# Local training plan and learning agreement for delivering the Scientist Training Programme in 'Clinical Engineering'

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## Introduction

The Department of Clinical Science and Engineering (CSE) hosts several clinical services in the field of clinical engineering and related sciences and is involved in a variety of clinical, scientific and technical activities, including research and development. The department is multi- disciplinary, with staff employed from many healthcare professions, and it has excellent links to other departments in trust and to an NHS-owned company (SJM based on site). SJM delivers the Functional Electrical Stimulation and other neuro-rehabilitation services and staff between CSE and SJM work very closely together. CSE and SJM both operate accredited quality management systems and there is good access to many scientific techniques and to engineering design and manufacturing facilities. Close working relationships are enjoyed with other NHS Trusts and there is collaboration with several universities on research and postgraduate student projects.

CSE has supported trainees and students over many years and was an accredited training centre under the previous IPEM training scheme for Medical Physicists and Clinical Engineers, being part of the South West England Training Consortium. Senior CSE staff have been involved in training initiatives within IPEM, ACS and the NSHCS. The training plan described in this document has been constructed around the Scientist Training Programme (STP) to enable the trainee to specialise in the field of Rehabilitation Engineering in years 2 and 3. By collaborating with other departments and hospitals, CSE can fully support the breadth and depth in training for each of the rotations and in the core skills, as detailed in the STP Learning Guide. At the moment, Rehabilitation Engineering is the only specialism that CSE offers within the STP.

The Training Plan described here is subject to change and the most recent version – found in the department’s shared folder – should be used whenever planning training programmes. This document works as a Learning Agreement between the trainee and the training department. Every effort will be made to make this Training Plan and Learning Agreement accessible to all staff. Readers should also familiarise themselves with publications from the NSHCS, including the NHS STP Helpbook for Training Centres and on-line material.

It is important to note that trainees are supernumerary, and this should be borne in mind when assigning any clinical, technical or scientific activities to them.

The STP Training Officer (TO) for CSE is …….

A list of acronyms is included at the end of this document.

## Training schedule

The 3-year (36 months) training programme follows the general structure below, but this is subject to change from local requirements or resources.

**September (Yr1) up to 1 week**

* + - * Induction and orientation.
* Stage I parts of both trust and CSE induction.
* Meet with the TO and discuss expectations from the training. Be familiar with this document and discuss with the TO.
* Register with the NSHCS’s online e-portfolio and nominate TO and TC (HoD).
* Be familiar with the organisational structure of CSE and associated services and with the Department Handbook.
* Undertake relevant parts of mandatory training, including health and safety and governance training.
* Attend the NSHCS induction day for new STP trainees.

**October – December (Yr1)**

* MSc taught part at university and exams.
* Time for rotations: approximately 43 weeks (approx. 11 weeks training per rotation) after taking into account annual leave and study leave for university modules/exams.
* Total weeks shown below are indicative only and may change according to annual leave requests or to local training/service needs, at the discretion of the department.
* University module and examination dates are subject to change by the host university – the trainee is to ensure that they keep aware of any changes and notify these to the TO.

**January – April (Yr1)**

* Complete CSE induction
* Complete mandatory training, including practical manual handling. First rotation – 11 weeks training in Rehabilitation Engineering (RE) over 14 weeks.
* Attend (optional) university Specialist modules in:
  + Management of Medical Equipment (4d)
  + Medical Engineering Design and Software Development (7d)

**April – October (Yr1)**

* Second and third rotations run in parallel
* Equivalent to approx. 11 weeks training in both Design and Development (DD) and in Clinical Measurement and Information Communication Technologies (CMICT).

**October – December (Yr2)**

* Fourth rotation – 10 weeks training in Device Risk Management and Governance (DRM) over 12 weeks.
* Trainee to also start thinking of ideas for their MSc project and discussing these with their TO.

**January (Yr2) – July (Yr3)**

* Specialism – Rehabilitation Engineering (RE) across three modules.
* (AT, CGA, MED)

**January – March (Yr2)**

* Attend any refresher training on practical manual handling and H&S relevant to areas of working.
* January: PPI project (working with the Yr3 trainee)
* February: problem solving tasks whilst shadowing other services March: Decision on MSc project and preliminary work.
* Compulsory university modules:
* Specialist module in Rehab Eng (4d typ. end Jan)
* Medical Engineering Design course (5d typ. end Feb)
* Further Specialist modules in Rehab Eng (8d typ. mid-end March) Also further university modules in Yr2.
* Biomaterials (2d typ. April)
* University exam tutorials (2d May) and exams (2d May)
* Continue to work on the MSc project – to have the project proposal approved by both CSE and the university, to continue with the literature review and project planning, and to ensure any necessary approvals (e.g. ethical) are obtained prior to the project start date.

**Aug (Yr2) – Jan (Yr3)**

* MSc project (2 d/wk)

**February (Yr3)**

* MSc thesis submission.
* Mock OSFAs (national).

**June (Yr3)**

* MSc viva.

**July (Yr3)**

* STP final assessments (OSFAs).

**July/August (Yr3)**

It is recommended that the Elective is completed during this time, but there is some flexibility if this is discussed with the TO in advance of any arrangements being made.

**September (Yr3)**

Resit OSFAs (if required).

**End September**

End of training contract.

All university modules and dates are subject to change by the university – the trainee should notify the TO and their Supervisor if there are any changes.

## Annual leave entitlement

In the first 6 months of year 1, the trainee will be asked to take annual leave from the close of university to the first working day in January; this is due to staff being unavailable for training. They are then entitled to 3 days annual leave from January-March. Thereafter, the leave period runs from 1st April to 31st March and the entitlement is 27 days. Any leave must first be checked with the relevant Supervisor for where the trainee will be based on those dates and agreed with their line manager and TO in accordance with Trust and department policies.

## Other leave

Any other periods of absence, such as sickness and study, should be notified to the department in line with local and Trust policies. Any leave taken whilst at university should be agreed with the MSc Programme Director and the line manager and TO notified by email.

## Training roles

The key people involved in delivering and supporting the training programme are listed below (their exact roles and responsibilities are detailed later in this document and in the Helpbook for Training Centres).

**Training Officer (TO)** - oversees and has responsibility for the planning, timetabling, delivery and progress monitoring of the training. They will have training responsibility and pastoral support for the trainee. The TO will be a Clinical Scientist and appointed by the HoD. Should be nominated on OneFile by the trainee as their Training Officer.

**Head of Department (HoD)** - has responsibility for the strategic planning of the STP within the department. Should be nominated on OneFile by the trainee as their Training Co-ordinator (not Training Officer) to enable access to records.

**Line Manager** - has line management responsibility for the trainee in all HR related issues, including managing leave and performance appraisal. This person is appointed by the HoD and may not necessarily be the TO.

**Subject Supervisor (hereafter called Supervisor)** - for each rotation and specialist module there is a named Supervisor appointed by the HoD who has responsibility for delivering their subject and supporting the trainee. They will be a Clinical Scientist or working at an equivalent level in another healthcare profession. For the specialist modules the Supervisor should be at a senior Clinical Scientist level.

**Trainers** - in each subject, other staff are given responsibility for delivering and/or supervising part of the training. Trainers will be identified by the relevant Supervisor.

**Assessors and Reviewers** - have responsibility for formally assessing a trainee’s competence and/or learning outcome and for recording this using the OneFile. Supervisors and the TO should keep a list of suitably qualified people to perform this role.

**Raters** - these will be identified by the trainee as part of the Multi-Source Feedback assessment process.

**Mentor** - each trainee is assigned a Mentor for support and guidance. Typically, the Mentor will be the trainee in the year above. The 3rd year trainee can select their own appropriate Mentor and notify who this is to the TO.

NOTE: Clinical Scientists, at the Supervisor level or above, involved in the training programme may be asked to participate in recruitment (short-listing and interviews) and/or assessment (assessing and writing OSFA stations).

## Meetings

### With individuals

**TO meetings** - every 3 months the TO should meet with the trainee to review general progress and assure themselves that the trainee is aware of the next stage in their timetable and is on track with their online e-portfolio submissions.

**Appraisals** - these are a Trust requirement and are held annually by the trainee’s line manager with an interim review of the agreed objectives at 6 months. The trainee must prepare for this beforehand, including entering any evidence for the appraisal on the Trust’s on-line appraisal system. The TO may also be invited to attend.

**Progress review meetings** - these are between the trainee and the relevant Supervisor. It is recommended that for the rotations these are held weekly or bi-weekly, and for the specialist modules monthly. Since the purpose of each meeting is to check progress and identify any gaps in learning, it is advised that the trainee brings to the meeting any areas of concern as well as evidence of progress on OneFile. A summary of the meeting and any agreed actions should be minuted by the trainee and emailed to the Supervisor.

**Mentor meetings** - these are between the trainee and their Mentor. It is recommended that these are held monthly, but if the trainee or Mentor is away on placement then mentoring by email may be sufficient. The relationship between the Mentor and the trainee should be built on supporting the trainee professionally, guiding them through the STP, rather than be seen as a replacement for the assessment or teaching of the trainee.

**MSc project meetings** - these are between the trainee (i.e. student) and the local Project Supervisor (suggested every 2 weeks), and also between the trainee and the university Academic Supervisor (when to be agreed between both parties). The trainee should prepare for these meetings beforehand, bringing evidence of progress as well as items for discussion and areas of concern.

### In groups

**Supervisor meetings** - these are between the TO and all Supervisors. They are held quarterly, usually in January, April, July and October, and the purpose is to review progress of all trainees and to discuss any issues with the training programme or timetabling.

**Trainee feedback meetings** - these are between the TO and all the trainees to discuss the feedback from the evaluation surveys sent out to trainees in February and August. The meeting is therefore held near the end of March and September, to give time for reflection on the results and prior to the Supervisor meetings held in April and October.

## Guidance for and standards expected of trainees

The training plan for the rotations is designed around the Learning Guide to provide breadth in basic skills and a means to apply knowledge and skills gained during the MSc to the workplace. The specialist modules extend that level of knowledge and skills. Particular emphasis is placed on the use of practical experiences, tutorials and small projects, but applied to healthcare. The trainee will be required to maintain a logbook of all activities during their time in training and to upload appropriate reports and documents onto their e-portfolio via OneFile as evidence for assessment. Though not assessed, reflective practice should also be performed and uploaded as a record. The trainee should familiarise themselves with the relevant documentation on the STP and to the processes required for assessment; the NSHCS website contains useful documentation and videos.

All documents submitted to OneFile should have the following information: trainee’s name, the date and the document version number. If these are not included, then the document may be returned as unassessed and marked as incomplete.

Since this is the trainee’s training programme, it is expected that they are proactive in leading it. However, at the start more direction and support may be needed before they gain the confidence and skills to continue that. The guidance here should support the trainee and is based on feedback from previous IPEM and STP trainees in CSE.

## Guidance for trainees

### Management and support

* Ensure that you have an up-to-date training timetable and that you are familiar with it
* Arrange with your Supervisor regular progress review meetings and complete minutes from each meeting including a summary of what was discussed and any actions arising
* Attend all review meetings with the TO
* Arrange regular meetings with your Mentor
* Participate in national and regional networks with other trainees, including any local networks in trust for peer support and learning
* Make contact with each Supervisor or contact person a short time before your placement starts to discuss any final arrangements or requirements
* Keep in touch with the Supervisor or TO when you are on placement away from Trust
* Complete evaluation surveys when requested to do so by the TO and participate in the feedback meeting
* Prepare for and attend your annual appraisal and reviews

### Preparing for progress review meetings with Supervisors

* At the first review meeting for the rotation or specialist module, familiarise yourself with what is expected from the training plan, the Curriculum and the assessments
* Know the lines of reporting and responsibility during the rotation or module
* Review your previous assessments and the resulting feedback, looking particularly at any identified areas for improvement or action plans which can be addressed
* After each module, reflect on your strengths and weaknesses and discuss these with your Supervisors and TO to direct other learning opportunities and to show continuous improvement (strengths and weaknesses may be self-identified or indicated at review meetings, CBDs and other assessments)
* Keep a portfolio record of reflections on ‘strengths and weaknesses’ to take to each new module
* At subsequent meetings discuss what activities you have been involved in
* Discuss progress both in your learning and in your assessments
* Be proactive in ensuring that learning competencies are being addressed and signed off in a timely way
* Look at areas for improvement that have been identified at previous assessments and highlighted by the Assessors

### Training opportunities

* Understand what is expected from you during each piece of training and who your Trainer is for that activity
* You should not be expected to provide patient facing services or deliver other activities without adequate training or supervision – this includes manual handling and H&S (if this occurs, please raise this as a concern first with the Trainer and if necessary with the Supervisor)
* Experiential learning is more than just observing, so participate as fully as possible and learn from these experiences (i.e. be ‘hands-on’)
* Make yourself known at each placement and be open to contribute to the section’s workload
* Be sensitive to the busy workload of staff when asking for support
* Be enquiring by asking questions at appropriate times and record what you have learnt or experienced
* Work with your Supervisor to identify projects that are as ‘real’ as possible for the workplace
* Manage your time so that training activities and projects are completed on time and do not over- run into other placements

## Study and tutorials

* Work with your Supervisor, Trainers and other trainees to timetable in tutorials
* Attend any tutorials offered to support the experiential learning that you are undertaking, as well as the existing knowledge you have of engineering, science and healthcare from your previous degree(s) and from the taught part of the MSc
* Tutorials may be based on established learning sessions or on Supervisor requests for background reading, short reports and/or presenting case studies – it is advised that you prepare for these sessions and follow up with self-directed learning
* Discuss with your Supervisor your learning needs and what tutorials they may be able to provide in response
* Make use of library facilities and quiet areas in the department to work
* Attend the Master Classes which will aim to address learning gaps in specific and core topics
* Use allocated time for personal study wisely to complete assessments (typically this is each Friday afternoon during rotations, time during the specialism should be arranged as appropriate)

## E-portfolio and assessments

* Write up your training experiences and e-portfolio as you go along – do not leave it to the end
* Submit appropriate evidence at the right level of quality, depth and quantity to support the completion of learning competencies
* Link the theoretical knowledge and practical skills within your writing
* Ensure that all submitted documents have your name, the date and document version number (note: submissions may be returned to you unassessed if this is not met)
* Discuss and agree all Assessors with your Supervisor or the TO in advance of nominating them on OneFile
* Arrange timely submission of evidence and review meetings with your Assessor for completing on- line assessments
* Follow up with the Assessor if a submitted assessment is not reviewed within 3 weeks
* It is expected that you manage your time effectively for completing assessments

## Reflective practice

* Used to demonstrate what you have learnt and how you plan to apply it in practice
* Encouraged at all stages of the training
* Submitted to OneFile as a record

We expect our trainees to work in a professional manner at all times, respecting the privacy, dignity and confidentiality of staff and patients alike. You should familiarise yourself with the Standards of Conduct, Performance and Ethics from the Health and Care Professions Council and with Trust and department policies and procedures.

## Feedback

Trainees will receive an annual appraisal, but in addition every 6 months (in February and August) all trainees working in CSE will be asked to complete a Training Evaluation Survey based on the one used by the NSHCS. A follow-on meeting is then arranged between all the trainees and the TO to discuss the comments from the survey in a forum where more general concerns or issues can be raised. Information from these sources will be shared with the TO and HoD and will contribute to the department’s self- assessment for accreditation.

## Complaints and concerns

Though every effort is made for the trainee to have an enjoyable and productive training experience, we recognise that there may be times when they or the people they work with may have a complaint or a concern. Before raising a concern, a trainee is encouraged first to discuss and take advice from their Mentor or a colleague in an informal way. We take all complaints and concerns seriously and use the following process, sitting alongside the Trust’s HR policies and complaints procedure:

1. If anyone has a complaint or a concern relating to the training or the work of a trainee, then the relevant Supervisor should first be made aware of it.
2. If it cannot be resolved, a meeting should be arranged between the relevant parties and the TO informed by email.
3. If it still remains unresolved the TO should be asked to intervene. They may then arrange a further meeting and/or escalate the concern or complaint to the HoD or higher in the Trust.
4. Any emails or minutes from meetings associated with a complaint or concern must be copied to the TO and HoD.

If a member of staff has a serious concern about the trainee’s professional conduct, then the TO and HoD should be informed at the earliest opportunity (step 3).

## Standards expected of training roles

Just as there are standards expected of trainees, there are also standards expected of the staff involved in their training.

The Head of Department (HoD) will

* Have responsibility for the strategic planning of the STP in the department
* Be responsible for the Local Training Plan and Learning Agreement (this document)
* Appoint Supervisors for the rotations and specialist modules and have contingency plans in place to cover any long-term or unplanned leave
* Provide the appropriate level of resources to support the training
* With the TO and the department’s Head of Research and Training, produce and review the department’s Training Strategy and Annual Plan and report on trainees’ progress to the Directorate Management Team
* Ensure that the annual Self-Assessment for Work-Based Placement Providers is completed and submitted to the NSHCS as part of continuing accreditation
* Engage in national initiatives related to Clinical Scientist training

The Training Officer (TO) will

* Have overall responsibility for the delivery of the training programme
  + Manage the training programme and the training roles therein
  + After discussing and agreeing it with the Supervisors, plan and timetable the modules in the 3-year training programme appropriately for each trainee
  + Keep in regular contact with the trainee and the Supervisor(s) when the trainee is on a particular rotation/placement (especially when the trainee is off-site) to ensure things are going well
  + Monitor and manage access to ONEFILE within the training centre and cascade training
  + Work with the Supervisors to have a list of suitably qualified Assessors and monitor this when reviewing OneFile activity, raising any concerns with the trainee and the Supervisor
  + Oversee the assessment process and work with Supervisors to pick up and address any issues with colleagues where there is a delay in undertaking any assessment
  + Look to have peer moderation (internal and external) of assessments for QA purposes
  + Discuss and, if appropriate, action any changes required to the training programme arising from events or meetings (e.g. Feedback meeting)
  + Make themselves available to the trainees and/or training staff if they have any concerns or complaints and act as an arbitrator in any disagreement, taking any final decision with the HoD and within HR policies
  + Facilitate a quarterly meeting with the Supervisors to review trainees’ progress, to share good practices and to identify any changes required in either the local training plan or timetables
  + Request and collate responses to the 6 monthly trainee evaluation survey, facilitate the follow-on feedback meeting with the trainees and report the outcomes directly to the TO by email, following up any identified actions
  + Organise the Master Classes on a regular schedule
  + Work with the Supervisors to arrange local mock OSFAs in years 2 and 3
  + Organise the annual meeting for staff in CSE and SJM (in January each year); to raise awareness of STP, to explain any changes nationally or locally and to introduce the new trainee
  + Attend meetings arranged by the university for training centres and supervisors
* Have responsibility for the trainee (this does not necessarily include line management on HR related issues)
  + Assist the line manager in HR related matters, including performing their appraisals and agreeing their objectives
  + Act as the signatory on expenses incurred during training (to a set limit)
  + Meet with the trainee at the start of their training and thereafter at least every 3 months to review progress
  + Co-ordinate each trainee’s journey through the training programme by liaising directly with the trainee and the Supervisors
  + Monitor progress of trainees (including monitoring OneFile) and look at any areas of improvement as recommended by Assessors
  + Provide pastoral support to trainees and manage the mentoring scheme
  + Perform the MSF review meeting with each trainee, twice during their training
* Have responsibility for their own professional development
  + Take opportunities to develop own skills in training, supervision and assessment, including attending the Train the Trainers workshop run by the NSHCS
  + Participate in events related to Clinical Scientist training put on by external organisations, such as the NSHCS, AHCS or IPEM
  + Engage in national initiatives related to Clinical Scientist training

Supervisors will

* Have responsibility for delivering a rotation or a specialist module
  + Be familiar with the local training plan and the training timetable for each trainee
  + Take ownership of the training plan for their subject, plan in advance the work and any placements, and ensure that it is accurate and fit for purpose
  + Put in place a plan to address the learning outcomes and typical training activities as detailed for their subject, allowing for some flexibility to consider a trainee’s needs and service requirements
  + Provide a safe environment for training
  + Identify suitably qualified people to be workplace Trainers for daily supervision and learning for each learning outcome
  + Ensure that Assessors nominated by trainees are suitably qualified in their subject and that these Assessors go on the approved list held by the TO
  + Pick up any issues with colleagues where there is a delay in undertaking any assessment
  + Make themselves available to the trainee and/or other staff if there are any concerns or complaints
  + Monitor and manage access to OneFile within their section or local department
  + Attend a quarterly meeting with the TO to review trainees’ progress, share good practices and to identify any changes required in either the local training plan or timetables
  + Contribute to any audits or self-assessment as required by the TO or HoD for monitoring purposes or continuing accreditation
* Have responsibility for ensuring trainees progress through the assessments
  + Welcome the trainee on placement, by introducing them to the section staff and by communicating expectations for each placement, both in professional conduct and learning experiences
  + Meet with the trainee (and if appropriate their previous supervisor or TO) at the start of the module to talk about their strengths and weaknesses as identified by themselves, previous supervisors or from CBDs and other assessments
  + Support the trainee during their work-based training activities and arrange any appropriate tutorials
  + Arrange regular progress review meetings with the trainee and monitor their progress on OneFile
  + Read the minutes from the progress review meetings and highlight to the trainee any inaccuracies or potential misunderstandings
  + Liaise with the training staff at departments external to CSE and trust where the trainee is working off-site
  + Identify areas for improvement and look for and give every opportunity for the trainee to learn and develop new skills
  + Encourage and support trainees to complete assessments in a timely manner
  + Raise any issues with a trainee’s progression to the TO and work with them to put in place an action plan
  + Encourage and, where possible, allow trainees time for personal study and for writing up assessments in a timely way
  + Work with the TO in arranging the Master Classes
* Have responsibility for their own professional development
  + Take opportunities to develop own skills in training, supervision and assessment, including attending the Train the Trainers workshop run by the NSHCS

Trainers will

* Be familiar with the local training plan and the learning outcomes for their subject, as described by the Supervisor
* Plan in advance the training activity or placement and communicate this to the trainee and the Supervisor
* Welcome the trainee and introduce them to their area of work and the environment,
* Provide a safe environment for training
* Take time to demonstrate and explain the work-based activity to the trainee
* Support the trainee during their work-based training activities and identify areas for improvement
* Look for and give every opportunity for the trainee to learn and develop new skills, including arranging any tutorials where required
* Highlight any areas of concern in a trainee’s knowledge or skills to the trainee and to the Supervisor,
* Make themselves available to the trainee if they have any concerns
* Take opportunities to develop their own skills in training and assessment

Assessors and Reviewers will

* All Assessors should be approved by the Supervisor prior to a trainee nominating them on OneFile
* Register with OneFile and become familiar with the relevant documentation and advice on the website
* Familiarise themselves with the assessment process, through meeting with the Supervisor and by viewing the guidance videos on the OneFile website
* Perform assessments of submitted work and provide critical, informative and developmental feedback to the trainee through OneFile so that agreed actions and areas for improvement and development are clear
* Make every effort to complete assessments on OneFile in a timely manner (within 2-3 weeks) and to raise any issues of not being able to meet this timeframe with the trainee and, if necessary, the Supervisor
* Raise any concerns they may have with the trainee and the Supervisor
* Keep a record for audit purposes of the questions that were asked, and the responses given when assessing a CBD
* Take opportunities to develop their own skills in training and assessment

Mentors will

* Make themselves available to meet with the trainee
* Support and guide the trainee through the training programme and in their decision-making process of career progression
* Listen to the trainee and any concerns that may have, but also challenge them in a supportive way
* Mentoring is seen as a supporting relationship and not as a replacement for assessment or teaching

## Tutorials and master classes

Learning experiences are supported and enhanced through the use of tutorials and master classes.

Tutorials are provided during the rotations and specialist modules to teach the basics and more advanced techniques and are arranged, as appropriate, between the trainee(s) and the Supervisor. The department works to arrange Master Classes every 2-3 months and all trainees are expected to attend. They typically cover the more generic topics but will also be used to give the trainees experience in readiness for the assessments and OSFAs.

## Assessments

There is continuous assessment during the workplace training using a series of on-line assessment tools through OneFile. Trainees are expected to keep a record of all assessments and competencies in their e- portfolio, as well as ensure that they are being continually assessed in a timely way. It is recommended that these assessments are spread across the training to allow the trainee to demonstrate progression in their knowledge and skills, as well as to give them the opportunity to address any areas identified for improvement.

Competence encompasses a combination of knowledge, skills and behaviour and can be defined as a standardised requirement for an individual to properly perform a specific job. It describes the ability to show skills through action in a situation or context that might be different the next time they are required to act. Assessment is therefore designed around the ‘Why? What? How?’ scenarios, where there is shared learning experiences, questioning, self and peer assessment, and feedback. It is important for the trainee to put reflection of experiences and practices into their learning; for example, after observing a clinic, to reflect on what they have learnt and how they plan to apply that in future cases and transfer to other areas.

It is important for us to ensure high quality assessment, so a list of approved Assessors is kept by the TO and any different Assessor being nominated should be agreed in advance with the TO and/or Supervisor. Assessors may not only be Clinical Scientists, but also staff from other disciplines such as Clinical Technologists, Design Engineers, Therapists, and Physiologists. Any assessment of a piece of evidence (written, oral or demonstrated) should be made in an informative and developmental way, taking into account what would be expected of a trainee at the same stage of their training. It is important therefore that the Assessor provides relevant information and guidance for the trainee to take away and to reflect on as part of the trainee’s development. Any agreed actions or areas for development/improvement should therefore be addressed in subsequent training opportunities and assessments.

The assessment tools are as follows, with fuller descriptions in the Learning Guide and on the OneFile website. The trainee and Supervisor should work to ensure that assessments are spread across the whole timeframe.

## Learning competencies

* These underpin all other assessments
* Supports continuous assessment and development as the trainee progresses through the modules
* Examples of applying knowledge and skills, perhaps through case studies
* Evidence of hands-on experience and reflection
* Provide a wide body of evidence – different pieces of evidence can be linked between different competencies
* Professional competencies should be spread across all 3 years and with a wide group of staff and disciplines
* When presenting a written report, ensure that it is at the appropriate academic level in language, content, critical analysis and referencing
* Should be seen as formative assessments as the trainee progresses through their training
* Can be assessed by an approved Assessor

## Direct observation of practical skills (DOPS)

* Observation and assessment of a practical procedure or skill in real-time, followed by 2-3 minutes for the Assessor to ask the trainee some questions, then to provide feedback on their performance at a meeting
* Designed to check knowledge, as well as assessing the ability to follow an appropriate procedure and the standard reached
* Assessor can take a more holistic approach, by asking the trainee about health and safety, quality assurance, ethical, legal and social implications of a procedure, equipment care, relevant standard operating procedures, etc
* DOPS can be repeated; areas for immediate or future development may be identified in an action plan – it is important to facilitate a consistent approach to performance and that progression of the trainee is demonstrated
* Should be seen as formative assessments as the trainee progresses through their training
* Can be assessed by an approved Assessor

## Observed clinical events (OCE)

* Observation and assessment in a clinical encounter which may look at interactions with patients and/or clinical teams
* Designed to cover issues such as meeting and greeting, taking a clinical history, performing a patient investigation or test, or explaining a procedure to a patient or peer
* Could address areas such as: history taking, physical/clinical examination, communication, clinical decision making, professionalism, organisation and efficiency, or overall clinical care (empathy, compassion, dignity, patient focus)
* Assessor observes event and reports back on performance, identifying where the trainee could improve in future
* Should be seen as formative assessments as the trainee progresses through their training
* Can be assessed by an approved Assessor

## Case based discussion (CBD)

* Across the subject CBDs should be distinct and representative of work, not necessarily complex cases
* For each CBD, 2 specific cases are submitted (narrative plus attachments), each one in a different area and covering a range of competencies
* One is selected for assessment and the assessment should be completed within 3 weeks of submission; typically it lasts for 30 minutes, with 5-10 minutes for feedback
* Designed to examine issues such as the trainee’s
  + understanding of clinical and scientific principles relevant to the scenario
  + understanding of the patient pathway and the wider issues relating to a particular case
  + decision making and critical thinking
  + use of reasoned analysis and interpretation of results
  + knowledge of relevant health and safety issues, professional practice, and quality control procedures
  + skills in writing succinctly
* To make the trainee’s thinking explicit, i.e. why they acted as they did (e.g. “Talk me through the process …”) and what they have learnt
* Discussion should be broader than the case presented
* Basically, like a mini viva with opportunities to identify areas of strength and those requiring development
* During the rotation the CBD should be towards the end, whereas during the specialist modules they should be spread more across the timeframe
* When presenting a written report, ensure that it is at the appropriate academic level in language, content, critical analysis and referencing
* CBDs should also be seen as being useful in preparation for OSFAs
* Should be assessed by the Supervisor

## Multi-source feedback (MSF)

* Trainee and raters (i.e. colleagues) are asked to rate perceived performance against several different criteria, including their professionalism, interpersonal skills, team working, and communication
* Similar in nature to the more widely used 360-degree feedback tool
* Performed around the 18-month mark and again towards the end of the training
* Provides a framework for the TO to meet with the trainee to provide constructive feedback and discussion on practice – this may also be used to inform the trainee’s PDP at appraisals

## Reflective log

* Documents reflective practice on training experiences and illustrates what was learnt and how it may influence future practice
* Reflection is an important aspect of any continuing professional development and especially for submitting a portfolio of work for registration and re-registration
* Not formally assessed but should be discussed at progress review meetings

## Objective Structured Final Assessments (OSFAs)

* Organised at the end of the 3 years by the NSHCS
* Consisting of a series of stations covering work related to the rotations and the specialist modules and also generic knowledge and skills
* Exact details are forwarded to the trainee by the NSHCS before the date
* Mock OSFAs are held by the NSHCA during February in year 3, but local ones may also be arranged in the spring/summer of years 2 and 3

## Performance appraisals

* It is good practice and a Trust requirement for everyone to have an annual appraisal with their line manager, along with a review of their objectives at 6 months
* Evidence from the mid-term MSF may be used to inform the trainee’s PDP

**Guidelines from the NSHCS say that over the 3 years the following assessments should be performed.**

For each rotation

* 1 CBD plus 1 DOPS or OCE (we recommend 1 CBD, 1 DOPS and 1 OCE)
  + CBD towards the end of each rotation
  + DOPS/OCE during rotation

For the specialism of Rehabilitation Engineering (20 assessments)

* Assistive Technology: 4 CBDs plus 3 DOPS or OCEs
* Clinical Gait Analysis: 4 CBDs plus 3 DOPS or OCEs
* Medical Engineering Design: 3 CBDs plus 3 DOPS or OCEs
* DOPS and OCEs should be split as 5 DOPS and 4 OCEs (it is suggested that each module is assessed through at least 1 DOPS and 1 OCE)
* CBDs, DOPS and OCEs should be staggered across the duration of each module
* For a single module, CBDs should cover a variety of areas.

For some assessments these may be moderated by a second person, who may be from within CSE or another training centre. These moderations are designed to quality assure the assessments we score and the standard of training provision.

## Evidence suggested for reviewing against the learning competencies

The Learning Guide and documents relating to STP outline the various assessments that must take place to demonstrate the required level of knowledge, skills and competence. Many of these assessments relate around the e-portfolio and the list below gives some examples of what pieces of evidence could be used:

* Case study reports (3-4 pages suggested) on direct assessment of an individual patient or piece of equipment, which can then be used in discussions in tutorials and for informal CBDs
* Reports on specific activities undertaken or observed, e.g. quality assurance, design specification, critical evaluations
* Standard operating procedures undertaken and reflective learning
* Completed CPD forms to demonstrate evidence of training undertaken and reflective learning
* Minutes from progress review meetings

Evidence for CBDs may require fuller documentation than that submitted for the learning competencies – it is advised that this is agreed in advance between the trainee and the Supervisor.

It is suggested that training experiences are documented on the internal Continuing Professional Development (CPD) form used in CSE as a record of providing evidence and reflective learning. For example, attending a local medical meeting should be followed by time for reflection and the writing of a short synopsis to indicate the knowledge gained, how it relates to experiential learning from the training and how it may change personal practice. It is suggested that these forms can also be uploaded to the e- portfolio (OneFile) and used as evidence, as well as a focus for discussion at review meetings. This format for CPD supports the requirements for professional and registration bodies, such as the HCPC, IPEM, IET and IMechE.

Learning competencies are filled in on-line by the Assessors as either ‘satisfactory’ or ‘unsatisfactory’. If the latter, the Assessor should give the trainee feedback as to what is required to be demonstrated before the competency can be signed off as ‘satisfactory’. In some rotations/modules, especially for those that involve several placements, a competency may be scored as ‘unsatisfactory’ simply because the required level of breadth has not yet been met. It would then be expected that demonstrating the same competency in 1 or 2 other placements would result in a ‘satisfactory’. An Assessor may also identify areas for improvement in their feedback, even when they have signed off the Learning Competency as ‘satisfactory’. It is important that the trainee reads these comments and reflects/acts on them where necessary; this may be reviewed at progress review meetings. In the event of continuing poor performance or non-attainment of competence by a trainee, this should first be raised with the Supervisor and discussed between them and the trainee. If it continues, then the concern should be escalated to the TO who may consider sanctions, including non-progression of pay.

It is expected that the following objectives are met by the trainees

* By end of year 1: MSc exams passed; 2 rotations fully signed off as satisfactory
* By end of year 2: MSc exams passed; MSc project deadlines met; all 4 rotations fully signed off as satisfactory; 20% of specialist module assessments/competencies signed off as satisfactory; 20% of professional practice competencies signed off as satisfactory
* The NSHCS performs a mid-term review where 90% of all rotations should have been signed off
* By April in year 3: MSc project submitted; 50% of specialist module assessments/competencies and 50% of professional practice competencies signed off as satisfactory

## Professional practice

Core skills are defined in the Professional Practice part of the Learning Guide and should be met through both the MSc course and work-based learning. Typically, they will be signed off during the specialist modules, but the trainee and Supervisors should also refer to the framework during the rotations. Rather than seeing these skills as “I’ve done it once … therefore I am competent”, trainees should see their development in these core skills as an ongoing process through the 3 years. Like all learning experiences, these should be documented and reviewed with the Supervisors and at the same time identify areas for improvement. The trainee may also decide to discuss some parts with their Trainers and peers. Knowing what a core skill is can be difficult, but generally they can be seen as transferrable skills. The Learning Guide details these skills in the following areas: Professional Practice, Clinical Practice, Research and Innovation, and Clinical Leadership. Like for all staff, supporting a trainee in their development of these skills is best achieved by continual review of professional practice and using those reviews to identify areas for improvement as part of a Personal Development Plan (commonly used in staff appraisals).

To consolidate training in the rotations and in the core skills, trainees will be expected to

* Complete the induction programmes for trust and for CSE
* Complete and keep up to date with mandatory training through on-line learning packages (i.e. MLE for trust), seminars and practical workshops
* Attend department meetings and team meetings when on placement
* Attend and participate in Clinical Governance sessions when on placement
* Contribute directly to proposing and implementing changes in practice
* Look to present aspects of their work at department research seminars or team meetings (at least twice)
* Look to attend and present (at least once) at appropriate local and national medical and scientific meetings, including IPEM workshops and the Annual Scientific Meeting
* Find opportunities to deliver any formal teaching or lecturing to health care professionals or students,
* Attend Trust’s internal medical meetings (i.e. Grand Round) and CSE research seminars
* Identify appropriate internal or external courses suitable to support their training (e.g. Library Skills, Clinical Audit for Improvement) as part of their Personal Development Plan
* Use a variety of learning methods, including private study and reading
* Show evidence of developing professional practice by maintaining reflective practice reports and discussing these with their Mentor, the TO and/or the Supervisor
* Work with the Supervisors and training staff to discuss areas of improvement in these core skills

Trainees may be asked to assist in arranging placements for visiting trainees and/or mentor them through their visit, and to teach more junior trainees.

All trainees are encouraged to apply to become involved in the work of professional bodies, such as APEN

(trainee network in IPEM) and the Wessex Trainee Scientist Network.

Similarly, trainees are also encouraged to become involved in outreach work, such as enrolling as an engineering ambassador for schools and young people through STEMnet and contributing to the Biomedical Engineering course for young people run each year by the Smallpeice Trust.

## Rotations in years 1 and 2

The STP Curriculum describes four rotations for training in years 1 and 2

* Rehabilitation Engineering (RE)
* Clinical Measurement (CM) and Information Communication Technology (ICT)
* Design and Development (DD)
* Device Risk Management and Governance (DRM)

Each rotation is described below with an introduction specific to CSE, a table of how the rotation is delivered and a list of typical training activities that may be used to demonstrate competence in breadth and depth. In each rotation any clinical work with patients should be supervised at all times. All training plans and timetables are subject to change if local requirements demand this.

## Rehabilitation Engineering

The Rotation Supervisor is ………………………….

The training is provided predominantly at CSE, with short external placements to provide breadth of experience. CSE is very clinically based and employs scientists, technologists, therapists and other healthcare professionals working together to provide an integrated RE service. These related services include Medical Engineering (postural management and wheelchairs), Orthotics, the trust Gait Lab (clinical gait analysis) and SJM. (functional electrical stimulation (FES) and clinical gait analysis (CGA)). Familiarisation and training in other fields, such as electronic assistive technology (EAT) to include communication and switching systems, prosthetics, and Activities of Daily Living (ADL), are delivered through short placements in external units.

It is the department’s philosophy to educate and train staff across all disciplines (e.g. engineering and therapy) to be proficient in most aspects of RE. The trainee is therefore expected to undertake observations and hands-on clinical experiences with patients, supervised routine clinical and technical practices, identifying and setting up RE technologies and project work. Shorter placements within other clinical settings may also be found, such as in therapy departments where clinical scientist input is unavailable. The trainee will be trained in skills to use and provide a variety of assistive technologies, as well as in using equipment and clinical tools to evaluate biomechanics and outcome for assessment and for directing the provision of these technologies or rehabilitation interventions. Project work may be stand- alone or part of ongoing projects within CSE or related services. All training will involve working in these multi-disciplinary teams.

At the start of the rotation a meeting will be held to discuss the training timetable and to identify specific training requirements (though the actual activities may change at short notice in response to clinical or service needs). At each placement the Trainer will take the trainee through any relevant health and safety or governance training. Tutorials will be used during the placements to provide sound background knowledge and to reinforce experiential learning. The trainee will be guided in relevant self-directed learning for each area. This rotation is one where some competencies should only be signed off when they

have been demonstrated in at least 2 areas (including the major ones delivered at CSE, i.e. FES and postural management or wheelchairs).

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Delivered at** | |  |
| **Rotation** | **CSE** | **Another department** | **Potential for being offered to external**  **trainees** |
| **RE** | | | |
| 11 weeks  1 Typically near the  start of the rotation  2 Typically near the  end of the rotation | FES – National Clinical FES  Centre and SJM (for 2 wks) 1  Followed by …   * CGA – Trust Gait Lab (for * 3 wks) * Project (2d/wk for 4-5 wks) * Orthotics (1 wk) * Attend 1 Moiré Fringe clinic * Postural Mgt (Special * seating) and Wheelchairs – * Med Eng + regional WCSs (for 3 wks) 2 | Placement to  experience other  areas of RE, including  EAT, ADL and  Prosthetics (for 1 wk) | All of rotation,  or  FES – up to 2 wks  Orthotics – only as part of a FES placement  Seating – up to 1 wk |

## Functional electrical stimulation (contact………….)

* Week one: tutorial on relevant anatomy and physiology; attending clinics; tutorial on stimulator set up and parameter change; observing gait and function
* Week two: three days in clinics; two days on project related to RE (continues into CGA placement)
* Learn about taking consent from patients and/or carers, including the Gillick Competent assessment and the Mental Capacity Act, and apply this through supervised practice
* Participate in initial assessments for FES treatment and take a past medical history from a patient,
* Participate in a basic clinical examination (including muscle strength, spasticity, range of movement, visual gait analysis)
* Participate in clinics for the provision and review of FES systems for gait assist and other applications (including upper limb)
* Fit a FES device on a volunteer or patient and set appropriate stimulation parameters for basic dropped foot correction
* Take, record and provide basic interpretation of outcome measures, including observations of gait, walking speed, effort of walking and goal setting
* Complete clinical notes following a review appointment
* Provide 2 case study reports for discussion
* Attend one other therapy session unrelated to FES (e.g. spinal injuries unit, stroke unit, orthopaedics)

## Clinical gait analysis (contact…………………)

* Three days/week CGA; 2 days/week continuing with RE project
* Week one: introduction to the gait cycle; visual gait analysis; interpreting videos and 3D kinematic data; gait lab equipment familiarization
* Weeks two to three: introduction to the lab’s standard operating procedures; calibrating the lab; marker placement and data collection; data processing and artefact removal; introduction to kinetics; interpreting real and archived data
* Use visual gait analysis techniques to score quality of walking in archived videos
* Tutorial on the basics of the clinical examination,
* Perform 2 calibrations of the gait lab and discuss the potential impact of an incorrect calibration, and the errors and limitations associated with the procedure
* Assist in setting up markers on a person to enable 3D data collection during walking, after observing a marker set-up and basic teaching of the Helen-Hayes model and the assumptions and limitations associated with using markers
* Collect gait data from a volunteer or patient and perform data processing
* Participate in a clinical interpretation meeting in preparation to presenting a shadow report – relating data to biomechanics of walking, pathological gait and compensatory strategies (these may be through current or archived case studies)

## Postural management and wheelchairs (Medical Engineering) (contact…………)

* Week one: tutorial on posture management; shadowing clinics; wheelchair mechanics; workshop induction; QMS induction
* Week two: further tutorial on posture management and special seating; shadowing clinics; WCS visit; attend RE talk in Spinal Unit; assist in manufacturing a seat, accessory or non-assessment item
* Week three: shadowing clinics; attend Spinal Unit pressure clinic; self-learning on pressure sore prevention and tissue viability
* Continue to learn about taking consent from patients and/or carers, including the Gillick Competent assessment and the Mental Capacity Act, and apply this through supervised practice
* Participate in an assessment and a fitting for a special seating system
* Complete medical notes and a report or letter, including recommendations and rationale for the seating solution to be provided
* Assist in producing a wheelchair seat (Foam, Matrix or Lynx) and interfacing it to the wheelchair and patient
* Participate in assessment and provision of wheelchairs and routine seats by shadowing rehabilitation engineers from a regional wheelchair service
* Be trained at the appropriate level in using workshop tools and equipment for manufacturing
* Assist technical staff in the workshop to design and manufacture aids for daily living and/or modifications or attachments to wheelchairs, such as a headrest or foot plates
* Understand the basic principles underlying the quality system used in Medical Engineering
* Set up, calibrate and use pressure mapping equipment (as a tutorial with a willing volunteer sitting on different cushions/surfaces) and assess the errors due to incorrect calibration and curvature of sensors
* Understand the significance of tissue viability by undertaking on-line training through MLE on Pressure Ulcer Prevention and Management Induction and Pressure Ulcer (Computer based training) and by attending in-house pressure clinics with REs and tissue viability nurses to observe pressure mapping appointments and understand the consequences of having unsuitable seating
* Spend half day in the Spinal Injuries Unit to observe pressure clinics and to discuss wheelchairs with their in-house technician
* Provide 2 case study reports, one on special seating and one on a related topic

## Orthotics (contact……………….)

* Observe assessments and fitting of orthotic systems
* Attend ward rounds and the diabetic foot and lower limb clinics
* Take a cast for a contoured insole or an AFO
* Provide an orthotic case study report for discussion
* Observe 1 Moiré Fringe clinic

## Project

* May be an innovation project, an audit or a literature review
* For an innovation project, this may fit within the confines of a larger project being run in CSE
* For an audit, this may be using retrospective or new data and can run across the whole rotation (Note: this may also extend into and contribute to the ICT project in the CMICT rotation – see later notes)

External placement(s) for 1 week (e.g. at the Bristol Centre for Enablement, Chailey Heritage, TRUST Speech and Language Therapy Unit) to cover other areas, including

## Activities of daily living

* Observe an Occupational Therapist led assessment of a patient’s needs for an aid for daily living
* Assist in specifying and designing/sourcing equipment to assist in ADL

## Prosthetics

* Observe a clinic for the assessment, provision and review of prosthetic systems

## Electronic assistive technology (EAT)

* Observe assessments (including therapist led) for the provision of an EAT system
* Understand use of computers in EAT and program computer technology to allow interfacing to or the controlling of a piece of EAT
* Understand communication systems used with these patient groups
* Observe different switching systems used in controlling EAT systems

## Other activities

* Participate in a risk assessment of a procedure or piece of equipment related to RE
* For all pieces of equipment used, undertake the appropriate safety, calibration and quality control checks

## Suggested items for inclusion in case study reports

* Discuss the disabling condition and the resulting motor/control deficits
* Details on the operation of the piece of assistive technology and any adjustments made
* Report on patient progress using outcome measures
* Reference documents on practice guidelines, effectiveness, risk and safety standards, legislation
* Search of commercially available alternatives
* Relate experiences to learning from other RE services

## Clinical Measurement and Information Communication Technologies

The Rotation Supervisor is ……………… (Highly Specialist Clinical Physiologist, Neurophysiology, CSE).

It is expected that the split between Clinical Measurement (CM) and Information Communication Technologies (ICT) will be 6 and 5 weeks respectively. At the start of the rotation a meeting is held to discuss the training timetable and to identify specific training requirements (though the actual activities may change at short notice in response to clinical or service needs). At each placement the Trainer will take the trainee through any relevant health and safety or governance training. Tutorials will be used during the placements to provide sound background knowledge and to reinforce experiential learning. The trainee will be guided towards relevant self-directed learning.

## Clinical Measurement

The training is provided at CSE and other departments in trust. CSE hosts some specialist CM services, including neurophysiology, whilst other trust departments can offer opportunities for the trainee to observe and participate in a variety of others that are necessary to deliver the breadth in training. All these services run with healthcare professionals working in multi-disciplinary teams, comprising scientists, technologists, physiologists, medical consultants, and nurses. CSE has the philosophy that scientific staff should be proficient in many aspects of CM, including both operating the equipment and having direct contact with patients to take measurements. The trainee will observe all clinics and, where appropriate, take measurements from patients. They will perform supervised routine practices, equipment quality assurance checks and calibration tests. Small scientific projects are encouraged. In this rotation some CM modules are compulsory whilst others, chosen and arranged by the trainee, are from personal preference.

The trainee will be trained to use a variety of equipment and to understand the scientific and clinical rationale behind the choice of test, as well as to perform statistical and scientific analysis and interpretation of the data collected. Ensuring high quality data collection and accurate interpretation requires a theoretical understanding of the measurement, practical experience, understanding the methods of quality assurance and the ability to critically analyse the data. An understanding of the normal values and patterns provides useful support to differentiate between artefacts and real data.

Tutorials will be provided to teach the scientific principles. Project work may be stand-alone or part of ongoing projects within the departments. Competencies relating to CM should only be signed off when they have been demonstrated in at least 2 of the 3 major areas.

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| --- | --- | --- | --- |
|  | **Delivered at** | |  |
| **Rotation** | **CSE** | **Another department** | **Potential for being offered to external**  **trainees** |
| **CM & ICT (CM Component)** | | | |
| Run in parallel with DD  Any opportunities to embed ICT learning  through CM placements will be encouraged | **Compulsory**  Neurophysiology (2 wks)  Time spent with a Clinical Scientist (electronics  trained) to introduce the trainee to block system  design approach to  measuring a clinical signal  (e.g. ECG, EMG, EEG) –  project based | **Compulsory**  Urodynamics (2 wks)  LASERs plus Doppler Ultrasound (1 wk)  Optional, from:  Vascular and Blood  Flow  Audiology Cardiology  Respiratory /  Pulmonary Function Medical Imaging  Moiré Fringe Interface pressures | Neuro – up to 1 wk |

For each major area of clinical measurement, the trainee will be expected to

* Know the relevant health and safety and governance issues
* Read around the literature of the scientific and clinical evidence base that underpins the test
* Set up equipment to acquire clinical measurement data
* Participate in the clinical interpretation of test results as part of an MDT
* Recognise technical artefacts and analyse data, including reporting on the use of a specific measurement (particularly in terms of accuracy, variability, reproducibility, bias, specificity and sensitivity) and its impact on analysis and interpretation

In at least one area, the trainee will

* Participate in a risk assessment of a procedure or piece of equipment related to clinical measurement
* Analyse deterioration in equipment performance
* Programme using an appropriate language (e.g. MS VB, MS VBA-Excel, Matlab, Java) to reduce and report clinical measurement data. Note: this may be part of the ICT component of this rotation

## Neurophysiology (contact……………………)

* Take the trainee through a tutorial of the basics of clinical measurement equipment, including basic system components (e.g. transducers, amplification, filtering, isolation, display, etc.) and calibration/QA checks
* Participate in electroencephalography (EEG), evoked potentials (EPs), electromyography (EMG) and nerve conduction studies (NCS), working with Clinical Physiologists and a Neurophysiology Consultant
* Perform a nerve conduction test on a volunteer
* Assist in setting up the equipment and placing electrodes to acquire an EEG recording
* Conduct quality assurance checks and/or calibration tests on one piece of equipment
* Undertake half day training on the governance of information assets relating to this field (see ICT module)

## Urodynamics (contact…………………)

* Observe urodynamic clinics
* Attend multi-disciplinary team meetings for spinal urodynamics
* Attend tutorials on the science and clinical relevance of urodynamic measurements
* Participate in preparing the room and the equipment prior to patient sessions, including any QA checks,
* Participate in the process of taking a urodynamic measurement and discuss the recorded data to recognise technical and clinical artefacts

## Vascular and Blood flow (contact………………….)

* With a Clinical Scientist
  + Attend a tutorial on the Doppler effect and its application in blood flow measurements
  + Complete calibration tests and quality assurance checks using phantom objects
* Ultrasound Doppler (Vascular Unit, Surgery)
  + Observe measurements using 2D ultrasound, colour Doppler, and pulse Doppler
  + Attend clinics using Doppler to measure blood flow in a range of patient groups (including carotid stenosis and TIAs, DVT assessments, peripheral arterial claudication, and aortic aneurysms), working with Vascular Consultants, Nurses and Sonographers
  + Understand and discuss findings of clinical measurements, including attending a multi- disciplinary team meeting (Mon a.m.
  + Use a hand-held Doppler system to take measurements appropriate to calculate the ankle- brachial pressure index on a healthy volunteer

## LASERs and LASER Doppler (LASER Centre and Burns Unit) (contact……………….)

* Observe clinical measurements from peripheral vessels in the skin,
* Perform a blood flow measurement on a healthy volunteer using LASER Doppler and follow appropriate safety procedures
* Complete calibration tests and quality assurance checks and discuss possible causes of variation and effects on patient response
* Understand and discuss findings of clinical measurements (including variability and reliability)
* Review safety standards, including eye protection and alignment laser
* Observe other clinical measurements performed in the LASER clinic, i.e. Clinical photography and Colour measurement
  + Observe and assist in reporting of images (including wound measurements)
  + Carry out routine measurements to determine change in the colour of tattoos or port wine stain skin

## Audiology (contact…………….)

* Participate in diagnostic audiological assessment and observe the fitting of hearing aids (adults and children)
* Participate in the tuning of a hearing aid for a patient
* Participate in vestibular function assessment and observe rehabilitation for balance disorders
* Observe hearing therapy clinics, including for tinnitus

## Cardiology (contact……………….)

* Observe electrocardiogram measurements, echocardiography and pacemaker function clinics

## Respiratory / Pulmonary function testing (contact………………)

* Observe clinics measuring air flow
* Set up and calibrate equipment

## Medical imaging (contact………)

* Observe the use of the following equipment in imaging: DEXA, X-ray, CT (angiograms), MRI and ultrasound
* Discuss the data obtained and the clinical relevance
* Participate in quality assurance checks using phantoms
* Undertake a tutorial on the measurement, its clinical relevance and understand the errors relating to using the equipment

## Information communication technologies

CSE uses ICT in many of its services and projects, hence it can deliver some parts of this module. However, it is unable to deliver the depth and breadth of experiential learning of Information Technology across a whole healthcare setting (i.e. an NHS Trust) as described in the Learning Guide. Arrangements have therefore been made for specialist aspects of the training, such as local area networks and PC configuration, to be delivered by the Informatics Department in TRUST.

An ICT based design project, probably related around a relatively simple spreadsheet or database, will be undertaken in CSE, SJM or another trust department by the trainee. This project may be related to current audit, research or service development activities.

The Informatics Department in trust (contact: ……………) has three main activities that relate to the STP

* Operations and IT Technical Support
* Networking
* Business Transformation

The trainee will spend some time shadowing different sections of the department, including working with engineers to cover the technical aspects of hardware and system protection of networks and in setting up a blank computer for safe and secure use. There may also be the opportunity to observe the work of Project Support Officers working with Business Analysts and Developers to design and implement a web application through a software development cycle.

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| --- | --- | --- | --- |
|  | **Delivered at** | |  |
| **Rotation** | **CSE** | **Another department** | **Potential for being offered to external**  **trainees** |
| **CM & ICT (ICT Component)** | | | |
| 5 weeks  (3 wks ICT project and 2 wks in IT Dept.) | ICT project (based in CSE, SJM or another TRUST dept.) on a database or  spreadsheet design (3 wks) | TRUST Informatics Dept (2 wks) | x |

## ICT project (spreadsheet or database)

* Liaise with the customer to specify, design, develop and test a small spreadsheet or database
* Manipulate a spreadsheet or database to provide analysis of data
* Programme using an appropriate language (e.g. Microsoft VB) to reduce and report on data
* Provide a secure handover of the ICT system and appropriate documentation to the customer

## NHS Trust IT hardware specifics

* Be familiar with the operation of major ICT hardware
* Understand the role of networks in a hospital setting
* Assist a network engineer to set up and maintain a local area network, including using shared access and security issues
* Put in place protective measures for ICT systems including anti-virus protection, updating and firewalls
* Install and maintain system and applications software on a computer
* Implement ICT components in a controlled way, taking into account the impact on existing facilities and clinical service

## Shadowing NHS Trust IT projects

* Participate in one or more of the stages relating to the specification, design and development of a web application in response to a specific clinical need
* Identify and implement any ICT components in a controlled way to minimise the impact on existing facilities and clinical service
* Understand the risks associated with the new project and need for protective measures
* Document all work undertaken

## Information governance

* Undertake a tutorial with the Information Governance Manager in TRUST to understand the principles underlying Information Governance and the roles underpinning the organisation’s Information Assets
* Undertake a tutorial and shadow the work of an Information Assets Administrator to understand the need for security protection and business continuity (this tutorial will occur during the CM neurophysiology module with the assigned IAA)

## Design and development

The Rotation Supervisor is ………………. (Clinical Scientist, CSE)

The training is primarily provided in CSE. Multi-disciplinary teams work to innovate new products and though principally these are in the field of rehabilitation engineering, this is not exclusive. Staff in Medical Engineering both design and manufacture a variety of Class I medical devices; these are often associated with wheelchairs, seating systems and aids for daily living. SJM has a New Product Development team for FES devices and associated systems. Both operate BSI accredited quality systems: Medical Engineering ISO 9001:2016, SJM ISO 13485:2016 and the requirements of 93/42/EEC Annex V 3.2 for low risk electromedical devices. The department is fully equipped with electronic and mechanical design, prototyping and manufacturing facilities, including electronic circuit design packages, CAD, PCB manufacturing facilities, electronic fabrication and test facilities, mechanical engineering workshops, vacuum forming and powder coating.

The trainee will be taken through a project under the Design and Development management procedure used in Medical Engineering to design, prototype and test a mechanical, electronic or electromechanical medical device. A project may be novel or an ongoing design; it may be stand-alone or part of a larger project in these design teams. The trainee will participate in each aspect of the design process, from the development of specification from a client’s brief through to the manufacture and testing of a prototype or product. Finished product(s) will be either fitted to patients or used in their intended settings, after documentation appropriate for use and full verification and validation have been completed.

The trainee will understand and follow a formal design process and learn and apply project management skills, e.g. chairing design meetings, risk assessing, project planning, costing and evaluating. It will be expected for the trainee to use existing paperwork (forms and documentation) in the design and development process or generate their own if appropriate. Access to Medical Engineering and/or NPD design procedures and paperwork will be given to aid the trainee. The trainee will receive appropriate training in basic and

advanced workshop and bench skills – mechanical and/or electronic – appropriate for their project. The trainee may be asked to set up a project team and/or a team of stakeholders, to cover specific roles in a project life cycle of developers, analysts and testers.

Generally, the trainee will be expected to participate in just one project. The project may come from within CSE, SJM or from another department, such as the Innovations Hub or in response to a Trust Broadcast, or the trainee may have their own idea for a project that they would like to undertake. The latter may come from their training placements or previous work, but whatever the source the final project(s) must be agreed between the Supervisor and the trainee.

The project will have a named project lead (not necessarily the Supervisor) and every effort will be made to ensure that this person, or another member of the project team, is a Chartered Engineer and has significant experience in managing design projects. At the start of the rotation a meeting will be held to discuss the training timetable and to identify specific training requirements (though the actual activities may change at short notice in response to clinical or service needs). At the start of the rotation the Supervisor will take the trainee through any relevant health and safety or governance training. Tutorials will be used to provide sound background knowledge and to reinforce experiential learning.

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| --- | --- | --- | --- |
|  | **Delivered at** | |  |
| **Rotation** | **CSE** | **Another department** | **Potential for being**  **offered to external trainees** |
| **DD** | | | |
| Run in parallel with  CMICT  11 weeks, one major  project plus any additional smaller  projects  DD in Med Eng may  involve a series of  smaller projects only, depending on service need | Projects may be based in  CSE or in SJM | Projects may come  from other TRUST departments | In full, if a project can  be identified with full  support and named project lead from  CSE/SJM – consider  each case on its own merit |
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|  |  |
| Undertaking this rotation after CMICT is advised in the Learning Guide, but for logistics the  order of rotations may be organised differently. | | | |

## Typical training activities

* At the start of the rotation, the trainee will be taught about formal design methodologies, design procedures and relevant quality management processes (from both Medical Engineering and SJM) through tutorials
* Identify, investigate and follow a design process (e.g. British Standards, Pugh Model for Design) for the product development lifecycle agreed for this rotation
* Document the project plan by identifying objectives, milestones and timescale and present this at a design team meeting
* Have weekly project meetings to monitor progress against the projected project timeline
* Liaise with the client and produce functional, performance and technical specifications from the design brief or concept (to be aware of and to use design procedures from Medical Engineering and/or SJM)
* Apply personal time and project management skills through the whole process, including chairing design meetings and setting up a project team and/or a team of stakeholders if required (this training will be supported through mentoring from the Supervisor)
  + Search the literature for commercial systems and perform a competitor analysis if appropriate
  + Look into the standards and legislation relevant to the product to inform both the design and testing,
  + Develop and evaluate concept designs, by scoring the relative merits of each design and provide justification for the decision of which one to progress to prototype
  + Undertake CAD tutorials (mechanical and/or electronic) as appropriate
  + Follow one design through to prototype, using CAD software (mechanical and/or electronic) to produce drawings
  + Specify manufacturing processes and be trained to use mechanical and/or electronic manufacturing tools appropriately and safely to produce the device
  + Carry out appropriate analysis (if necessary, using CAD or circuit simulations) to ensure components and design is fit for purpose – determine critical areas for functional testing
  + Perform verification and validation on the prototype, including undertaking a search of literature and standards to determine relevant test procedures and performing appropriate bench testing
  + Produce a technical file
  + Create other appropriate documentation (e.g. user manuals, health and safety considerations, inspection and maintenance requirements, calibration procedures and data, manufacturing and user assembly, training file)
  + Undertake a risk assessment at relevant parts of the design and on the final product, mitigating the risks where possible
  + Present final product/prototype to the design team / client and plan and perform a design review and product evaluation
  + Ensure an appropriate handover to the client
  + Understand the requirements for the Quality Management System, including the relevance of having technical folders and look into the processes required for CE marking and MHRA notification
  + Discuss the relevance of intellectual property in the NHS with the Innovations Lead for TRUST

## Device risk management and governance

Though our trust has a Medical Device Management Service, unfortunately it has neither the infrastructure nor the resources to support training in this rotation. There is therefore a local arrangement to provide the training at the Medical Equipment Management Service (MEMS) at another trust, but another hospital would be considered if it was more convenient for the trainee. Prior to starting the main placement, a week is spent in trust service for an appreciation of typical activities and equipment.

MEMS in Bath provides a complete equipment management function to the RUH, covering medical equipment of total value around £38M. The department gets involved with the whole lifecycle of the equipment, including specifying, pre-purchase evaluation, purchasing and funding, acceptance testing and user training, and a wide range of other risk management activities relating to medical equipment. There is a maintenance and repair workshop employing 9 Clinical Technologists who provide repair and maintenance service for over 8,000 items, half of which are owned by the RUH and the remainder by other Trusts and organisations located from Swindon to Shepton Mallet.

The equipment under the care of the department at Bath range from the linear accelerators for radiotherapy to weighing scales. Typical examples include infusion pumps, bedside monitors, theatre equipment, ward equipment, defibrillators, audiometers.

MEMS is part of the Clinical Engineering Section of the Department of Medical Physics and Bioengineering and has close links with Clinical Scientists working in imaging physics and radiotherapy physics. The Clinical Engineering Section employs three Clinical Scientists, ten Clinical Technologists plus a team of six who run the Medical Equipment Library. Other activities include software development, research and development, clinical user training, and non-ionising radiation support. There are close working links with medical, nursing and other health professional staff groups across the Trust.

The training will cover all the relevant learning outcomes and will largely include real situations backed by self-study of the regulatory environment. The trainee will become familiar with the department’s structure and approach to applying risk management and governance to medical equipment, through activities which are relevant to the local Trust. The trainee may sometimes shadow staff carrying out tasks such as delivery of clinical user training; repairs and maintenance; and participation in Trust committees. The trainee will also take the lead on some activities under supervision. Examples include conducting risk assessments, applying statistical analysis on data from the Trust’s medical equipment inventory and service history system, and organising the evaluation of medical equipment in a purchase project. A Clinical Engineer working in this discipline will be in a lead role and will interface with a wide spectrum of staff depending on the job in hand. The training will provide confidence to deal with examples such as arriving at a risk-based decision relating to medical equipment and will give the satisfaction of making a real contribution to the workplace.

At the start of the rotation a meeting will be held to discuss the training timetable and to identify specific training requirements (though the actual activities may change at short notice in response to clinical or service needs). Similarly, the trainee will be taken through any relevant health and safety or governance training that is required. Tutorials will be used to provide sound background knowledge and to reinforce experiential learning.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Delivered at | |  |
| Rotation | CSE | Another dept. | Potential for being offered to external  trainees |
| DRM | | | |
| 10 weeks at the RUH  or another NHS Trust. | x | MEMS, RUH.  Prior to starting at the  RUH, the trainee should arrange to spend a week in Trust MDMS and Medical Electronics. | x |

## Typical training activities

* Operate and carry out functional and electrical safety testing on a wide range of both Class 1 and 2 medical devices (e.g. infusion pumps, vital signs monitors, ECG recorders)
* Complete a competency-based training programme for one medical device
* Perform a calibration test on 2 different pieces of equipment
* Clean and decontaminate a medical device
* Carry out a risk assessment on at least one piece of medical equipment
* Complete the decommissioning and condemning of a medical device
* Understand the equipment management life cycle and attend both MEMS and hospital committee meetings where these issues are discussed
* Participate in selecting and evaluating a medical device required for the hospital as part of a procurement exercise
* Search for relevant safety standards and legislation on products being evaluated
* Contribute to generating contracts for external providers of electromedical equipment
* Participate in maintaining web-based applications for MEMS (note: knowledge and skills acquired here may also be used to strengthen evidence for the ICT module)
* Under supervision, give the MEMS induction lecture to new nursing staff
* Carry out an audit of equipment training competency
* Look to attend the 2-day training session on EM field measurement run by the RUH (this may need to be outside of the placement weeks) – or similar
* Become familiar with the IT system used in the RUH for medical devices and navigate around competently to acquire asset related information and reports
* Generate key performance indicators from the Medusa system
* Introduction to DB 2006(05)
* Complete a real or shadow change to a standard operating procedure (this could be associated with looking at training requirements in MEMS and the departments it supports)
* Gather evidence appropriate for an external inspection, such as the NHSLA
* Participate in the actions relating to a safety alert from the MHRA or from a company
* Be aware of the steps required to investigate and report on an incident involving a medical device
* Visit an equipment management service at another hospital and generate a report on the main differences and similarities

## Elective

The Learning Guide says that “The aim of the elective period is to facilitate wider experience of healthcare and/or the practice of Healthcare Science in a cultural and/or clinical setting that is different from the usual training environment. This may involve healthcare or Healthcare Science in a different area of the health service, or in pursuit of a particular clinical or research interest.” It then goes on to describe the scope of the elective, giving examples of what may be followed.

This department recommends that the elective is undertaken after the final OSFAs (i.e. over 4 weeks in July/August in Yr3) to allow for sufficient and uninterrupted time for the specialism and the MSc project. However, this may be flexible as long as it is discussed and agreed with the TO in advance of any arrangements being made and an assurance that the main parts of the training can be delivered and completed. Before an elective is therefore arranged the trainee should first agree the dates with the TO so that it does not impact negatively on their training or university work. Desired aims and objectives for the elective should then be drafted by the trainee and discussed with the TO and named supervisor at their chosen place of elective. It is the trainee’s responsibility to make the final arrangements, keeping the TO informed at progress review meetings. During the elective the trainee will be required to keep a log of all activities undertaken and the knowledge and skills learnt and applied. Afterwards a time will be arranged for them to present an aspect of their elective period to colleagues from CSE and inviting people from the organisation where the elective was undertaken.

Electives may be in TRUST or elsewhere in the UK or overseas – funding to support the elective must be met by the trainee in full. Typical activities may include working in another rehabilitation setting (e.g. Spinal Injury or Stroke Units, therapy department), a medical specialty (e.g. Cardiology, Respiratory), medical physics (e.g. LASERs, Medical Imaging, Radiation Physics), another healthcare science (e.g. Genetics, Microbiology, Histopathology) or a related science discipline (e.g. Sports Science).

## Specialism in years 2 and 3

The Learning Guide describes three specialist modules for Clinical Engineering in years 2 and 3

* Rehabilitation Engineering
* Clinical Measurement and Development
* Device Risk Management and Governance

In CSE only Rehabilitation Engineering is offered, which is made clear to the candidates and funding commissioners at the time of recruitment. Rehabilitation Engineering covers three modules

* Assistive Technology (RE1)
* Clinical Gait Analysis (RE2)
* Medical Engineering Design (RE3)

In constructing the training plan for the specialism, a less prescriptive approach has been taken in defining specific activities to meet the competencies and assessments as outlined in the Learning Guide. This is because this part of the training is more dependent upon service need and the aim will be to partly use each trainee to their full potential to assist in this, as well as to continue to provide them with challenging activities. In each area the trainee will be therefore fully immersed in service activities. It is expected that the trainee will take more of a lead in developing and directing their own training plans over this time.

Near the time of transition between the third and fourth rotations a discussion will be held between the trainee and the TO to start defining this training plan. Experiential learning and the skills gained during the rotations will be taken further to provide opportunities to develop a deeper level of competence. The trainee will be given opportunities to take a lead in providing many of the clinical engineering activities and to take responsibility for some specific activities, including clinics. All work will be undertaken in a multi- disciplinary team and the trainee will be expected to participate fully in team meetings and clinical governance sessions, where on occasion they will be asked to present their work or to lead the meeting.

The specialism will start in January (year 2) and run through to end July (year 3); a total of 19 months (this time may also include the elective). During this part of their training, the trainee will be split across these three modules depending upon service need. Training will be provided predominantly at CSE, with short external placements and visits to provide breadth and specific experiences. The trainee will be required to ensure that the Professional Practice competencies are also completed. Time is given for the trainee to undertake their MSc project.

For a 19-month specialism, the training timetable may follow a typical pattern as below but again this is subject to change (some flexibility may be accommodated to allow for a trainee’s specific requests)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Typical week | | | | |
| Jan (Yr2) | PPI |  |  |  |  |
| Feb | Problem  solving |  |  |  |  |
| Mar | MSc (prep) |  |  |  |  |
| Apr | SEATING and | MED-1 |  |  |  |
| May |  |  |  |  |  |
| Jun |  |  |  |  |  |
| July |  |  |  |  |  |
| Aug | MSc |  | FES |  |  |
| Sept |  |  |  |  |  |
| Oct (Yr3) |  |  |  |  |  |
| Nov |  |  |  |  |  |
| Dec |  |  |  |  |  |
| Jan |  |  | PPI |  |  |
| Feb | MED-2 |  | CGA |  |  |
| Mar |  |  |  |  |  |
| Apr |  |  |  |  |  |
| May |  |  |  |  |  |
| Jun |  |  |  |  |  |
| July |  |  |  |  |  |
| Aug | ELECTIVE -  recommended |  | Completing  assessments |  |  |
| Sept | End of contract | | | | |

This split over the 19 months equates to approximately

* PPI – 11%
* Problem solving – 5%
* MSc – 16%
* Specialist modules – 68%

And in the time allowed for specialist modules

* RE1 – Assistive Technology 42%, split between FES (23%) and Postural Management (18%)
* RE2 – Clinical Gait Analysis 28% (unfortunately this module is timetabled for after the mock OSFAs in Yr3)
* RE3 – Medical Engineering Design 30%, split as MED-1 (12%) and MED-2 (18%)

## Patient and public involvement activity (PPI)

During January, the Yr2 and Yr3 trainees will work together to complete a project in the field of PPI, such as a patient survey or audit. Managed and directed by the TO, the Yr3 trainee will be expected to lead the activity and manage theirs and the Yr2’s time effectively to complete the work on time. Note that the Yr2 trainee will spend some time during this month at the university, whilst the Yr3 trainee is also given 2 days per week to continue with their MSc.

## Problem solving activities

Short placements will be arranged by the trainee – but guided and approved by the TO – in other departments (some RE related, others not) for the Yr2 trainee to observe work/clinics and to think about how clinical engineering could be applied to improve services/clinics. This will also give them the opportunity to engage with and work alongside different patient and healthcare professional groups, but obviously this needs to be managed sensitively with the Clinical Leads in each of these departments (what we are not saying is that CE can solve everything!). One approach may be 2 days in clinic followed by 3 days working on ‘design concepts’ but the deliverable for each placement will be set by the TO. Example departments may be SLT, SIU, Hospice, Physiotherapy.

## Assistive technology (RE1)

In this module the trainee will focus specifically on three modalities across 2 placements: /1/ functional electrical stimulation (FES) and /2/ postural management (i.e. special seating) and wheelchairs. The trainee will build on their knowledge and skills in this field but will develop a deeper level of competence across a longer time period than allowed for during the rotation. The Supervisors for the 2 modalities are ……………. (Consultant Clinical Scientist CEng, CSE) for FES and ………………. (Senior Clinical Scientist, CSE) for postural management and wheelchairs.

In each of these areas they will work directly in the clinics, gaining skills and confidence to get them to the point of leading their own clinic, including assessments, set ups and reviews and completing associated paperwork and letters. To this end, the trainee will be guided through a set of competencies specific to each field. The trainee will also be involved in other service-related activities, such as clinical audits, project work, maintaining and reviewing the quality system and undertaking repairs and production of devices. Many of the STP training competencies will need to be demonstrated in two of the major modalities before they are able to be signed off as satisfactory.

In addition, the trainee will be encouraged to continue learning and familiarisation with the other fields listed under Assistive Technology (RE1) of the Learning Guide (i.e. ADL, EAT, prosthetics and orthotics).

In FES, a typical training plan may accommodate the following activities

* Attend SJM FES courses (as a minimum, the Odstock Dropped Foot Stimulator Accreditation Course)
* Mentored through the set of FES competencies by an experienced FES clinician (Clinical Scientist or Physiotherapist) appointed by SJM’s Lead Physiotherapist
* Refresher training in relevant manual handling (incl. assessing risk and use of handling belts and walking aids) and H&S matters
* In clinic for 1 day per week to shadow clinicians (both Clinical Scientists and Physiotherapists) and gain specialist skills, knowledge and confidence
* After approximately 2-3 months training, to lead their own clinic session (half day per week to the end of placement), under supervision, as an integral part of the service. This will include setting up FES devices, leading review appointments and taking responsibility for associated tasks, such as record keeping and letters
* Participate in initial assessment clinics
* Perform basic clinical examinations (including muscle strength, spasticity, range of movement, visual gait analysis) and use that information and the information contained in the referral to identify and define requirements for treatment
* Assist in funding applications for FES treatment for named patients, liaising with the relevant healthcare professionals and funding commissioners
* Review outcome measures appropriate for this service
* Initiate, design, undertake and complete an audit project related to the FES service (the trainee will be mentored through this process by an experienced member of staff)
* Complete a risk assessment and produce an action plan to mitigate that risk
* Undertake an individual or group project. This project may involve a small series of clinical case studies where FES is used in a specific application or analysing responses from a questionnaire or focus group. The trainee will design the clinical study and experimental protocol, develop the necessary paperwork, write the patient and clinician information sheets, and if necessary, submit the necessary paperwork for peer review
* Become familiar with the operations in SJM Customer Services and with the FES equipment technicians (some time may be allowed to participate in fault finding and repairs using electronic bench equipment
* Look to attend the SJM FES User Day
* Spend some time in other TRUST departments that see similar patient groups to observe other treatment and rehabilitation options (e.g. SJM Neurophysiotherapy and Spasticity clinics, Orthotics, Stroke Unit, Spinal Injuries Unit, Movement Disorders Clinic)

In postural management and wheelchairs, the trainee will be based full-time at Medical Engineering working in both this field of AT and on small design projects linked to this service (MED-1). A typical training plan for the AT side may accommodate the following activities

* Mentored through the set of clinical and technical competencies related to this service
* Refresher training in relevant manual handling (including assessing risk and use of hoists/slings and transfer equipment) and H&S matters
* Look to attend postural management and seating courses run at other institutions, including those arranged by companies
* In seating clinics (assessments, fittings and reviews) to shadow other clinicians and gain specialist skills, knowledge and confidence
* Progress to leading their own seating clinic, working closely with a Clinical Technologist, as an integral part of the service
* Be familiar with more routine wheelchair and seating solutions
* Be trained on workshop manufacturing skills
* Contribute to design, manufacturing, fitting (interfacing) and testing of special seating and wheelchair modifications to accommodate postural management solutions
* Review outcome measures appropriate for this service
* Initiate, design, undertake and complete an audit project in Medical Engineering
* Take the lead in an aspect of the quality management system operating in Medical Engineering
* Complete a risk assessment and produce an action plan to mitigate that risk
* Undertake at least one design project for Medical Engineering, taking the project from concept through to producing a working prototype and thence to fitting
* Maintain and implement any changes to the service’s website
* Participate in the provision and fitting of wheelchairs as part of regional services, working closely with REs and OT
* Spend some time with the tissue viability nurses and in the Spinal Injuries Unit to gain specialist knowledge of interface pressure measurement and pressure ulcers,
* Visit another organisation that offers special seating and postural management services (these may include other Trusts, companies and charities)
* Look to attend PMG or RAE at conferences

## Assessments

* 2 CBDs in FES (1 on clinical case studies/reports; 1 on other work e.g. audits)
* 2 CBDs in Postural Management/ Wheelchairs (1 on clinical case studies/reports; 1 on other work
* e.g. audits, design and manufacturing for a client brief)
* 3 DOPS/OCEs; at least 1 DOPS or OCE should be assessed in each of the areas (suggested: 1 OCE in each area, plus 1 DOP in either)

## Clinical gait analysis (RE2)

The trainee will build on their knowledge and skills in this field but will develop a deeper level of competence across a longer time period than allowed for during the rotation. They will work in the Trust Gait Lab and be involved in all aspects, including clinical assessments, data collection, data processing and interpretation, quality assurance, research studies and service developments. Ensuring high quality data collection and accurate interpretation requires a theoretical understanding of the measurement, practical experience, understanding the methods of quality assurance and the ability to critically analyse the data. An understanding of the normal values and patterns provides useful support to differentiate between artefacts and real data. To increase clinical experiences with different patient groups and to observe other gait labs in operation, opportunities will be provided for the trainee to have short placements or visits to other hospitals or institutions performing gait analysis. The trainee will also assist in training the next trainee in CGA and equipment use.

A typical training plan may accommodate the following activities

* Mentored through a set of clinical and technical competencies related to CGA and this service
* Revision on the gait cycle, video scoring and kinematics
* Learn more on the kinetic data collected during a typical session
* Complete on-line training opportunities in gait analysis
* Lead CGA sessions from referral through to planning the appointment and reporting
* Plan the session with an emphasis on acquiring the maximum information in the minimum amount of time and prioritising the most clinically significant measurements
* Become competent in marker placement
* Participate in collection, processing and interpretation of data from patients with a variety of conditions and/or from volunteers undertaking mimicked walks
* Be able to demonstrate the reasoning behind the choices made during data processing
* Lead interpretation meetings (through real and/or archived data)
* Provide a case study report relating to clinical gait analysis and interpretation
* Be familiar with internal Vicon settings (e.g. the Woltring filter) used in data collection and processing and evaluate their impact on recorded data
* Be able to recognise artefacts from real data
* Take appropriate steps to minimise errors in recorded data and conduct a simple test on one aspect to evaluate data consistency and impact from errors or from an incorrect calibration
* Research one aspect of the clinical examination more thoroughly, understand the clinical reasoning behind the examination and identifying any improvements
* Maintain and add to data sets (e.g. normal males and females) used in the laboratory
* Research and/or use complementary clinical methods, such as functional scales,
* Complete a risk assessment and produce an action plan to mitigate that risk
* Participate in service developments
* Lead equipment quality assurance checks and/or calibrations tests
* Research, plan and implement a new quality assurance check into the service
* Plan, undertake and complete a small project in CGA
* Contribute to the work of the service in working towards and/or maintaining CMAS accreditation
* Undertake training through courses and/or self-directed study on Polygon and BodyBuilder software
* Research different models used in CGA; test such a model in practice and/or construct and test a new model in BodyBuilder
* Visit another UK gait lab to observe good practices and complementary equipment (such as EMG, energy cost, plantar pressure) and to attend MDT clinical interpretation meetings,
* Look to attend at least one surgery session in a referring department (e.g. Orthopaedics)

## Assessments

Of the 4 CBDs, each one may focus on a different aspect of the work, for example

* Reporting on and comparing 2 biomechanical models
* Two clinical case studies and CGA reports
* Aspects of QA

3 DOPS/OCEs; DOPS and OCEs will be spread across the duration and areas of work for this module (at least 1 DOPS and 1 OCE will be assessed).

## Medical Engineering Design (RE3)

The Supervisor for this module is ……………. (Senior Clinical Scientist, CSE), but for each project a person with a declared interest will be identified as the design project supervisor to deal with the day-to- day supervision and support.

The trainee will further develop their engineering design skills, but specifically apply this to the field of RE. Typically the trainee will work in their previous undergraduate engineering discipline, but scope will be provided to allow them to work across other engineering disciplines and learn new skills. They will be firmly embedded in the design team, following the processes and procedures that the other designers are required to follow, working alongside other engineers and healthcare staff from other disciplines.

The Supervisor may ask the trainee to complete a short project near the start of the placement to highlight certain aspects, such as introducing 60601 and producing a simple PCB or 3D printed item. Similarly, there may be a period of learning required near the start, for example of Proteus or Solid Works, and therefore additional time is given to the first design project.

Projects may involve combinations of one or more of the following: mechanical engineering, electronic and electrical engineering, instrumentation or ICT. As detailed in the Learning Guide, at least two pieces of equipment relating to rehabilitation engineering will be developed and for each one the trainee will be required to follow a formal design process and lead on project design multi-disciplinary team meetings. The design process will follow a similar pattern of work as in the rotation, but the trainee will be expected to take more of a lead and initiative, as well as undertake a fuller analysis and critique. They will be required to complete a suitable technical file, develop appropriate validation and verification tests and provide training for others on the new equipment before being released into service.

As in the rotation, project proposals may come from a variety of sources, but the final projects must be agreed with the Supervisor. Projects will be identified and selected as those being relevant to service need and of higher priority at the time. Opportunities to link with universities and industry for design and prototyping facilities may be explored if considered appropriate. Design placements for the year 2 and 3 trainees partly coincide to allow the Supervisor to provide a larger design project that both trainees may contribute to together. During the first phase (i.e. MED-1) the trainee will work on a series of small design projects linked to the work of Medical Engineering. In the second phase (MED-2) they will undertake a larger design project.

## Assessments

The 3 CBDs should cover different aspects of the design work, for example

* Project briefs and specifications
* Design process and stages
* Design drawings and manufacturing of prototypes
* Validation and testing
* Commissioning and training

3 DOPS/OCEs; DOPS and OCEs will be spread across the duration and areas of work for this module (at least 1 DOPS and 1 OCE will be assessed).

## MSc project

A research project suitable at Master’s level will be selected by the trainee after discussions with the TO and the Head of Research and Training During those discussions, the trainee is encouraged to think of what area of RE they would like to research and the knowledge and skills that they would like to develop during their studies. In addition to discussing the various projects being proposed by other originators and potential supervisors, they are also encouraged to come up with their own ideas for potential projects. The project must be in the field of RE to meet STP requirements; the local Project Supervisor will be a member of CSE experienced in postgraduate degree supervision, working with the university’s Academic Supervisor.

Due to the tight timescale it is important for the trainee to start considering the various project options during their 4th rotation and be ready to work on their chosen MSc project from January (Yr2). Before starting a significant amount of work, the project must be approved by the TO, the Head of Research and Training and the university. The trainee will be given time in March (Yr2) to consolidate on and to build the project proposal, including the literature review and ethical approval.

From August (Yr2) through to the end of December (Yr3) 2 days per week is protected for their project. The proposed project, along with a plan and any approvals from either the NHS or the university (e.g. ethics, research committee, audit committee) will need to be obtained prior to starting. Please note undertaking a project that requires applying for research ethics is not recommended by the university and should first be discussed with them and the Head of Research and Training. An interim report for the university will be prepared (approx. July Yr2), along with a presentation.

To support the trainee in developing their research skills, opportunities will be provided in tutorials to discuss topics such as how to design a clinical research study, how to develop a research protocol, how to complete an ethics application, etc. These will be with experienced researchers in CSE and/or with members of the Research Support Unit in TRUST. They will also be expected to complete the NIHR Good Clinical Practice (GCP) course, “Introduction to GCP in Secondary Care workshops: A practical guide to ethical and scientific quality standards in clinical research”.

Meetings should be arranged between the local Project Supervisor and the trainee on a regular basis (suggested every 2 weeks). It is the trainee’s responsibility to liaise with their Academic Supervisor to arrange meetings with them, if required. At the start of year 3, a full review meeting should be held between the TO, the local Project Supervisor and the trainee to assess progress in the project and to ensure that steps are in place for the project to be completed. On completion, the trainee should be encouraged to submit their work for publication in a scientific journal or conference.

## Acronyms

ACS Association of Clinical Scientists

ADL Aids for Daily Living

AT Assistive Technology (specialist module)

CGA Clinical Gait Analysis (specialist module)

CMICT Clinical Measurement and Information Communication Technologies (rotation)

CPD Continuing Professional Development

CSE Department of Clinical Science and Engineering

DD Design and Development (rotation)

DRM Device Risk Management and Governance (rotation)

EAT Electronic Assistive Technology

FES Functional Electrical Stimulation

HoD Head of Department, CSE

IPEM Institute of Physics and Engineering in Medicine

MED Medical Engineering Design (specialist module)

MEMS Medical Equipment Management Service

NSHCS National School of Healthcare Science

OneFile On-line Learning and Assessment Tool

SJM SJM

OSFA Objective Structured Final Assessments

RE Rehabilitation Engineering (rotation)

STP Scientist Training Programme

TO Training Officer, CSE

SJM Anonymised NHS Company

# Training evaluation survey for healthcare science

# Department of Clinical Science and Engineering

This short questionnaire is a way to measure how you feel about the quality of training and education in your current job. Please indicate the score you consider most appropriate for your post in each of the domains below using the following scores: **5 = excellent, 4 = above expectation, 3 = meets expectation, 2 = borderline, 1 = below expectation**

|  |  |  |
| --- | --- | --- |
| Domain | Score | Comments and Suggestions |
| **1. Patient and staff safety**  The training environment and training delivered ensures safety is maintained at all times, e.g. trainees do not provide patient facing services without adequate supervision. |  |  |
| **2. Training personnel**  Trainers are selected appropriately and supported to undertake the programme. Time is made available for regular progress review  meetings. |  |  |
| **3. Assessor personnel**  Assessors are selected appropriately and complete assessments of my work in a timely and constructive manner. |  |  |
| **4. Facilities and IT**  Adequate facilities are available to deliver the programme successfully. |  |  |
| **5.Delivery of programme**  Programme is effectively planned and managed. |  |  |
| **6. Repertoire**  Training dept delivers (or can arrange to deliver) the range of clinical and technical services required for the training programme. |  |  |

Would you recommend the STP to one of your friends? Yes ❑ No ❑

Would you recommend this training centre to one of your friends? Yes ❑ No ❑

Any other comments?

Thank you for filling in this questionnaire. Please return to ……………….