a subjective listening test and comment on the performance of a hearing aid.
4. Apply the fundamental principles of aural rehabilitation.
5. Assist in the assessment and management of routine audiological caseload, in particular adult rehabilitation.

### Indicative Content

- Types of equipment routinely used within the audiology clinic and basic audiological test procedures
- Common forms of hearing disorder in terms of auditory capabilities and speech recognition performance
- Principles of auditory diagnostic investigation strategy and treatment of audiological disorders
- Performance of hearing aids and how they can be subjectively and objectively measured
- Routine outcomes of basic hearing assessment and consequences for case management
- Everyday technological principles of aural rehabilitation
- Audiology services; clients with special needs, including people with learning difficulties, cognitive and sensory impairment, physical disabilities, older people, paediatrics, intensive care
- Statutory, voluntary, charitable agencies or services, e.g. social services

### Rotation B

#### Introduction to Neurophysiology

This work based module will provide the trainee with the knowledge and understanding of Neurophysiology.

### Learning Outcomes: Knowledge and Understanding
On successful completion of this module the trainee within the clinical environment will:

1. Describe, compare and contrast a range of methods and equipment used for the routine neurophysiological assessment of patients.
2. Explain the internal and external calibration of neurophysiological equipment, describing the effects of the recording characteristic of the equipment components.
3. Evaluate the type of patient recording derivations and stimulus and recording parameters used in the recording of all modalities of evoked potentials (visual, auditory and somatosensory).
4. Recognise, measure and label using the correct nomenclature the major components of all modalities in patients when using evoked potentials (visual, auditory and somatosensory).
5. Critically evaluate the causes of error encountered and the non-pathological effects in the recording of evoked potentials and their elimination.
6. Describe patient special needs and circumstances as applied to neurophysiology services, such as people with learning difficulties, cognitive, sensory impairment, physical disabilities, older people, paediatrics and intensive care.
7. Describes the ways that non-NHS or external statutory, voluntary, charitable agency services in the community can assist with patient care in neurophysiology services, e.g. social services.

Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Measure visual, auditory or somatosensory evoked potentials in a normal subject.
2. Measure and label, using the correct nomenclature, the major components of a patient evoked potential (visual, auditory or

Indicative Content

- Routine test procedures and equipment used in neurophysiology for assessment of neurological conditions
- Instrumentation and internal and external calibration of neurophysiological equipment
- Demonstrates knowledge of the components and their function of the equipment used in Clinical Neurophysiology for the recording of the signals
  - Amplifiers
  - Filter
  - Signal average
  - Delay lines
Triggers
Nomenclature for measuring all modalities of normal evoked potentials
- Electroretinography: flash; pattern
- Visual evoked: full; central; half field
  - Auditory evoked; brainstem
  - Somatosensory evoked; upper/lower limb measurement

- Types of recording derivation, stimulus and recording parameters used for the recording of all modalities of evoked potentials
- Types of stimulators and electrodes used in all modalities of evoked potentials
  - Pattern; onset/offset; flash pattern; Ganzfeld
  - Click; tone; pips
  - Constant current; voltage; magnetic

- Non-pathological effects on all types of evoked potential (i.e. contrast and luminance, stimulus rate and duration, age and gender)
  - Visual/auditory/somatosensory
  - Visual acuity, age and gender
  - Attention and fixation
  - Contrast and luminance
  - Check and field size
  - Temperature
  - Anaesthesia
  - Stimulus rate, intensity, rate, duration and polarity
  - Physical contributes, i.e. height, limb length

- The diversity of neurophysiology services; special needs; people with learning difficulties, cognitive and sensory impairment, physical disabilities, older people, paediatrics, intensive care
- Statutory, voluntary, charitable agencies or services, e.g. social services

Rotation C
Introduction to Ophthalmic and Vision Science

This work based module will provide the trainee with the knowledge and understanding of Ophthalmic and Vision Science.

Learning Outcomes: Knowledge and Understanding

On successful completion of this module the trainee within the clinical environment will:

1. Describe, compare and contrast a range of methods and ophthalmic equipment used for the routine psychophysical assessment of patients’ vision.
2. Describe the principles and equipment used for imaging and measurement of eye and ocular adnexae.
3. Assess the principles and methods used for the electrophysiological assessment of patients’ vision.
4. Discuss and evaluate patient special needs and circumstances as applied to ophthalmic and vision services, such as people with learning difficulties,
cognitive and sensory impairment, physical disabilities, older people, pediatrics and intensive care.

5. Describes the ways that non-NHS or external statutory, voluntary, charitable agency services in the community can assist with patient care in ophthalmic and vision services, i.e. social services.

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Measure visual acuity using a LogMAR chart for adult subjects.
2. Perform an Ishihara colour vision assessment on an adult subject.
3. Perform an automated static perimetry or confrontation visual field on an adult subject.
4. Label the main peaks of a normal electroretinogram (ERG).
5. Identify the landmarks of the eye and fundus in different imaging modalities.

**Indicative Content**

- Routine test procedures and equipment used in the ophthalmic clinic for assessment of visual acuity, colour vision, visual field and refractive error
- Clinical presentation, assessment, routine examination and management of common ophthalmic disorders
- Clinical indications for and common methods of imaging and measurement of the eye and ocular adnexae with light, laser and ultrasound
- Basic methods for assessment of refractive error of the eye
- Basic methods for assessment of binocular function
- Modifications of assessment strategies and techniques according to patient age and any disabilities
- Clinical indications for and methods used to assess electrophysiology of vision
- The diversity of ophthalmic and vision services; special needs; people with learning difficulties, cognitive and sensory impairment, physical disabilities, older people, pediatrics, intensive care
- Statutory, voluntary, charitable agencies or services, e.g. social services

**Rotation D**

**Clinical Assessment and Investigation**

This work based module will provide the trainee with the opportunity to apply their knowledge and some basic skills of clinical assessment and investigation used in the diagnosis, care and treatment of patients of all ages in a range of clinical settings and care, e.g. medical assessment, neonatal care, integrated
care, critical care and community-based services. Integral to this will be a greater understanding of the role of other related diagnostic modalities such as Radiology and Pathology. In this themed pathway this module will be particularly focused on the assessment and investigation of patients with hearing and balance problems, the central and peripheral neurological systems and those with vision difficulties as well as commonly associated co-morbid conditions.

Integral to this module is the opportunity for the trainee to gain a greater understanding of the role of other related diagnostic modalities such as Radiology and Pathology. This module will give the trainee knowledge and understanding of the interpretation and clinical decision making associated with clinical assessment and investigations in the context of differential diagnosis, together with an understanding of the principles of operation, data acquisition and quality assurance of other diagnostic service modalities.

<table>
<thead>
<tr>
<th>Learning Outcomes: Knowledge and Understanding</th>
</tr>
</thead>
</table>

On successful completion of this module the trainee within the neurosensory pathway environment will:

**Clinical Assessments and Investigations**
1. Describe how different auditory, visual, central and peripheral neurological and other related specialist assessments and investigations can contribute to a holistic patient approach in the diagnosis, management, prognosis and care.
2. Describe how different assessments and investigations are used by non-specialist neurosensory centres in the assessment of patients who have auditory, visual, central and peripheral neurological disorders, e.g. healthcare for older people; neonatal care (NICU and SCBU), integrated care, critical care, primary care, independent sector.
3. Describe how different auditory, visual, central and peripheral neurological assessments and investigations can be combined in differential diagnosis of disease, or disability.

**Imaging and Pathology Diagnostics (assessments and investigations)**
4. Explain the basis of ionising and non-ionising imaging using screening and diagnostic applications to assess pathologies in neurosensory referrals to a radiology service, e.g. head CT/MRI; ultrasound.
5. Explain the legislation and physical principles behind radiation with matter.
6. Discuss and evaluate the digital processing of 2D and 3D images in neurosensory pathologies.
7. Explain the principles and application of routine pathology tests, including normal ranges, requested as part of the investigation of patients referred for investigation within the neurosensory pathway.
8. Recognise recent advances in biomarkers and pharmacogenomics and the impact of these new technologies in audiology, neurophysiology, ophthalmic and vision diagnostics, and treatments.
9. Describe the key anatomical landmarks of the auditory, visual, central and peripheral neurological pathways using imaging media.
10. Describe how calibration, safety testing and quality assurance procedures (including the legislative aspects of use of radiation) are applied in diagnostic imaging and pathology services, relating these to the processes used in physiological science services.

11. Discuss the need for and processes used in safety testing and quality assurance of imaging equipment.

**Clinical Assessment and Investigations within Patient Pathways**

12. Describe the patient pathways relating to common pathological conditions associated with auditory, visual, central and peripheral neurological health issues.

13. Discuss the major contributor and risk factors in auditory, visual, central and peripheral neurological health issues.

14. Describe the normal function and major abnormalities or common pathologies of physiological control mechanisms that give rise to referrals for imaging in patients undergoing neurosensory pathway treatment[s] and/or care.

15. Describe cellular, tissue and system responses to diseases occurring in auditory, visual, central and peripheral neurological disorders, concentrating on disorders of growth, tissue responses to injury, cell death, inflammation, neoplasia, normal and abnormal immune responses, atheroma, thrombosis, embolism and infarction.

16. Describe the basis of common diseases and infections arising in auditory, visual, central and peripheral neurological disorders.

17. Discuss the role of inter-professional team working in the diagnosis and treatment of patients.

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

In this rotational module, learning outcomes are related to three key areas in Clinical Assessment and Investigation:

1. Working in Partnership
2. Related Diagnostic Services
3. Patient Pathways

On successful completion of this module the trainee will:

**Working in Partnership**

1. Record and integrate a patient history with the outcome of clinical examination and determine appropriate diagnostic investigations for patients commonly referred to cardiac, vascular, respiratory and sleep OR gastrointestinal, urodynamic science OR audiology, neurophysiology, or ophthalmic and vision science diagnostic services in conjunction with the wider clinical team.
2. Assist in performing a range of diagnostic and therapeutic procedures, recognising abnormal results/findings and appreciating the implication of results on patient treatment and care.

**Related Diagnostic Services**

3. Identify key anatomical landmarks on images obtained using ionising and non-ionising imaging media in the investigation of patients with cardiovascular, respiratory, sleep OR with gastrointestinal and lower urinary tract (LUT) disorders OR conditions resulting in referral to audiology, neurophysiology, or ophthalmic and vision science services, and describe the limitations and impact of results on patient diagnosis, treatment and care.

4. In a supportive role assist in performing pathology tests that patients with cardiovascular, respiratory, sleep OR with gastrointestinal and LUT disorders OR conditions resulting in referral to audiology, neurophysiology, or ophthalmic and vision science services will commonly undergo as part of an individual diagnostic plan.

5. In a supportive role assist in performing safety checks, calibration and quality assurance of imaging and pathology equipment using local, national or international standards.

**Patient pathways**

6. Devise a diagnostic plan for a patient based on the presenting symptoms and clinical information available, and indicate what the next steps might be (diagnostic or therapeutic), dependent on the outcome of the initial results from a mix of diagnostic modalities.

**Indicative Content**

**Assessments and investigations using imaging**

- Screening and diagnostic radiology equipment
  - Technology developments and advances of differential diagnosis
- Diagnostic imaging
  - Imaging with lasers
  - Image display and reconstruction techniques
  - Clinical application and the basics of normal and pathological appearances within the image
  - The physics and mathematics of image formation; radiological image; CT scanning
  - X-rays, magnetic fields, lasers and ultrasound
- Key anatomical features; film viewing
  - Features of a normal MRI scan, CT scan
    - Auditory pathway
    - Visual pathway
    - Neurological pathways
- Techniques in the CNS MRI assessment
  - Use of different weighted, diffusion and functional MRI
- CT technique and advances; reporting
- Ultrasound scan/imaging of soft tissue area
  - Transducers for measuring pressure and flow
• Digital imaging, different forms of scanning laser, e.g. optical coherence tomography
• Patient safety management in imaging
• Quality assurance
  o Image quality and artefacts
• Risk assessment techniques
  o Electrical safety, fault conditions, laser safety
  o Biological safety: equipment contamination, cleaning, cross-contamination; handling procedures and protocols
  o Physical effects of radiation

Patient pathways
• Auditory, visual, central and peripheral neurological pathway disorders
  o Hearing impairment
  o Neurological infections, disease, or disorders
    ▪ Degeneration, demyelination, re-innervation
  o Impact of visual impairment
    ▪ Visual perception
      ● Visual; contrast; visual field;
      ● Colour vision
  o Hearing, vision and neuromuscular disorders
  o Social disability; effect on lifestyle; effect of age, gender
• Basis of auditory, visual, central and peripheral neurological viral, bacterial infections, disease and trauma on assessment, diagnosis, management and prognosis
  o Audiology
    ▪ Discharge, perforation, otitis media, age-related hearing loss, noise
  o Neurophysiology
    ▪ Diabetics, epilepsy, sleep apnoea, Parkinson’s disease, tumours, cerebral palsy
  o Ophthalmic and Vision Science
    ▪ Macular degeneration; cataracts; diabetic retinopathy; low vision; glaucoma

Team working
• Team formation and functions
• Role of single-discipline and multiprofessional teams
  o in the care and management of patients
  o in the delivery of services
• Effective interprofessional team working
### Section 12: MSc Clinical Science Specialist Modules for Audiology

<table>
<thead>
<tr>
<th>Year</th>
<th>Module Titles</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 3</strong>&lt;br&gt;Specialist Modules</td>
<td>Healthcare Science Audiology 3</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Research Project in Audiology</td>
<td>30</td>
</tr>
<tr>
<td><strong>Year 2</strong>&lt;br&gt;Specialist Modules</td>
<td>Research Methods</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Healthcare Science Audiology 2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Research Project in Audiology</td>
<td>30</td>
</tr>
<tr>
<td><strong>Year 1</strong>&lt;br&gt;Core Modules</td>
<td>Introduction to Healthcare Science, Professional Practice and Clinical Leadership</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Introduction to Neurosensory Sciences &lt;br&gt;Underpinning knowledge for rotational elements and integrated professional practice</td>
<td>40</td>
</tr>
</tbody>
</table>

**Legend:**
- **Blue:** Generic Modules: Common to all divisions of healthcare science
- **Yellow:** Division/Theme-Specific Modules: Common to a division or theme
- **Orange:** Specialist Modules: Specific to a specialism
This module provides trainees with the knowledge that underpins the specialist module in Audiology and gives trainees the tools to undertake learning in the workplace.

Aim

The provision of this academic module is spread over the second and third years of the programme and is designed to provide trainees with the conceptual scientific and clinical basis necessary for a Clinical Scientist in Audiology. It is expected that the HEI provider(s) will work with National School of Healthcare Science and the workplace training departments to agree which year the learning outcomes should be taught to meet local service need.

Objectives

The objectives of this module are:

- To provide the trainees with a fundamental theoretical background in auditory and vestibular science, assessment and rehabilitation that is essential for clinical practice and research in audiology.
- To develop data analysis skills, the ability to synthesise information, their critical thinking and problem-solving skills for academic study as a Clinical Scientist in Audiology.

Learning Outcomes: Knowledge and Understanding

On successful completion of this module the trainee will:

Acoustics and Psychoacoustics
1. Explain and evaluate the statistical basis of auditory discrimination and detection.
2. Discuss and justify the need for and processes used in calibration of audiological equipment.
3. Describe the acoustics and psychophysics of hearing.

Audiological and Vestibular Assessment
4. Describe and critically evaluate the fundamental principles of audiovestibular assessment, including tinnitus.
5. Discuss and justify the essential principles involved in the selection of subjective and objective audiological techniques for successful assessment of hearing, tinnitus and balance of adults, e.g. pure tone audiometry, acoustic admittance tests, otoacoustic emissions and evoked response audiometry.
## Function and Disorders of the Audiovestibular system

6. Explain the normal and abnormal structure and function of the auditory and vestibular systems in adults and children.

7. Explain the pathophysiology of the audiovestibular system.

8. Describe and critically evaluate the assessment and management strategies involved in the management of audiovestibular dysfunctions, including tinnitus.

### Adult Audiology

9. Describe and assess the conceptual framework underpinning rehabilitation of adults with acquired hearing impairment, tinnitus, or balance problems.

10. Discuss and evaluate factors that may influence a successful outcome in rehabilitation.

11. Discuss and evaluate current theories of amplification and signal processing in the management of hearing disorders.

12. Describe and justify the processes involved with the selection, verification and evaluation of hearing aids.

13. Describe and appraise the technical, surgical and psychosocial aspects of implantable devices, including cochlear implants and bone-anchored hearing aids.

14. Critically evaluate the role of the audiologist in the holistic management of adults with acquired hearing impairment, tinnitus, or balance problems.

### Paediatric Audiology

15. Describe normal child development, including communication, attention and listening skills, speech, hearing and balance, and the effects of disorders of these.

16. Discuss the relationship between developmental age and paediatric hearing test selection, assessment, rehabilitation strategy, or referral.

17. Describe the techniques for the (developmentally appropriate) behavioural assessment of hearing in infants and children, including the scientific basis, limitations and advantages of each.

18. Compare and contrast the techniques for the objective assessment of hearing in infants and children (e.g. tympanometry, evoked potentials, otoacoustic emissions), including the scientific basis, limitations and advantages of each.

19. Describe and justify the principles and practice of screening particularly in relation to screening for childhood hearing loss and the newborn hearing screening programme.

20. Describe the critical and timely stages of assessment of hearing levels.

21. Examine the factors that contribute to a successful test, e.g. accuracy, sensitivity, reliability.

22. Discuss the principles of the planning and implementation of audiological assessment strategies, taking into account the needs of the individual patient.

23. Discuss and justify the principles of the selection, prescription, verification, evaluation and monitoring of amplification for children, including the role of cochlear implants, environmental and other assistive listening devices.
24. Assess the evidence base underpinning the planning and implementation of a rehabilitation strategy, taking into account the needs of the individual patient.
25. Explain the psychosocial and educational impact of hearing loss and auditory processing disorders on babies and young children.
26. Discuss the medical and aetiological investigations of childhood hearing loss.
27. Evaluate the range of communication options that are available to families of children with hearing loss within an informed choice framework.
28. Discuss and evaluate the principles of ‘family-friendly’ service delivery and the role of parents and other professionals in collaborative teams working with families with a child with hearing loss, e.g. physiotherapists, paediatricians, teachers of the deaf, speech and language therapists, ENT, AVP, voluntary sector.
29. Discuss and critically evaluate the role of the audiologist in the holistic management of children with hearing loss.

**Hearing and Communication across the lifespan**
30. Appraise the psychosocial and communication implications of an acquired hearing impairment on the individual’s everyday life.
31. Identify the prevalence and incidence of hearing, tinnitus and balance disorders.

**Epidemiology and Public Health**
32. Describe the prevalence and incidence of hearing, balance disorders and tinnitus in relation to demographic characteristics.
33. Discuss and critically evaluate the principles of health education and screening to improve public health related to hearing/balance/tinnitus.

**Section 12.1: Associated Work Based programme for Audiology**

The work based learning programme comprises four modules (see Table below), which are described in more detail in the Neurosensory Work Based Learning Guide.

<table>
<thead>
<tr>
<th>Module 1 (A&amp;VA-5)</th>
<th>Adult Audiological and Vestibular Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 2 (AA&amp;R-6)</td>
<td>Adult Audiology and Rehabilitation</td>
</tr>
<tr>
<td>Module 3 (PA&amp;H-7)</td>
<td>Paediatric Audiology and Habilitation</td>
</tr>
<tr>
<td>Module 4 (E&amp;PH-8)</td>
<td>Epidemiology and Public Health</td>
</tr>
</tbody>
</table>

**Adult Audiological and Vestibular Assessment (A&VA-5)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.
On successful completion of this module the trainee will:

1. Perform daily calibration and checks of the equipment and environment following local procedures, to ensure patient safety and quality of facilities.
2. Formulate, prior to patient contact, a consultation plan and plan appropriate clinical testing, utilising the relevant information available.
3. Interview a variety of different patients, overcoming any communication barriers.
4. Perform subjective and objective hearing and balance tests in a safe and effective manner, adapting as required to ensure information is efficiently gained within the time available.
5. Interpret test results and consolidate these in relation to all other relevant information obtained and make informed decisions concerning the diagnosis and management options.
6. Present information regarding results, advice and recommendation for follow-up actions/interventions to patients and carers, using appropriate language and communication strategies, and formulate individual management plan.
7. Write reports/letters regarding test results and management, including appropriate onward referrals.

**Adopt Audiology and Rehabilitation (AA&R-6)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Perform daily calibration and checks of the equipment and environment following local procedures, to ensure patient safety and quality of facilities.
2. Formulate, prior to patient contact, a consultation plan and plan appropriate clinical testing, utilising the relevant information available.
3. Interview a variety of different patients, overcoming any communication barriers.
4. Perform subjective and objective hearing and balance tests in a safe and effective manner, adapting as required to ensure information is efficiently gained within the time available.
5. Interpret test results and consolidate these in relation to all other relevant information obtained and make informed decisions concerning the diagnosis and management options.
6. Present information regarding results, advice and recommendation for follow-up actions/interventions to patients and carers, using appropriate language and communication strategies, and formulate individual management plan.
7. Write reports/letters regarding test results and management, including appropriate onward referrals.

**Paediatric Audiology and Habilitation (PA&H-7)**
Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Perform any subjective and objective development and age-appropriate hearing tests within the field of paediatric audiology and rehabilitation.
2. Interpret test results and consolidate these in relation to all other relevant information obtained.
3. Make informed decisions concerning the diagnosis and management options.

Epidemiology and Public Health (E&PH-8)

Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Perform the range of methodologies, including statistical analysis, used in epidemiology to identify the prevalence and incidence of hearing, tinnitus and balance disorders, and their relationship to relation to demographic characteristics.
2. Design a screening protocol that could be used in a community setting such as a GP practice, write a proposal that includes the implementation, evaluation and cost benefit of the programme and the potential patient benefit from the programme.
3. Undertake a rehabilitation session, under supervision, for example with a hearing therapist, to support patients through the behavioural change process and provide evidence-based advice.

Indicative Content

- Statistical basis of auditory discrimination and detection
- Processes used in calibration of audiological equipment
- Acoustics and psychophysics of hearing

Audiological and vestibular assessment

- Management of calibration programmes relevant to auditory-vestibular science
- Diagnostic and treatment strategies in single and multidisciplinary clinical contexts
- Objective and subjective assessment techniques for auditory-vestibular assessment of adult cases
- Clinical history taking
- Communication, reporting and referring
- Effective patient management

**Adult rehabilitation**
- Applications, classifications and theories of rehabilitation models to practice
- Auditory and non-auditory influences on assessment of and goals in enablement
- Social and emotional aspects of hearing impairment
- Processes of rehabilitation and enablement
- Assessment, evaluation and verification of technological and non-technological interventions
- The role of government, charitable and other agencies in adult rehabilitation
- Effective communication, reporting and referring in a broad healthcare arena

**Paediatric assessment**
- Medical and aetiological investigations of childhood hearing loss; normal and abnormal speech and hearing development
- Quality-assure calibration of equipment and facilities used for paediatric assessment
- Techniques for the (developmentally appropriate) behavioural assessment of hearing in infants and children, including the scientific basis, limitations and advantages of each
- Techniques for the objective assessment of hearing in infants and children (e.g. tympanometry, evoked potentials, otoacoustic emissions), including the scientific basis, limitations and advantages of each
- Principles and practice of screening childhood hearing loss and the newborn hearing screening programme
- Selection, prescription, verification, evaluation and monitoring of amplification for children, including hearing aids, cochlear implants, educational, environmental and other assistive listening devices
- Specific issues associated with fitting hearing aids and FM systems to infants
- The role of parents and other professionals in collaborative teams working with families with a child with hearing loss, e.g. physiotherapists, paediatricians, teachers of the deaf, speech and language therapists, ENT, AVP, voluntary sector
- ‘Family-friendly’ services
- Communication options for families of children with hearing loss; informed choice framework
- Professionals and agencies to support deaf children and their families
Professional practice

- Working in teams; the role of the audiologist as the primary healthcare professional managing intervention, treatment, referrals and reporting
- Health education and screening principles to improve public health related to hearing/balance/tinnitus

<table>
<thead>
<tr>
<th>Division:</th>
<th>Physiological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme:</td>
<td>Neurosensory Sciences</td>
</tr>
<tr>
<td>Specialism:</td>
<td>Audiology</td>
</tr>
<tr>
<td>Year 2 and 3:</td>
<td>Research Project in Audiology</td>
</tr>
</tbody>
</table>

[60 credits]

The overall aim of this module, building on the Research Methods module, is for the trainee to undertake a research project 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 knowledge in a specialism of healthcare science. The research project may span scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service development, service improvement, or supporting professional service users to meet the expected learning outcomes. Research projects should be designed to take into account the research training required by individual trainees and the needs of the department in which the research is to be conducted.

**Learning Outcomes: Knowledge and Understanding**

On successful completion of this module the trainee will:

1. Discuss the stages of the research and innovation process from conceptualisation to dissemination and, if appropriate, translation into practice.
2. Describe the purpose and importance of different kinds of research, including scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service development, service improvement and supporting professional service users, and relate these to the roles undertaken by Clinical Scientists in the trainee’s specialism.
3. Discuss and evaluate the use of reference manager systems.
4. Justify the rationale for research governance and ethical frameworks when undertaking research or innovation in the NHS.
5. Describe the process and requirements for publication in a peer-reviewed journal and the current system of grading research publications.

**Learning Outcomes: Practical Skills**

On successful completion of this module the trainee will:
1. Design, plan and undertake a research project to test a hypothesis from conception to completion/archiving in accordance with ethical and research governance regulations, drawing on expert advice where necessary and involving patients and service users.
2. Analyse the data using appropriate methods and statistical techniques, and interpret, critically discuss and draw conclusions from the data.
3. Prepare a written project that describes and critically evaluates the research project, clearly identifying the strengths and weaknesses.
4. Present a summary of the research project and outcome that conforms to the format of a typical scientific presentation at a national or international scientific meeting, responding to questions appropriately.
5. Prepare a summary of the research project suitable for non-specialist and lay audiences.

**Indicative Content**
- Critical evaluation of the literature/evidence base
- Reference management
- Identification of a research question
- Research ethics and regulatory requirements, including issues related to access and use of information
- Data protection and confidentiality guidelines
- Patient safety
- Patient consent
- Sources of funding/grants
- Peer review/expert advice
- Possible risks and balancing risk vs benefit
- Project management techniques and tools
- Roles and responsibilities of those involved in the research
- Monitoring and reporting
- Data analysis
- Data interpretation
- Criteria/metric for assessing and grading research data and publications in the scientific, NHS and HE sectors
- Range of formats and modes of presentation of data
- Requirements for publications submitted to scientific, education and similar journals
- Current conventions with respect to bibliography and referencing of information
## Section 13: MSc Clinical Science Specialist Modules for Neurophysiology

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Core Modules</th>
<th>Module Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction to Healthcare Science, Professional Practice and Clinical Leadership</td>
<td>Healthcare Science Integrating underpinning knowledge required for each rotational element and integrated professional practice [40]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Specialist Modules</th>
<th>Module Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Research Methods</td>
<td>Research Project in Neurophysiology [30]</td>
</tr>
<tr>
<td></td>
<td>Healthcare Science Neurophysiology 2</td>
<td>[20]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Specialist Modules</th>
<th>Module Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthcare Science Neurophysiology 3</td>
<td>Research Project in Neurophysiology [30]</td>
</tr>
</tbody>
</table>

### Notes:
- **Generic Modules:** Common to all divisions of healthcare science
- **Division/Theme-Specific Modules:** Common to a division or theme
- **Specialist Modules:** Specific to a specialism
This module provides trainees with the knowledge that underpins the specialist module in Neurophysiology and gives trainees the tools to undertake learning in the workplace.

**Aim**

The provision of this academic module is spread over the second and third years of the programme and is designed to provide trainees with the conceptual scientific and clinical basis necessary for a Clinical Scientist in Neurophysiology. It is expected that the higher education provider will work with the National School of Healthcare Science and workplace training departments to agree which year the learning outcomes should be taught to meet local service need.

**Division:** Physiological Sciences  
**Theme:** Neurosensory Sciences  
**Specialism:** Neurophysiology  
**Year 2 and 3:** Neurophysiology 2 & 3  
**[50 credits in total]**

**Objectives**

The objectives of this module(s) are:

- To provide the trainees with a fundamental theoretical background in neurophysiological science, assessment and rehabilitation that is essential for clinical practice and research in neurophysiological sciences.
- To develop data analysis skills, the ability to synthesise information, their critical thinking and problem-solving skills for academic study as a Healthcare Scientist in Neurophysiology.

**Learning Outcomes: Knowledge and Understanding**

On successful completion of this module the trainee will be able to:

**Nerve conduction studies and EMG and evoked potentials**

1. Describe the anatomy and physiology of the peripheral nervous system.
2. Discuss and evaluate the types of electrodes, and their characteristics used in electromyography and nerve conduction studies and evoked potentials.
3. Describe the non-pathological sources of error and non-pathological effects on nerve conduction studies.
4. Describe the pathological changes in nerve conduction studies, clinical presentation and nerve conduction and electromyography changes in diseases of the peripheral nerves and skeletal muscle.
5. Describe the potentials associated with electromyography.
6. Critically evaluate the clinical uses of evoked potentials.
7. Describe the types and function of stimulators used in nerve conduction studies and evoked potentials (visual, auditory, somatosensory).
Paediatric EEG
8. Evaluate the design of a paediatric neurophysiology department.
9. Describe the normal resting and sleeping electroencephalogram of a paediatric patient.
10. Describe the pathophysiology, clinical presentation and electroencephalographic findings in paediatric epileptic syndromes.
11. Describe the pathophysiology, clinical presentation and electroencephalographic findings in paediatric conditions of the nervous system, paediatric metabolic manifestations on the central nervous system, and mental retardation syndromes and child psychiatry.
12. Critically appraise and discuss the clinical significance and interpretation of the paediatric electroencephalogram.

EEG on the intensive care unit
13. Describe the anatomy and blood supply of the cerebral cortex and brainstem.
14. Describe the pathophysiology and management of the unconscious patient in the intensive care unit.
15. Critically appraise the techniques for the long-term monitoring of the electroencephalogram in patients on the intensive care unit.
16. Describe the effects that drugs and changes of other physiological variables have on the electroencephalogram.
17. Critically evaluate the clinical uses of the electroencephalogram in the unconscious patient.

Sleep and long-term monitoring
18. Describe the physiology of sleep and explain normal and abnormal sleep pattern.
19. Discuss and evaluate methods to assess excessive daytime sleepiness is assessed.
20. Critically evaluate the use of video telemetry and ambulatory recording in epileptic and non-epileptic seizure disorders.
21. Critically evaluate the clinical applications of ambulatory recordings in adult and childhood seizure disorders and disorders of sleep.

Section 13.1: Associated Work Based Programme for Neurophysiology

The provision of this work based module is spread over the second and third years of the programme and is designed to provide trainees with the opportunity to put theory into practice and to meet the required competencies necessary to practice as a healthcare scientist in one of the neurosensory specialisms.

The work based learning programme comprises four modules (see Table below) which are described in more detail in the Neurosensory Work Based Learning Guide.

Module 1 (E&NC&EP-5) Electromyography and Nerve Conduction Studies
Electromyography and Nerve Conduction Studies and Evoked Potentials (E&NC&EP-5)

Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Plan, prepare and perform nerve conduction studies, obtaining recordings from the upper and lower limbs in adult and/or paediatric patients referred for investigation of disorders of the peripheral nervous system, e.g. carpal tunnel syndrome, peripheral neuropathy, etc.
2. Assist in electromyography (EMG) studies and identify the electropotentials associated with electromyography.
3. Plan, prepare and perform evoked potential studies (visual, auditory and somatosensory) and measure visual acuity and hearing and sensory threshold.
4. Interpret the data and produce high-quality reports with respect to nerve conduction studies and evoked potentials, and differentiate between artefact and physiological occurrences.

Paediatric EEG (PEEG-6)

Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Plan, prepare and perform EEG recordings, accurately measuring electrode sites, site electrodes using recommended placement system, and differentiate between artefact and physiological occurrence in paediatric patients.
2. Interpret the data and produce high-quality reports with respect to paediatric EEG.

EEG in the Intensive Care Setting (EEG on ICU-7)
Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Plan, prepare and perform EEG recordings in an intensive care setting, siting electrodes using recommended placement system, including any modifications due to the nature of the patient.
2. Report on a range of EEGs recorded from patients in ICU, for example status epilepticus, anoxic/hypoxic brain injury.

Sleep and Long-term Monitoring (S&LTM-8)

Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare, plan and perform multiple sleep latency tests (MSLT) and/or polysomnography (PSG).
2. Prepare, plan and perform videotelemetry and/or ambulatory EEG recordings.
3. Factually report on the results from MSLT and/or PSG.
4. Factually report on the results from video telemetry and/or ambulatory EEG recordings.

Indicative Content

Nerve conduction studies and EMG and evoked potentials

- The generation of neural, membrane, propagation, resting potentials and refractory periods
  - Saltatory conduction
    - F waves
    - H reflex
  - Compound nerve, muscle and sensory action potentials
- Anatomy of the peripheral nerves
  - Brachial plexus
  - Median
  - Ulnar
  - Radial
  - Tibial
• Sural and common peroneal nerve

• Recording and stimulus parameters used in the electromyogram and motor/sensory nerve conduction studies
  o Different types of needle electrodes
    ▪ Concentric
    ▪ Monopolar and single fibre
  o Electrode placement for nerve conduction studies (motor and sensory)
    ▪ Median
    ▪ Ulnar
    ▪ Radial
    ▪ Tibial
    ▪ Sural and common peroneal nerve

• Measure visual acuity; hearing threshold; sensory threshold

• Different types of electrodes used for recording evoked potentials
  o Surface
  o Gold foil
  o DTL needles

• Causes of errors encountered and non-pathological effects in the recording of conduction studies and evoked potentials and their elimination

• Nerve conduction studies
  o Errors in measurements and reproducibility of results
  o Limitation of motor conduction velocity measurements
  o Effect of age, gender, limb temperature

• Pathophysiological changes in nerve conduction studies
  o Axonal degeneration, demyelination, re-innervation
  o Block and slowed conduction

• The pathophysiology and clinical presentation and nerve conduction and electromyographic findings in the following conditions
  o Types of neuropathy
  o Axonal
  o Fibre-selective neuropathies
    ▪ Large and small fibre neuropathies
  o Demyelinating diseases
  o Acute onset, hereditary, acquired, mononeuropathies
  o Entrapment neuropathies
    ▪ Carpal tunnel syndrome
    ▪ Ulnar nerve at the elbow
    ▪ Tarsal tunnel
  o Radiculopathies
  o Traumatic nerve lesions
  o Myopathies
    ▪ Inflammatory, endocrine, genetically determined myopathies
    ▪ Plexus and root lesions
    ▪ Neuromuscular junction disorders
    ▪ Motor neurone disorders

• Potentials related to electromyography
  o Motor units
  o Insertion activity
  o End-plate noise
  o Fibrillations
- Fasciculations
- Positive sharp waves
- Spontaneous repetitive activity
  - Myotonic discharges
  - Complex repetitive discharges
  - Neuromyotonia
- Reinnervation

Clinical uses of evoked potentials
- Visual
  - Flash
    - Non-organic visual loss; cortical blindness
    - Pattern reversal visual evoked potentials
    - Optic nerve; demyelinating; systemic diseases
    - Chiasmal and retrochiasmal lesions
    - Optic tract and optic radiation disease
    - Occipital lesions
    - Non-organic visual loss
- Auditory brainstem
  - Conduction hearing loss
  - Lesions of the acoustic nerve and brainstem lesions
  - Demyelination; ataxias; degenerative disorders
  - Prognostic value in coma
- Somatosensory
  - Spinal cord; brainstem; trauma lesions
  - Tumours of the spinal cord
  - Giant SEPs
  - Central demyelination
  - Prognostic value in coma

EEG on the intensive care
- Anatomy and blood supply to the cerebral cortex and brainstem
- Management of the unconscious patient on the intensive care unit
  - Clinical neurological examination
  - Glasgow coma scale and outcome scale
  - General nursing, nursing procedures and techniques
- Intensive care environment
  - Electrical safety; patient safety; infection control; sterile fields
  - Intensive care equipment
- The electroencephalogram in the unconscious patient on the intensive care unit
- Electrode types used in the intensive care unit for the recording of the electroencephalogram; electrode placement used; artefact and interference identification and elimination
  - Main interference; respirators; infusion pumps
  - Electrical beds; renal dialysis equipment
  - Vital signs monitors
- Recording of other physiological variables
  - Electrocardiogram; pulse; respiration
  - Tremor; myoclonic jerks; eye movement
• Drugs used for sedation on the intensive care unit and their effect on the electroencephalogram
• Effect of other physiological variables and mechanism of effect on the electroencephalogram and evoked potentials
  o Blood pressure; heart rate; respiration rate; metabolic state
  o Liver and renal function
  o Electrolytes; temperature; raised intracranial pressure
• Uses of the electroencephalogram in the unconscious patient (adult and children)
  o Anoxic brain damage; head injury; cerebral infarct; encephalitis and meningitis
  o Metabolic disease; multi-organ failure
  o Status – clinical and subclinical
  o Locked-in syndrome
  o Renal dialysis
  o Prediction of outcome
  o Prognostic value
  o Raised intracranial pressure
  o Brain death and irreversible cerebral damage
  o Status epilepticus
• Technical requirements and instrumentation for the continuous monitoring of the electroencephalogram on the intensive care unit
• Basic signal processing and interpretation
  o Fourier and amplitude analysis
  o Display, quality control and validation requirements
  o Artefact identification
  o Cerebral function monitor, analysing monitor
  o Compressed spectral array

Paediatric EEG
• Design of a paediatric neurophysiology department
  o Layout, accessibility, waiting areas, recording suites
  o Child–parent facilities
  o Staff areas, availability and departmental structure
  o Equipment specifications and availability
• Normal resting electroencephalogram, normal variants and the sleeping electroencephalogram in paediatric patients
  o Infants in the first year of life; child and adolescence
• Activation procedure their indications and contraindications
  o Hyperventilation, photic stimulation
  o Sleep deprivation and drug-induced sleep
• Paediatric epileptic syndromes
  o Epileptic syndromes of infancy and early childhood
    ▪ Infantile spasms (West syndrome, Blitz-Nick-salaam Krämpfe)
    ▪ Febrile convulsions
    ▪ Benign myoclonic epilepsy; severe myoclonic epilepsy in infancy
    ▪ Lennox-Gaustaut syndrome
    ▪ Epilepsy with myoclonic-astatic seizures
  o Epileptic syndromes of childhood
    ▪ Childhood absence epilepsy
- Epilepsy with myoclonic absences
- Benign partial epilepsies in children
  - Benign childhood epilepsy with centro-temporal spikes
  - Childhood epilepsy with occipital paroxysms
  - Benign epilepsy with affective symptoms
  - Benign partial epilepsy with extreme somatosensory evoked potentials
  - Atypical benign partial epilepsy
  - Other forms of benign partial epilepsies
- Epilepsy with continuous spike and slow wave during slow sleep (CSWS or ESES)
- Acquired epileptic aphasia (Laudau-Kleffner syndrome)
- Chronic progressive epilepsia continua of childhood (Kojewnikov’s syndrome)
- Epileptic syndromes of late childhood and adolescence
- Juvenile absence; juvenile myoclonic epilepsy
- Epilepsy with generalised tonic-clonic seizures on awakening
- Primary reading; photosensitive epilepsy
- Progressive myoclonic epilepsies of childhood and adolescence

- Paediatric conditions of the nervous system
  - Infection of the nervous system
    - Meningitis; encephalitis; Herpes simplex encephalitis
    - Tuberculose meningencephalitis; cerebral thrombophlebitis
  - Cerebral malaria
    - Slow virus infections
    - Subacute sclerosing panencephalitis
    - Human immunodeficiency virus infections and AIDS
    - Rasmussens’s syndrome; Reye syndrome
  - Brain tumours; cerebral palsy
  - Structural abnormalities

- Paediatric metabolic conditions
  - Peroxisomal disorders
  - Lysosomal enzyme disorders and other leucodystrophies
  - Neuronal ceroid lipofuscinosis
  - Amino acid disorders and organic acidurias

- Paediatric metabolic manifestations on the central nervous system
  - Endocrine disorders
  - Disturbances of carbohydrate metabolism
  - Disturbances of electrolyte balance

- Learning difficulties and child psychiatry
  - Down’s; Fragile X; Angelman’s; Rett’s; Tourett’s syndrome
  - Autism and related disorders
  - Developmental dysphasial; attention deficit hyperactivity disorder
  - Behavioural/ conduct disorders/problems; anorexia nervosa
  - Batten’s

Sleep and long-term monitoring
- Clinical polysomnography
  - Electrode/Transducer placement
    - Electrooculogram
Submental muscle
Respiratory effort and movement

The electroencephalogram
- Origin of the electroencephalogram
- Characteristics of the normal awake EEG in adults and paediatrics including normal variants

Sleeping EEG in adults and Paediatrics
- Vertex sharp waves, sleep spindles, K complexes and positive occipital sharp transients of sleep (POSTs)

Demonstrates an understanding of the normal phenomena of sleep and the different stages of sleep
- Sleep stages
  - Stage I
  - Stage II
  - Stage III
  - Stage IV
  - Rapid eye movement (REM)

- Sleep staging
  - Rechtschaffen and Kales
  - Hypnograms

Physiology of sleep and sleep disorders
- Parasomnias
- Insomnias
- Hypersomnias

Assessment of excessive daytime sleepiness
- Multisleep latency test (MSLT)
- Maintenance of wakefulness test
- Stanford sleepiness scale

Application of video-telemetry and Ambulatory Recording
- Differential diagnosis
- Differentiation between epileptic and non-epileptic attacks
- Classification of seizures (in known epilepsy)
- Focus localisation
- Evaluating clinical symptoms
  - Seizure classification by clinical criteria
  - Hard to recognise seizures
  - Transitory cognitive impairment
- Evaluating frequency of events
- Detection of precipitating factors

Clinical utility of ambulatory recordings
- Adult seizure disorders
- Childhood seizure disorders
- Evaluation of episodes of altered awareness or behaviour
- Uses in sleep disorders
  - Hypersomnias
  - Parasomnias
  - Sleep apnoea
  - Periodic movements of sleep

Division: Physiological Sciences
The overall aim of this module, building on the Research Methods module, is for the trainee to undertake a research project 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 knowledge in a specialism of healthcare science. The research project may span scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service development, service improvement, or supporting professional service users to meet the expected learning outcomes. Research projects should be designed to take into account the research training required by individual trainees and the needs of the department in which the research is to be conducted.

<table>
<thead>
<tr>
<th>Theme: Neurosensory Sciences</th>
<th>Specialism: Neurophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years 2 and 3: Research Project in Neurophysiology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Outcomes: Knowledge and Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>On successful completion of this module the trainee will:</td>
</tr>
<tr>
<td>1. Discuss the stages of the research and innovation process from conceptualisation to dissemination and, if appropriate, translation into practice.</td>
</tr>
<tr>
<td>2. Describe the purpose and importance of different kinds of research, including scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service development, service improvement and supporting professional service users, and relate these to the roles undertaken by Clinical Scientists in the trainee’s specialism.</td>
</tr>
<tr>
<td>3. Discuss and evaluate the use of reference manager systems.</td>
</tr>
<tr>
<td>4. Justify the rationale for research governance and ethical frameworks when undertaking research or innovation in the NHS.</td>
</tr>
<tr>
<td>5. Describe the process and requirements for publication in a peer-reviewed journal and the current system of grading research publications.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Outcomes: Practical Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>On successful completion of this module the trainee will:</td>
</tr>
<tr>
<td>1. Design, plan and undertake a research project to test a hypothesis from conception to completion/archiving in accordance with ethical and research governance regulations, drawing on expert advice where necessary and involving patients and service users.</td>
</tr>
<tr>
<td>2. Analyse the data using appropriate methods and statistical techniques, and interpret, critically discuss and draw conclusions from the data.</td>
</tr>
<tr>
<td>3. Prepare a written project that describes and critically evaluates the research project, clearly identifying the strengths and weaknesses.</td>
</tr>
</tbody>
</table>
4. Present a summary of the research project and outcome that conforms to the format of a typical scientific presentation at a national or international scientific meeting, responding to questions appropriately.
5. Prepare a summary of the research project suitable for non-specialist and lay audiences.

Indicative Content

- Critical evaluation of the literature/evidence base
- Reference management
- Identification of a research question
- Research ethics and regulatory requirements, including issues related to access and use of information
- Data protection and confidentiality guidelines
- Patient safety
- Patient consent
- Sources of funding/grants
- Peer review/expert advice
- Possible risks and balancing risk vs benefit
- Project management techniques and tools
- Roles and responsibilities of those involved in the research
- Monitoring and reporting
- Data analysis
- Data interpretation
- Criteria/metric for assessing and grading research data and publications in the scientific, NHS and HE sectors
- Range of formats and modes of presentation of data
- Requirements for publications submitted to scientific, education and similar journals
- Current conventions with respect to bibliography and referencing of information
### Section 14: MSc Clinical Science Specialist Modules for Ophthalmic and Vision Science

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Core Modules</th>
<th>Module Titles</th>
<th>Module Titles</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Specialist Modules</th>
<th>Healthcare Science Ophthalmic and Vision Science 3</th>
<th>Research Project Trainees would usually begin a workplace research project in Year 2 and complete the project in Year 3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Specialist Modules</th>
<th>Module Titles</th>
<th>Research Project Trainees would usually begin a workplace research project in Year 2 and complete the project in Year 3</th>
</tr>
</thead>
</table>

#### Legend
- **Generic Modules**: Common to all divisions of healthcare science
- **Division/Theme-Specific Modules**: Common to a division or theme
- **Specialist Modules**: Specific to a specialism
This module provides trainees with the knowledge that underpins the specialist module in Ophthalmic and Vision Science and gives trainees the tools to undertake learning in the workplace.

**Aim**

The provision of this academic module is spread over the second and third years of the programme and is designed to provide trainees with the conceptual scientific and clinical basis necessary for a healthcare scientist in Ophthalmic and Vision Science.

It is expected that the HEI provider(s) will work with the National School of Healthcare Science and workplace training departments to agree which year the learning outcomes should be taught to meet local service need.

**Objectives**

The objectives of this module(s) are:

- To provide the trainees with a fundamental theoretical background in Ophthalmic and Vision Science, assessment and rehabilitation that is essential for clinical practice and research in Ophthalmic and Vision Science.
- To develop data analysis skills, the ability to synthesise information, their critical thinking and problem-solving skills for academic study as a healthcare scientist in Ophthalmic and Vision Science.

**Learning Outcomes: Knowledge and Understanding**

On successful completion of this module the trainee will:

**Visual perception**

1. Discuss different modalities of visual perception, including visual acuity and contrast sensitivity, visual field, colour vision, dark adaptation, and the anatomical and neurophysiological substrates of these modalities.
2. Discuss and critically appraise the application of the basic principles of psychophysics to methods of assessment of different modalities of visual perception.
3. Critically appraise the indications for and the interpretation of assessments of visual perception in the diagnosis of ophthalmic diseases.

**Imaging of eye with light and lasers**

4. Describe and evaluate the different technologies and methods used to image and measure ocular structures, and the indications for and interpretation of results in the diagnosis of ophthalmic diseases.
5. Discuss ocular blood flow, the principles and methods of ocular angiography, and the indications for and interpretation of results in the diagnosis of ophthalmic diseases.

**Ultrasonography of eye and orbit**
6. Explain and evaluate the physics underpinning a range of technology and scanning modes used for ultrasonography of eye and orbit.
7. Discuss the principles and methods of echographic examination of eye and orbit, to include screening, topographic examination, quantitative echography and kinetic echography, their clinical indications, and interpretation of findings.

**Ocular measurement, refraction and biometry**
8. Describe and evaluate a range of methods, including ultrasound, low coherence interferometry and corneal topography, used for measurement of ocular structures and refractive interfaces of the eye.
9. Discuss and justify the clinical indications for undertaking ocular measurements, and interpretation and calculations based on results of measurements.

**Ocular movement, binocular vision and vision development**
10. Describe the neurological basis and mechanisms for binocular vision and control of eye movement, and clinical methods for assessment of eye movement.
11. Discuss different methods of tracking and analysing eye movement, including video- and electro-oculography.
12. Describe normal and abnormal visual development, including suppression, amblyopia and developmental strabismus.

**Electrophysiology of vision**
13. Explain the methods and different modalities used to assess the electrophysiology of vision and the anatomical and neurophysiological substrates of these modalities.
14. Discuss and justify the indications for and the interpretation of results in the diagnosis of ophthalmic disease.

**Epidemiology, screening and vision impairment**
15. Discuss national and international epidemiology of vision impairment and initiatives to reduce vision impairment, criteria for screening and national screening programmes for sight-threatening disease.
16. Explain the causes and categories of low vision, social and psychosocial impact, and rehabilitation, including environmental design, daily living skills, and optical and electronic aids.

**Diagnosis and disease management**
17. Explain abnormal structure and function of the visual system in adults and children.
18. Discuss the process of construction of a differential diagnosis, and how further investigations can assist the reaching of a diagnostic conclusion.
19. Critically evaluate how methods of assessment of the visual system can
be used to monitor ophthalmic disease, and to assess and compare the effectiveness of new and current therapies for diseases of the visual system.

**Ophthalmic pharmacology**
20. Explain the principles of pharmacology and modes of action, administration and adverse effects of commonly used drugs for the investigation and treatment of ophthalmic disease.

**Professional practice**
21. Identify and explain new and potential developments in assessment of diseases of the visual system, critically review the literature, present the material to peers and demonstrate independent, lifelong learning skills.

## Section 14.1: Associated Work Based programme for Ophthalmic and Vision Science

### Aim
The provision of this workplace module is spread over the second and third years of the programme and is designed to provide trainees with the opportunity to put theory into practice and to meet the required competencies necessary to practice as a healthcare scientist in Ophthalmic and Vision Science.

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1</td>
<td>Patient Assessment</td>
</tr>
<tr>
<td>Module 2</td>
<td>Psychophysical Assessment of Vision</td>
</tr>
<tr>
<td>Module 3</td>
<td>Ophthalmic Imaging with Light and Lasers</td>
</tr>
<tr>
<td>Module 4</td>
<td>Ultrasonography of Eye and Orbit</td>
</tr>
<tr>
<td>Module 5</td>
<td>Ocular Measurement, Refraction and Biometry</td>
</tr>
<tr>
<td>Module 6</td>
<td>Ocular Movement and Binocular Function</td>
</tr>
<tr>
<td>Module 7</td>
<td>Visual Electrophysiology</td>
</tr>
</tbody>
</table>

### Patient Assessment (PA-5)

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:
1. Interpret referral letters in conjunction with medical and ophthalmic history, together with any pre-existing optometric, imaging or electrophysiological findings, where available, to formulate the appropriate testing strategy.

2. Care for visually impaired individuals and their families appropriately, with due consideration of the impact of their visual impairment.

3. Undertake a comprehensive ophthalmic examination safely and effectively, including external examination of ocular adnexae, assessment of pupil size and reactions, examination of anterior segment with a slit lamp or direct ophthalmoscope and fundus examination, and understand the principles of tonometry.

4. Derive a differential diagnosis and identify further investigations that will facilitate reaching a diagnostic conclusion.

5. Maintain an ongoing accurate, relevant and legible recording of information in the patient record.

6. Administer appropriate and approved eye drops where required, according to applicable protocols.

**Psychophysical Assessment of Vision (PAV-6)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare patients and the clinical environment for psychophysical assessment of vision.

2. Perform assessment of visual acuity in children and adults, including adults who are illiterate, have learning difficulties, or who are non-English speaking, with Snellen/logMAR and contrast sensitivity.

3. Assess colour vision with Ishihara charts and at least one other form of colour vision assessment, e.g. D15, City Plates.

4. Assess the visual field with standard automated perimetry and other methods, which may include kinetic perimetry, microperimetry, automated Amsler grid testing and frequency doubling perimetry.

5. Interpret and report results in the correct clinical context.

**Ophthalmic Imaging with Light and Lasers (OILL-7)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:
1. Prepare patients and the clinical environment for investigations using ophthalmic imaging with light and lasers.
2. Perform colour photography and optical coherence tomography (OCT) (or other scanning laser modality) of the fundus and anterior segment of the eye.
3. Observe ocular angiography, and if appropriate, take late-phase (non-time-critical) images under supervision.
4. Assess image quality and identify artefacts.
5. Interpret findings of investigations in the correct clinical context.

**Ultrasonography of Eye and Orbit (UEO-8)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare the patient and the clinical environment for ultrasonography investigations.
2. Screen the globe with A- and B-scan, understanding normal features and artefacts, and distinguishing features of dense cataract, vitreous haemorrhage, retinal detachment and ocular tumours.
3. Measure the dimensions of ocular masses and other lesions in the eye and orbit using ultrasound imaging.
4. Screen the orbits and image and measure the optic nerve and extraocular muscles.
5. Assess image quality.
6. Annotate, interpret and report results of ultrasonography investigations.

**Ocular Measurement, Refraction and Biometry (OMRB-9)**

**Learning Outcomes: Associated Work Based Learning**

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare patients and the clinical environment for investigations of ocular measurement, refraction and biometry.
2. Measure the axial length of the eye with low coherence interferometry A- and B-scan modalities, including in patients with significant ocular
pathology or previous corneal refractive surgery, and make appropriate calculations of intraocular lens power.
3. Perform corneal pachymetry with ultrasound and **at least one other** imaging modality.
4. Perform corneal topography, distinguishing abnormal results.
5. Perform focimetry and autorefraction and interpret results in the context of the patient's current optical prescription and ocular disease or condition.
6. Interpret and report on results of investigations.

### Ocular Movement and Binocular Function (OMBF-10)

#### Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare the patient and clinical environment for assessment of stereopsis.
2. Distinguish and assess different forms of ocular movement (saccades, smooth pursuit, optokinetic nystagmus [OKN], etc.) and demonstrate familiarity with recording methods, including video-oculography and electro-oculography.
3. Perform **at least one** method of assessment of stereopsis.
4. Interpret and report on results of assessment of stereopsis.

### Visual Electrophysiology (VE-11)

#### Learning Outcomes: Associated Work Based Learning

High-level description of the work based learning that accompanies this academic module. Further details of the work based programme can be found in the Work Based Learning Guide, including the Clinical Experiential Learning, Competences and Applied Knowledge and Understanding.

On successful completion of this module the trainee will:

1. Prepare patients and the clinical environment for visual electrophysiology investigations.
2. Record all visual electrophysiology tests (electroretinograms [ERGs], electro-oculography [EOG], visual evoked potentials [VEPs]) using the correct procedures.
3. Critically evaluate the effects and merits of altering the recording conditions, electrode types and positions, acquisition parameters and stimulation parameters.
4. Recognise, identify and remove sources of artefact.
5. Analyse recordings correctly, with appropriate use of a wide range of analysis techniques.
Indicative Content

Anatomy, physiology, pathology of the visual system
- Comprehensive knowledge of the anatomy and function of the eye, visual pathway, primary visual cortex, visual association areas, including pathways for different modalities of visual perception, and brainstem centres and pathways for oculomotor reflexes
- Diseases and disorders of eye, ocular adnexae and visual pathway
- Relevant systemic diseases and their ocular manifestations

Clinical assessment, diagnosis, disease management
- Patient/professional partnerships, effective communication, understanding of consequences of vision loss and other special needs to patients and families, confidentiality, documentation
- Interpretation of referral information, history taking, determination of appropriate investigations, comprehensive ophthalmic patient examination
- Construction of differential diagnosis, role of further investigations to narrow diagnostic possibilities, limitations of own role in diagnostic process
- Preparation of factual and diagnostic reports to address the identified clinical question

Optical functions of the eye, ocular measurement and biometry
- Optical interfaces of the eye, physiological optics, errors of refraction, low and high order optical aberrations, causes and consequences
- Keratometry, measurement of axial length, anterior chamber depth with low coherence interferometry and A-scan, the relationship of these measurements to refractive error and intraocular lens power, algorithms for calculating IOL power, sources of error, assessment of accuracy
- Biometry and calculation of IOL power in complex cases, including post-corneal refractive surgery, media opacities and high myopia
- Corneal topography: different methods, algorithms, appropriateness of methods to clinical context, effects of refractive surgery and corneal disease, interpretation of results
- Corneal pachymetry: different methods, algorithms, assessment of accuracy, clinical applications of results

Visual perception
- Visual acuity and contrast sensitivity: concepts of minimum resolvable, minimum angle of resolution, principles of logarithmic scales for measuring visual acuity; principles and measurement of contrast sensitivity; retinal and visual cortex pathways for visual acuity and contrast sensitivity
- Visual field: principles, methods of visual field assessment for screening and clinical management, including kinetic, standard automated, short wavelength, flicker/frequency doubling perimetry; measurement and analysis of light sensitivity, strategies and algorithms used, progression analysis, indications and interpretations in range of clinical contexts, sources of error, artefacts

Interpret and report findings of visual electrophysiology investigations.
- Colour vision: retinal receptors and neural processing, congenital and acquired defects, indications for and methods of testing, interpretation in clinical context
- Dark/light adaptation: physiological basis, methods of assessment, clinical indications and interpretation

**Imaging of eye with light and lasers**
- Principles, methods and techniques for photography of anterior segment of eye and ocular fundus, differences in procedures and techniques for retinal disease imaging and screening for retinal disease
- Principles of contact lens imaging of the eye, including gonioscopy
- Principles, procedures and techniques for performing ocular angiography with fluorescein and indocyanine green, contraindications, the appropriateness of procedure for investigation of ocular condition, the quality of the results, and interpretation of the findings in clinical context
- Principles, methods and techniques for imaging the eye with different forms of scanning laser, including optical coherence tomography, scanning laser ophthalmoscopy and scanning laser polarimetry; identification of normal and abnormal findings, quality of image and artefacts and the appropriateness of procedure for investigation of ocular condition and interpretation of the findings in clinical context

**Ultrasonography of eye and orbit**
- Principles, methods and techniques for examining and measuring anterior and posterior segment of eye and orbit eye with A- and B-scan ultrasound, including topographic examination of the globe, kinetic echography, quantitative echography of globe and orbit, principles of Doppler ultrasound
- Diagnostic interpretation of normal and abnormal findings and artefacts, in context with clinical presentation and findings

**Binocular vision and visuomotor system, vision development**
- Binocular vision: definition, methods of depth perception, retinal correspondence, fusion, stereopsis, cortical topography, abnormalities of binocular vision, methods of assessment
- Visuomotor system: types of ocular movement, including vergence, versions, saccades, smooth pursuit, oculomotor reflexes and control systems, classification of abnormal ocular movements, clinical methods of assessment, gaze tracking

**Electrophysiological assessment of visual function**
- Principles of electrophysiology, VEP, ERG, EOG instrumentation, techniques, difficulties and troubleshooting, normal findings, artefact reduction
- Patient preparation: electrode selection, correct positioning and application, removal and sterilisation.
- Test selection and protocols in context of clinical question, patient age, cooperation and ability
- Annotation of recordings with relevant settings, clinical status, etc.
- Assessment and interpretation of the results
Epidemiology, screening and vision impairment

- National and international prevalence of vision loss, definitions and criteria for registration with vision impairment, initiatives for prevention of blindness
- Causes and forms of vision impairment and strategies and methods for vision rehabilitation
- Principles, criteria and quality measures for screening programmes, current and potential screening programmes for ocular diseases in UK

Ophthalmic pharmacology

- Cholinergic and adrenergic receptors and neurotransmission in the eye
- Categories of drugs used in ophthalmic practice
- Drug preparations, administration, absorption and penetration into the eye, systemic and topical drug adverse effects: side effects, toxicity and allergy
- Regulations for prescription, supply and administration and storage of ophthalmic drugs
- Patient concordance and compliance

Division: Physiological Sciences
Theme: Neurosensory Sciences
Specialism: Ophthalmic and Vision Science
Year 2 and 3: Research Project in Ophthalmic and Vision Science
[60 credits]

The overall aim of this module, building on the Research Methods module, is for the trainee to undertake a research project 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 knowledge in a specialism of healthcare science. The research project may span scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service development, service improvement, or supporting professional service users to meet the expected learning outcomes. Research projects should be designed to take into account the research training required by individual trainees and the needs of the department in which the research is to be conducted.

Learning Outcomes: Knowledge and Understanding

On successful completion of this module the trainee will:

1. Discuss the stages of the research and innovation process from conceptualisation to dissemination and, if appropriate, translation into practice.
2. Describe the purpose and importance of different kinds of research, including scientific or clinical research, translational research, operational and policy research, clinical education research, innovation, service
development, service improvement and supporting professional service users, and relate these to the roles undertaken by Clinical Scientists in the trainee’s specialism.

3. Discuss and evaluate the use of reference manager systems.
4. Justify the rationale for research governance and ethical frameworks when undertaking research or innovation in the NHS.
5. Describe the process and requirements for publication in a peer-reviewed journal and the current system of grading research publications.

Learning Outcomes: Practical Skills

On successful completion of this module the trainee will:

1. Design, plan and undertake a research project to test a hypothesis from conception to completion/archiving in accordance with ethical and research governance regulations, drawing on expert advice where necessary and involving patients and service users.
2. Analyse the data using appropriate methods and statistical techniques, and interpret, critically discuss and draw conclusions from the data.
3. Prepare a written project that describes and critically evaluates the research project, clearly identifying the strengths and weaknesses.
4. Present a summary of the research project and outcome that conforms to the format of a typical scientific presentation at a national or international scientific meeting, responding to questions appropriately.
5. Prepare a summary of the research project suitable for non-specialist and lay audiences.

Indicative Content
- Critical evaluation of the literature/evidence base
- Reference management
- Identification of a research question
- Research ethics and regulatory requirements, including issues related to access and use of information
- Data protection and confidentiality guidelines
- Patient safety
- Patient consent
- Sources of funding/grants
- Peer review/expert advice
- Possible risks and balancing risk vs benefit
- Project management techniques and tools
- Roles and responsibilities of those involved in the research
- Monitoring and reporting
- Data analysis
- Data interpretation
- Criteria/metric for assessing and grading research data and publications in the scientific, NHS and HE sectors
- Range of formats and modes of presentation of data
- Requirements for publications submitted to scientific, education and similar journals
• Current conventions with respect to bibliography and referencing of information
Appendix 1: Contributor List

Members of the STP MSc and Work Based Programme Physiological Sciences: Neurosensory Sciences

Development of the STP curriculum for the MSc Clinical Sciences and Work Based programme for Neurosensory Sciences has been coordinated by the Modernising Scientific Careers team and the National School of Healthcare Science working with NHS and Higher Education colleagues. The professionals who have contributed to the development of STP Programme since 2009 include:

Kelly    Bill    Worcestershire Acute Hospitals
Laura    Booth    Royal Berkshire Hospital, Reading
Anne     Bolton    John Radcliffe Hospital, Oxford
Mary     Boland    University College, London
Graham    Brickley    Royal Hampshire County Hospital, Winchester
Lawrence Brown    Sheffied Teaching Hospitals NHS Foundation Trust
Malcolm  Brown    Royal Liverpool University Hospital
Anne     Burge    City Hospital, Birmingham
Debbie   Cane     Royal Berkshire Hospital, Reading
Amanda   Casey     Aston University, Birmingham
Evadne   Cookman   Hammersmith Hospital, London
Leah     Cooper    Norfolk and Norwich University Hospital
Amanda   Davis     Queen Elizabeth Hospital Birmingham
Grant    Duncan    British Association of Retinal Screeners
Sarah    Fancy     Royal Berkshire Hospital, Reading
Alison   Farrow    Grampian University Hospitals Trust
Robert   Gardner   Bradford Royal Infirmary
Ruth     Hamilton   School of Medicine, Glasgow University
Rosalind Harrison   Queens Hospital, Burton-on-Trent
Graham    Holder    Moorfields Hospital, London
Joanne   Horrocks   York Teaching Hospitals NHS Foundation Trust
Rachel   Hutchings  Queens Medical Centre, Nottingham
Nigel     Hudson    Derriford Hospital, Plymouth
Victoria  Keighley  Queen Elizabeth Hospital Birmingham
Mark      Lutman    Southampton University
Jacqueline Mansell  Barnet Primary Care Trust
Chris     Mody      Sheffield Teaching Hospital
Magella   Neveu     Moorfields Eye Hospital, London
Richard   Pottinger  Barts and The London NHS Trust
Daniel    Rowan     Southampton University
Huw      Thomas     Queen Alexandra Hospital, Portsmouth
Matthew   Thomas    Bristol Eye Hospital
Ruth     Thompsen   Imperial College, London
Dorothy   Thompson  Great Ormond Street Hospital for Children, London
Jagjit    Sethi     Berkshire Healthcare NHS Foundation Trust
Nick      Thyer     University of Leeds
Simon     Veal      Portsmouth Hospitals NHS Trust
Peter     Walsh     North Bristol NHS Trust
Professional bodies and societies were invited to review the STP programme for Neurosensory Sciences and their feedback has shaped the final publication:

Association of Neurophysiological Scientists
British Academy of Audiology
British Society of Audiology
British Chapter of International Society of the Electrophysiology of Vision
Ophthalmic Imaging Association

The National School of Healthcare Science Themed Board reviewed the MSc Clinical Science (Genetic Science) Curriculum on 30 January 2013 and their feedback has also shaped the final publication.

Modernising Scientific Careers Professional Advisor
Professor Gerald Armstrong-Bednall

National School of Healthcare Science Professional Lead
Mrs Theresa Fail
Dr Jagjit Sethi
Appendix 2: Programme Amendments

This section lists the programme amendments following first publication.

Amendment – March 2013

These amendments apply to trainees commencing STP in the academic year 2013/14.

1. A generic introduction to all STP MSc Clinical Science programmes has been added.
2. In order to improve the alignment to QAA level 7 the word ‘understand’ has been replaced with an appropriate verb from Bloom’s Taxonomy for the Knowledge domain.
3. The generic module Healthcare Science has been renamed ‘Introduction to Healthcare Science, Professional Practice and Clinical Leadership’.
4. The generic modules Healthcare Science (which incorporates Professional Practice) and Research Methods have been revised and updated.
5. The Research Project has been revised and all students are expected to complete a single 60-credit research project spanning Years 2 and 3, see relevant section.
6. Good Scientific Practice sets out for the healthcare science profession and the public the standards of behaviour and practice that must be achieved and maintained in the delivery of work activities, the provision of care and personal conduct this has been added to the document.
7. The learning outcomes related to ‘Personal Attitudes and Behaviours’ now appear in the Professional Practice section of this document but apply to all modules.
8. Within the Neurosensory MSc For all specialist rotations, to ensure consistent use of terminology the following was changed:
   a. ‘Describe’ was changed to ‘explain and critically evaluate’ or ‘compare and contrast’
   b. ‘Outline’ was changed to ‘discuss’ and ‘justify’
   c. ‘Summarise’ was changed to ‘evaluate’

The new version is called STP MSc Neurosensory Sciences final version 3.0 for 2013 14

For any queries regarding this change please email: msc.hee@nhs.net
Appendix 3: Good Scientific Practice

Good Scientific Practice
Section 1: The purpose of this document
There are three key components to the Healthcare Science workforce in the UK:

1. Healthcare Science Associates and Assistants who perform a diverse range of task based roles with appropriate levels of supervision.

2. Healthcare Science Practitioners have a defined role in delivering and reporting quality assured investigations and interventions for patients, on samples or on equipment in a healthcare science specialty, for example Cardiac Physiology, Blood Sciences or Nuclear Medicine. They also provide direct patient care and more senior Healthcare Science Practitioners develop roles in specialist practice and management.

3. Healthcare Scientists are staff that have clinical and specialist expertise in a specific clinical discipline, underpinned by broader knowledge and experience within a healthcare science theme. Healthcare scientists undertake complex scientific and clinical roles, defining and choosing investigative and clinical options, and making key judgements about complex facts and clinical situations. Many work directly with patients. They are involved, often in lead roles, in innovation and improvement, research and development and education and training. Some pursue explicit joint academic career pathways, which combined clinical practice and academic activity in research, innovation and education.

This document sets out the principles and values on which good practice undertaken by the Healthcare Science workforce is founded.

Good Scientific Practice sets out for the profession and the public the standards of behaviour and practice that must be achieved and maintained in the delivery of work activities, the provision of care and personal conduct.

Good Scientific Practice uses as a benchmark the Health Professions Council (HPC) Standards of Proficiency and Standards of Conduct, Performance and Ethics, but expresses these within the context of the specialities within Healthcare Science, recognising that three groups of the workforce, Biomedical Scientists, Clinical Scientists and Hearing Aid Dispensers are regulated by the HPC. The aim is that the standards are accessible to the profession and understandable by the public.

Good Scientific Practice represents standards and values that apply throughout an individual’s career in healthcare science at any level of practice. The standards will be contextualised by the role within Healthcare Science.
that an individual undertakes. This means that the standards must be interpreted based on the role that an individual performs. For example, in supervised roles where individuals work within defined procedures, rather than autonomously, some standards will need to be interpreted appropriately for the context of the specific role. There will, however, always be a requirement for an individual to work within the limits of their scope of practice and competence.

Students and trainees will be expected to be working towards meeting the expectations set out in this document. However, if an individual is undertaking further training and development following qualification from a professional training programme, he or she will be expected to be able to meet the standards in this document within their scope of practice.

The standards have been used to support curriculum development and will be used to underpin the process of judging individual equivalence, particularly for emerging specialisms.

The standards have been divided into five domains. The domains of Good Scientific Practice detailed in section 2 are:

1. Professional Practice
2. Scientific Practice
3. Clinical Practice
4. Research and development
5. Clinical Leadership

Section 2: The domains of Good Scientific Practice

Domain 1: Professional Practice

All patients and service users are entitled to good standards of professional practice and probity from the Healthcare Science workforce including the observance of professional codes of conduct and ethics. In maintaining your fitness to practice as a part of the Healthcare Science workforce, you must:

1.1 Professional Practice

1.1.1 Make the patient your first concern
1.1.2 Exercise your professional duty of care
1.1.3 Work within the agreed scope of practice for lawful, safe and effective healthcare science
1.1.4 Keep your professional, scientific, technical knowledge and skills up to date
1.1.5 Engage fully in evidence based practice
1.1.6 Draw on appropriate skills and knowledge in order to make professional judgements
1.1.7 Work within the limits of your personal competence
1.1.8 Act without delay on concerns raised by patients or carers or if you have good reason to believe that you or a colleague may be putting people at risk

1.1.9 Never discriminate unfairly against patients, carers or colleagues

1.1.10 Treat each patient as an individual, respect their dignity and confidentiality and uphold the rights, values and autonomy of every service user, including their role in the diagnostic and therapeutic process and in maintaining health and well-being.

1.1.11 Respond constructively to the outcome of audit, appraisals and performance reviews, undertaking further training where necessary

1.2 Probity

1.2.1 Make sure that your conduct at all times justifies the trust of patients, carers and colleagues and maintains the public’s trust in the scientific profession

1.2.2 Inform the appropriate regulatory body without delay if, at any time, you have accepted a caution, been charged with or found guilty of a criminal offence, or if any finding has been made against you as a result of fitness to practice procedures, or if you are suspended from a scientific post, or if you have any restrictions placed on your scientific, clinical or technical practice

1.2.3 Be open, honest and act with integrity at all times, including but not limited to: writing reports, signing documents, providing information about your qualifications, experience, and position in the scientific community, and providing written and verbal information to any formal enquiry or litigation, including that relating to the limits of your scientific knowledge and experience

1.2.4 Take all reasonable steps to verify information in reports and documents, including research

1.2.5 Work within the Standards of Conduct, Performance and Ethics set by your profession

1.3 Working with colleagues

1.3.1 Work with other professionals, support staff, service users, carers and relatives in the ways that best serve patients’ interests

1.3.2 Work effectively as a member of a multi-disciplinary team

1.3.3 Consult and take advice from colleagues where appropriate

1.3.4 Be readily accessible when you are on duty

1.3.5 Respect the skills and contributions of your colleagues

1.3.6 Participate in regular reviews of team performance.

1.4 Training and developing others

1.4.1 Contribute to the education and training of colleagues

1.4.2 If you have responsibilities for teaching, develop the skills, attitudes and practices of a competent teacher

1.4.3 Ensure that junior colleagues and students are properly supervised
1.4.4 Support colleagues who have difficulties with performance, conduct or health
1.4.5 Share information with colleagues to protect patient safety
1.4.6 Provide work-based development for colleagues to enhance/improve skills and knowledge

**Domain 2: Scientific Practice**

As a part of the Healthcare Science workforce, you will keep your scientific and technical knowledge and skills up to date to effectively:

**2.1 Scientific Practice**

2.1.1 Develop investigative strategies/procedures/processes that take account of relevant clinical and other sources of information
2.1.2 Provide scientific advice to ensure the safe and effective delivery of services
2.1.3 Undertake scientific investigations using qualitative and quantitative methods to aid the screening, diagnosis, prognosis, monitoring and/or treatment of health and disorders appropriate to the discipline
2.1.4 Investigate and monitor disease processes and normal states
2.1.5 Provide clear reports using appropriate methods of analysing, summarising and displaying information
2.1.6 Critically evaluate data, draw conclusions from it, formulate actions and recommend further investigations where appropriate

**2.2 Technical Practice**

2.2.1 Provide technical advice to ensure the safe and effective delivery of services
2.2.2 Plan, take part in and act on the outcome of regular and systematic audit
2.2.3 Work within the principles and practice of instruments, equipment and methodology used in the relevant scope of practice
2.2.4 Demonstrate practical skills in the essentials of measurement, data generation and analysis
2.2.5 Assess and evaluate new technologies prior to their routine use
2.2.6 Identify and manage sources of risk in the workplace, including specimens, raw materials, clinical and special waste, equipment, radiation and electricity.
2.2.7 Apply principles of good practice in health and safety to all aspects of the workplace
2.2.8 Apply correct methods of disinfection, sterilisation and decontamination and deal with waste and spillages correctly.
2.2.9 Demonstrate appropriate level of skill in the use of information and communications technology

**2.3 Quality**
2.3.1 Set, maintain and apply quality standards, control and assurance techniques for interventions across all clinical, scientific and technological activities
2.3.2 Make judgements on the effectiveness of processes and procedures
2.3.3 Participate in quality assurance programmes
2.3.4 Maintain an effective audit trail and work towards continuous improvement

Domain 3: Clinical Practice

As a part of the Healthcare Science workforce, you will keep your clinical skills up to date and undertake the clinical duties appropriate to your role in order to effectively:

3.1 Clinical Practice

3.1.1 Ensure that you and the staff you supervise understand the need for and obtain relevant consent before undertaking any investigation, examination, provision of treatment, or involvement of patients and carers in teaching or research
3.1.2 Ensure that you and the staff you supervise maintain confidentiality of patient information and records in line with published guidance
3.1.3 Ensure that you and your staff understand the wider clinical consequences of decisions made on your actions or advice
3.1.4 Demonstrate expertise in the wider clinical situation that applies to patients who present in your discipline
3.1.5 Maintain up to date knowledge of the clinical evidence base that underpins the services that you provide and/or supervise and ensure that these services are in line with the best clinical evidence
3.1.6 Plan and determine the range of clinical/scientific investigations or products required to meet diagnostic, therapeutic, rehabilitative or treatment needs of patients, taking account of the complete clinical picture
3.1.7 Plan and agree investigative strategies and clinical protocols for the optimal diagnosis, monitoring and therapy of patients with a range of disorders
3.1.8 Ensure that detailed clinical assessments are undertaken and recorded using appropriate techniques and equipment and that the outcomes of these investigations are reviewed regularly with users of the service
3.1.9 Ensure the provision of expert interpretation of complex and or specialist data across your discipline in the context of clinical questions posed
3.1.10 Undertake and record a detailed clinical assessment using appropriate techniques and equipment
3.1.11 Provide specialised clinical investigation and/or analysis appropriate to your discipline
3.1.12 Provide interpretation of complex and/or specialist data in the context of the clinical question posed
3.1.13 Provide clinical advice based on results obtained, including a diagnostic or therapeutic opinion for further action to be taken by the individual directly responsible for the care of the patient

3.1.14 Provide expert clinical advice to stakeholders in order to optimise the efficiency and effectiveness of clinical investigation of individuals and groups of patients

3.1.15 Prioritise the delivery of investigations, services or treatment based on clinical need of patients

3.1.16 Represent your discipline in multidisciplinary clinical meetings to discuss patient outcomes and the appropriateness of services provided

3.1.17 Ensure that regular and systematic clinical audit is undertaken and be responsible for modifying services based on audit findings.

3.2 Investigation and reporting

3.2.1 Plan and conduct scientific, technical, diagnostic, monitoring, treatment and therapeutic procedures with professional skill and ensuring the safety of patients, the public and staff

3.2.2 Perform investigations and procedures/design products to assist with the management, diagnosis, treatment, rehabilitation or planning in relation to the range of patient conditions/equipment within a specialist scope of practice

3.2.3 Monitor and report on progress of patient conditions/use of technology and the need for further interventions.

3.2.4 Interpret and report on a range of investigations or procedures associated with the management of patient conditions/equipment

Domain 4: Research, Development and Innovation

As part of the Healthcare Science workforce, research, development and innovation are key to your role. It is essential in helping the NHS address the challenges of the ageing population, chronic disease, health inequalities and rising public expectations of the NHS. In your role, you will undertake the research, development and innovation appropriate to your role in order to effectively:

4.1 Research, Development and Innovation

4.1.1 Search and critically appraise scientific literature and other sources of information

4.1.2 Engage in evidence-based practice, participate in audit procedures and critically search for, appraise and identify innovative approaches to practice and delivery of healthcare

4.1.3 Apply a range of research methodologies and initiate and participate in collaborative research

4.1.4 Manage research and development within a governance framework

4.1.5 Develop, evaluate, validate and verify new scientific, technical, diagnostic, monitoring, treatment and therapeutic procedures and,
where indicated by the evidence, adapt and embed them in routine practice

4.1.6 Evaluate research and other available evidence to inform own practice in order to ensure that it remains at the leading edge of innovation.

4.1.7 Interpret data in the prevailing clinical context

4.1.8 Perform experimental work, produce and present results

4.1.9 Present data, research findings and innovative approaches to practice to peers in appropriate forms

4.1.10 Support the wider healthcare team in the spread and adoption of innovative technologies and practice

Domain 5: Clinical Leadership

All patients and service users have a right to expect that Healthcare Science services efficiently and effectively managed to meet service needs. As a leader in Healthcare Science, you will seek to effectively:

5.1 Leadership

5.1.1 Maintain responsibility when delegating healthcare activities and provide support as needed

5.1.2 Respect the skills and contributions of your colleagues

5.1.3 Protect patients from risk or harm presented by another person’s conduct, performance or health

5.1.4 Treat your colleagues fairly and with respect

5.1.5 Make suitable arrangements to ensure that roles and responsibilities are covered when you are absent, including handover at sufficient level of detail to competent colleagues

5.1.6 Ensure that patients, carers and colleagues understand the role and responsibilities of each member of the team

5.1.7 Ensure that systems are in place through which colleagues can raise concerns and take steps to act on those concerns if justified

5.1.8 Ensure regular reviews of team performance and take steps to develop and strengthen the team

5.1.9 Take steps to remedy any deficiencies in team performance

5.1.10 Refer patients to appropriate health professionals

5.1.11 Identify and take appropriate action to meet the development needs of those for whom you have management, supervision or training responsibilities

5.1.12 Act as an ambassador for the Healthcare Science community

Good Scientific Practice AHCS V.2 Final
September 2012
## Appendix 4: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical experiential learning</td>
<td>The cyclical process linking concrete experience with abstract conceptualisation through reflection and planning.</td>
</tr>
<tr>
<td>Clinical experiential learning outcomes</td>
<td>The activities that the trainee will undertake to enable and facilitate their learning in the workplace.</td>
</tr>
<tr>
<td>Competence</td>
<td>The ability of an individual to perform a role consistently to required standards combining knowledge, understanding, skills and behaviour.</td>
</tr>
<tr>
<td>Competence statements</td>
<td>Active and outcome-based statements that provide a further breakdown of the Learning Outcomes – reflecting what the trainee will be able to do in the workplace at the end of the programme. Each competence should be linked back to the numbered Learning Outcomes.</td>
</tr>
<tr>
<td>Component</td>
<td>An indication of the type of module within a learning guide, i.e. rotational, specialist, or elective.</td>
</tr>
<tr>
<td>Curricula</td>
<td>An outline of the expected educational outcomes across a subject area. The learning that is expected to take place during the Scientist Training Programme described in terms of knowledge, skills and attitudes.</td>
</tr>
<tr>
<td>Division</td>
<td>A high-level description of an area of practice within healthcare science. There are three divisions: Life Sciences, Physical Sciences, and Biomedical Engineering and Physiological Sciences.</td>
</tr>
<tr>
<td>Domains of learning</td>
<td>Cognitive (knowledge and intellectual skills), affective (feelings and attitudes), interpersonal (behaviour and relationships with others) and psychomotor (physical skills).</td>
</tr>
<tr>
<td>Feedback</td>
<td>Specific information about the comparison between a trainee’s observed performance and a standard, given with the intent to improve the trainee’s performance (van de Ridder JMM, Stokking KM, McGaghie WC and ten Cate OT. What is feedback in clinical education? <em>Medical Education</em> 2008: 42: 189–197).</td>
</tr>
<tr>
<td>Good Scientific Practice</td>
<td>Non-statutory guidance on the minimum requirements for good practice for the healthcare science workforce.</td>
</tr>
<tr>
<td>Host Department</td>
<td>The department that is responsible for the three-year training programme and in which the training officer is based.</td>
</tr>
<tr>
<td>Job</td>
<td>A specific definition of the work activities, requirements, skills required to undertake work activities within a local context. This differs from a role – see below.</td>
</tr>
<tr>
<td>Key learning outcome</td>
<td>A defined learning outcome linked to relevant competence(s) within the workplace Learning Guide.</td>
</tr>
<tr>
<td>Knowledge and understanding</td>
<td>The knowledge and understanding that must be applied in the workplace to achieve the stated competence.</td>
</tr>
<tr>
<td>Learning framework</td>
<td>The specification for work based learning contained</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Learning module</td>
<td>A distinct set of learning outcomes and competences that form part of a programme. Modules may be rotational, specialist, elective, or professional practice and can be combined to meet the needs of specific programmes.</td>
</tr>
<tr>
<td>Learning outcome</td>
<td>A high-level, outcome-based statement that describes what a trainee will be able to do at the end of the module.</td>
</tr>
<tr>
<td>Mentoring</td>
<td>Mentoring is a process in which a trainer (mentor) is responsible for overseeing the career and development of the trainee. The emphasis is therefore on the relationship (rather than the activity).</td>
</tr>
<tr>
<td>Module aim</td>
<td>The overall objective of a work based learning module – defining the intended learning achievements of the trainee. The aim works together with the ‘Scope’ statement to define the overall objectives and scope of the module.</td>
</tr>
<tr>
<td>Module scope</td>
<td>A statement within work based learning modules that defines the range/limits of the learning undertaken by the trainee in a module – patients/investigations/equipment/modalities, etc.</td>
</tr>
<tr>
<td>National Occupational Standards</td>
<td>Nationally recognised standards of expected workplace performance and level of competence for a role. The standards are outcome based, defining what the role holder should be able to do, as well as what they must know and understand to demonstrate competent work performance. National Occupational Standards are supported by nationally agreed frameworks of expected attitudes, behaviour and skills.</td>
</tr>
<tr>
<td>Practical skill</td>
<td>A cognitive, psychomotor, physical, or communicative ability that supports performance of required role.</td>
</tr>
<tr>
<td>Programme</td>
<td>The package of learning, teaching assessment and quality assurance leading to an award.</td>
</tr>
<tr>
<td>Provider</td>
<td>An organisation that delivers required training and learning activities, to specified quality assurance requirements.</td>
</tr>
<tr>
<td>Role</td>
<td>A collection of functions undertaken in the workplace that represent the main broad areas of work for all similar workers at national level. A role differs from a job, the latter being defined specifically for a local context.</td>
</tr>
<tr>
<td>Specialism</td>
<td>A focused area of practice within a theme of healthcare science.</td>
</tr>
<tr>
<td>Trainer</td>
<td>A qualified individual who provides learning and development support for trainees.</td>
</tr>
<tr>
<td>Theme</td>
<td>A cluster of related specialisms within a division of healthcare science.</td>
</tr>
<tr>
<td>Work based learning</td>
<td>Learning that takes place in a real work setting and involves the application of academic learning to real...</td>
</tr>
<tr>
<td>Work performance</td>
<td>The requirements of satisfactory and consistent demonstration of competence in specified functions for a work role.</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Workplace</td>
<td>A real work setting in which the trainee can apply learning.</td>
</tr>
</tbody>
</table>