Credential in Mechanical Thrombectomy for Acute Ischaemic Stroke

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The Royal College of Radiologists

Contents

1 Introduction

1.1 Purpose of the credential

The Mechanical Thrombectomy for Acute Ischaemic Stroke credential aims to contribute to a workforce capable of delivering 24/7 services for intracranial acute ischaemic stroke (AIS) mechanical thrombectomy to the UK population.

Interventional neuroradiology (INR) exists as a distinct specialisation within the sub-specialty of interventional radiology. Interventional neuroradiologists (INRs) provide urgent and elective care for patients referred to neuroscience centres with a wide range of vascular conditions affecting the brain, spinal cord, craniofacial tissues and the spine. INR services are required 24 hours a day to support the diagnosis and treatment of neurovascular emergencies, including ischaemic and haemorrhagic stroke.

This credential will enable trained clinicians from non-radiology specialties as well as clinical diagnostic and non-neuro interventional radiologists to learn to interpret and report diagnostic imaging relevant to acute neurovascular diseases; to identify and select patients who will benefit from treatment; and to treat these patients by performing mechanical thrombectomies (MT) for acute stroke.

The credential includes training in both MT and intracranial aneurysm treatment. Intracranial aneurysm treatment is only included for the reason that use of catheters and devices to navigate the brain circulation and treat intracranial aneurysms will help attain some of the skills that accelerate training to perform MT safely. It is recognised however that some doctors, such as interventional radiologists, will already have considerable experience using coils, albeit in other anatomical sites.

While the credential will be key to training non-radiologists in mechanical thrombectomy, it is only one route to training mechanical thrombectomy operators. Radiologists in particular,can gain these skills through other pathways. The credential can be awarded based on evidence of skills gained elsewhere, and radiologists who have gained competence may choose to gain the credential through recognition of evidence collected, or to practise without the credential.

1.2 Need for the credential

The main drivers for the creation of this credential are:

- unequivocal evidence of the efficacy of MT for patients with acute ischaemic stroke and large artery anterior circulation occlusion[1];
- evident and projected human resource shortfall within INR services[2] with inability to meet 24/7 service need for MT in the foreseeable future which would be associated with worse patient outcomes and avoidable disability; and
- the inclusion of mechanical thrombectomy in the NHS's Long-term Plan which aims to expand access to MT from 1% to 10% of stroke patients and specifically mentions the development of the credential as a way of increasing the workforce[3].

The only doctors trained, as part of their specialty training, to provide a MT service are those who have trained in interventional neuroradiology and the number of practising INRs in the UK is appreciably short of what will be required. There is therefore an urgent need to train clinicians from a variety of backgrounds to perform MT to ensure comprehensive and safe delivery of a MT service for patients suffering from acute ischaemic stroke.

This credential has been developed by the RCR through multidisciplinary discussions with all interested specialty groups including clinical (diagnostic) radiologists, interventional radiologists, neuroradiologists, interventional neuroradiologists, stroke physicians, neurologists, neurosurgeons and interventional cardiologists including doctors in training from multiple specialties. Lay input was also sought to represent the interests of patients. The work has been supported by NHS England's National Clinical Directors for Stroke and Diagnostics and Imaging. It takes the form of a curriculum detailing the entry requirements, standards and expected outcomes of training, assessment structure and quality assurance processes that will be involved, to enable clinicians from differing backgrounds to achieve the competence required to deliver the service. It aims to meet the GMC's Excellence by Design standards and closely mirrors the structure of the recently redesigned clinical and interventional radiology curricula.

1.3 Scope of practice

Doctors trained in the Credential in Mechanical Thrombectomy for Acute Ischaemic Stroke will be able to evaluate complex imaging, independently diagnose ischaemic stroke and select patients for MT, independently perform MT and any other necessary procedures (angioplasty and or stent flow limiting stenosis) and provide post-treatment imaging support and management of complications. This will include being able to recognise when to refer to a colleague. After training, it is expected that some doctors with the credential will join INR

[1] NHS England Evidence review: Mechanical thrombectomy for acute ischaemic stroke in the anterior cerebral circulation https://www.engage.england.nhs.uk/consultation/clinical-commissioning-consultation-may-2017/user_uploads/mechanical-thrombectomy-evidence-review.pdf

[2] RCR 2022 Workforce Census https://www.rcr.ac.uk/media/qs0jnfmv/rcr-census_clinical-radiology-workforce-census_2022.pdf

[3] NHS England Long Term Plan https://www.longtermplan.nhs.uk/wp-content/uploads/2019/01/nhs-long-term-plan-june-2019.pdf

teams in a neuroscience centre, but some will provide 24/7 services providing MT for acute stroke in non-neuroscience centres.

It is essential that the training process is sufficiently robust to enable credential operators to independently manage the complications that they will encounter in practice, particularly those that are common and those that are potentially catastrophic but remediable; these will be described in the curriculum. Although networked support may well be available, once appointed, unlike neuroscience centre-based practitioners, non-neuroscience centre practitioners will not have immediate on-site support available from experienced INR colleagues. It is recognised that credential holders will not have the full expertise of an INR beyond MT. While those completing the credential will be equivalent to an INR consultant in the delivery of MT their scope of practice will be significantly narrower than that of an INR consultant who will have undergone six years of training in general radiology, neuroradiology and interventional neuroradiology and who will undertake a comprehensive range of other interventional neuroradiological procedures.

1.4 Entry requirements

Service providers and employers will identify potential learners to enter the credential in accordance with the published entry requirements including a person specification. Consideration should be given to training capacity within the department when identifying potential learners. It is expected that doctors undertaking this credential will mostly come from the following specialties: interventional radiology, diagnostic radiology, neurosurgery, stroke medicine, interventional cardiology and neurology as those working in these areas will all have some elements of relevant transferable knowledge or skills which will make them the most likely entrants to training. The knowledge and skills they have from their prior experience and learning will vary but examples include knowledge of neuro anatomy and pathology, catheter skills derived from practice in other body systems and clinical management of patients with both haemorrhagic and ischaemic stroke. It is feasible that clinicians from other specialties may be able to demonstrate the necessary experience and skill to meet the entry requirements, and flexibility will be needed to recognise relevant skills and adjust training time as required.

Upon entry to the credential training programme doctors will be required to undertake a skills gap analysis to determine their existing level of competence across the breadth of the curriculum, and to identify the capabilities that need to be improved or developed to allow safe independent MT practice. This process will be overseen by a multi-specialty gap analysis committee that will ensure the same standards are applied to all learners entering the programme. The committee may provide an estimate of the likely additional skills and capabilities required to complete the credential for that individual to assist job planning for the learner and the sponsoring institution.

Doctors undertaking the credential will be able to begin the training either during their specialty training or post-CCT or CESR. For those entering the credential after completion of specialty training, it would be mandatory for them to be on the Specialist Register.

If undertaking the credential during specialty training, trainees from non-radiology specialties or from clinical diagnostic radiology would begin training in the credential as a period of out of programme training. It would be mandatory for specialty trainees following this route to complete training in their parent specialty and be awarded a CCT/CESR prior to, and in addition to, satisfactory attainment of the credential outcomes.

1.5 Capabilities in practice (CiPs)

The overall outcome of training in this credential is to be able to diagnose and select patients for MT, perform this and any other necessary related procedures and provide post-treatment imaging support and management of complications. Those following the credential are expected to achieve the following high level CiPs:

1. Appropriately select, tailor and report required neuroimaging investigations for each patient, accurately diagnose the clinical and imaging findings and arrange interventional neuroendovascular treatment as/when appropriate/indicated.
2. Independently plan and perform all required components of the MT procedure competently and safely and perform vessel angioplasty/stent if required to maintain the circulation.
3. Recognise and manage the complications of the MT procedure, particularly those that are common or potentially catastrophic but remediable, understanding when and who to seek advice from in complex situations.
4. Contribute to clinical ward-based and outpatient management of MT patients.

1.6 Delivery of training, assessment, and progression

The credential is outcomes-based, and learners will enter training with different experience and skills and will progress at different rates. This will depend on a variety of factors such as the extent of existing neuro-clinical, diagnostic radiology or catheter skills, the volume and complexity of the cases they are exposed to and the individual's ability to assimilate and demonstrate the capabilities acquired. The skill level required to practise is defined along with the necessary competencies.

Acquisition of diagnostic competencies for associated neuroimaging techniques (reporting CT and MRI studies) will be a key step in the training process for clinicians from a non-radiology background. Advanced imaging techniques are used to diagnose and classify stroke patients, identify their suitability for treatment with MT and to help identify and manage complications. There is global consensus that operators providing a MT service should take responsibility for patient selection as well as treatment.

Training will be workplace-based and will progress from obtaining the diagnostic competencies to learning the practical skills. Most of the training, both diagnostic and procedural, is expected to take place in neuroscience centres. However, there may be some circumstances where elements of training are delivered outside a neuroscience centre, for example where there is a hub and spoke delivery model and a suitably skilled trainer is available in a primary stroke centre, or where two or more suitably experienced operators are available to train in a MT-only centre. The diagnostic training can be supplemented by existing online learning programmes, such as e-Learning for Healthcare's Radiology-Integrated Training Initiative (R-ITI) and would continue alongside the procedural training.

The assessment framework will necessitate close supervision by consultant neuroradiologists and interventional neuroradiologists, workplace-based assessments and regular reviews followed by a summative assessment of stroke diagnosis and summative procedure-based assessments.

The learner's operative competency will be assessed at the following critical stages:

Level 1: Entrusted to observe only

The supervisor must satisfy themselves that the learner understands the rationale and indication for MT and has knowledge of how the eligibility for MT is assessed/confirmed, how the procedure is undertaken and how complications are identified and managed.

Level 2: Entrusted to act with direct supervision

The learner will be directly supervised as they build their skills in both diagnosis to select patients appropriately and in the delivery of MT. The supervisor must be satisfied that they have acquired sufficient skills before they can progress to the next stage of training.

Level 3: Entrusted to act with indirect/minimal supervision

The learner should be able to lead procedural work with the assistance and support of the supervisor. The supervisor's assessment of their capabilities will inform progression to independent practice.

Level 4: Entrusted to act unsupervised

The time any individual takes to complete the necessary training and become an independent practitioner will vary depending on the prior experience and skills they possess and how they assimilate/develop the range of new skills required.

1.7 Quality assurance

Quality assurance of the training being delivered will be maintained through existing structures. All training will take place in sites that are GMC-approved for radiology and neurointerventional radiology training and will be overseen by trained clinical and educational supervisors.

The Royal College of Radiologists will maintain and support the credential alongside current training in clinical and interventional neuroradiology.

1.8 Key interdependencies

The content of the credential mirrors a significant proportion of the diagnostic neuroradiology content of the *Clinical Radiology Curriculum* and the interventional neuroradiology strand within the *Interventional Radiology Sub-Specialty Curriculum*.

1.9 Arrangements for consultant interventional radiologists

Interventional radiology consultants not currently specialising in neurointervention represent the clinical group with the most relevant existing skills to help in the delivery of MT. These clinicians already have many of the skills covered in this credential and may therefore be expected to acquire the necessary competencies to deliver MT in a shorter timeframe. Guidance was published in 2017 with a view to increase operator numbers. Consultant interventional radiologists wishing to train to deliver MT should refer to the "RCR, BSNR, UKNG, BSIR Supplementary guidance to facilitate the training of interventional radiology consultants to undertake stroke thrombectomy".

While the credential will be key to training non-interventional radiologists in mechanical thrombectomy, it is only one route to training mechanical thrombectomy operators. Radiologists in particular, can gain these skills through other pathways. Skills obtained elsewhere may contribute to the learning outcomes of the credential, and radiologists who have gained competence may choose to gain the credential through recognition of evidence collected, or to practise without the credential.

1.10 Enrolment with The Royal College of Radiologists

Learners are required to enrol with the RCR prior to commencement of their training, in order for the RCR to be able to recognise completion of their training in the credential. Following enrolment, learners will be given access to an e-portfolio account.

2 Structure of training

2.1 Length of training

The credential is outcomes-based, and learners will enter training with different experience and skills, will progress at different rates and therefore will take different lengths of time to complete. This will depend on a variety of factors such as the extent of existing neuro-clinical, diagnostic radiology or catheter skills, the volume and complexity of the cases they are exposed to and the individual's ability to assimilate and demonstrate the capabilities acquired.

Length of training will also depend on whether the learner is undertaking the credential full time (i.e., completely out of their parent specialty and full time in the credential training) or less than full-time (i.e., in coordination with the parent specialty). The latter is the more likely scenario and the RCR would recommend that learners continue to spend an indicative 30% of their time in their parent specialty to ensure no skill decay.

Training in the full scope of INR practice takes an indicative 3 years, but many of the skills that INRs have acquired are developed in the core radiology training years which many credential learners will not have experienced. Although there may be some areas where the learner will have relevant prior knowledge or experience and the scope of the credential is significantly narrower than full INR special interest training, individuals may expect to take an indicative 12 – 36 months to gain expertise and competence in diagnosing and treating acute neurovascular conditions as described in the curriculum.

2.2 Previous experience and impact on training time

It is expected that a newly appointed learner will undergo an initial capability assessment to match training to their learning needs. These will differ according to each learner's previous experience, but the following key criteria will apply:

- The indicative period of training is whole-time equivalent. The nature of the diagnostic and neurointerventional skills required to perform MT, coupled with the need to ensure patient safety in a high-risk area means it is unlikely any individual will complete training in less than two years.
- Entry to the credential will be possible during specialty training either as an out-of-programme period of training or training less than full-time alongside training in the parent specialty. The credential cannot, however, be awarded until the learner has achieved CCT/CESR in their parent specialty.

- The Neurosurgery Specialty Advisory Committee has agreed that the credential can be treated as an area of special interest. Therefore, exact arrangements may differ slightly for neurosurgery trainees, but CCT/CESR will still be required before the credential can be awarded.

2.3 Location of training

Most of the training, both diagnostic and procedural, is expected to take place in neuroscience centres where there are suitable educational facilities for both learners and educators. This will include adequate access to appropriate diagnostic and interventional neuroradiology cases, space, IT/PACS facilities and relevant learning resources including e-learning. Some learners may also need to attend centres where there are facilities for simulation training. However, there may be some circumstances where elements of training (e.g. diagnostic neuroradiology) are delivered outside a neuroscience centre, for example where there is a hub and spoke delivery model and a suitably skilled trainer is available in a primary stroke centre (In England Comprehensive Stroke Centre) or where two or more suitably experienced operators are available to train in a MT-only centre (In England a MT Capable Acute Stroke Centre).

In addition to training in neuroradiology and interventional neuroradiology learners will be encouraged to be involved in activities including radiology events and learning meetings (REALMs), quality improvement (QI), improving evidence-based practice (EBP) and research and innovation (R&I). They should also engage in supported reflective practice, applying learning from both positive and negative experiences and outcomes.

2.4 Diagnostic training

Initially learners should undertake a period of training in diagnostic neurovascular imaging, primarily aimed at interpretation of CT/CT Angiography (CTA), MR/MR Angiography (MRA) with further education in advanced imaging such as CT Perfusion and MR Perfusion (see content of learning) undertaken during the later stages of the credential.

Learners will be required to gain experience equivalent to that of those training in clinical radiology with a special interest in neuroradiology, and in a neuroscience centre they will have access to a greater volume of more complex imaging than in a district general hospital. It will also provide access to tertiary centre multi-disciplinary team meetings (MDTs), radiology events and learning meetings (REALMS) and morbidity & mortality (M&M) meetings.

Diagnostic training should primarily focus on neurovascular cases but will need to cover a range of pathologies in order to gain an understanding of normal variants, stroke mimics and causes of intracranial haemorrhage.

The degree of training in diagnostic imaging that is required will vary between each learner depending on their background. For example, those from a neurosurgical/neurology background will have experience of reviewing but not reporting imaging; radiologists will already possess core diagnostic and neuroradiology competencies and be competent in issuing reports; those from an interventional cardiology or vascular surgery background may be new to both.

CT and MR anatomy and pathology training can be partly delivered online as blended learning using self-directed learning/e-learning modules on e-Brain/R-ITI followed by

appropriate workplace-based assessment of core interpretation. Learners will be encouraged to attend relevant courses as recommended by trainers. Online learning such as this will not be undertaken in isolation, but rather will take place alongside the procedural training. Knowledge of relevant radiological anatomy, pathology and the physics as it pertains to each individual imaging modality should be incorporated into procedural training and be included in the workplace-based assessments. This should also include the understanding of Ionising Radiation (Medical Exposure) Regulations [IR(ME)R] and how they apply to practitioners.

Boot-camp imaging courses, one for core imaging techniques and one for advanced, with an assessment at the end of each course are a useful method of delivering training and attendance at such courses should be strongly encouraged by trainers.

2.5 Interventional training

For intracranial procedures learners will ideally be trained in an accredited neuroscience centre (See section 2.3 for examples of where this may not be the case.) performing a significant volume of intracranial procedures, e.g. no less than 40 intracranial procedures per consultant INR per year (as per NHS England Service Specification for Neurointerventional Services for Acute Ischaemic and Haemorrhagic Stroke). At least two consultant INRs should be involved in their training. Depending on local contract arrangements and training capacity, in a region where there is more than one neuroscience centre, the learner may gain experience at additional centres.

Learners should expect to undertake a proportion of training opportunities outside 'normal working hours' in order to gain exposure to an appropriate number of cases in neuroradiology and interventional neuroradiology.

Clinical simulation is a proven method of training that can be used for formative assessments/assessing competency and learners should have access where possible and be encouraged to use it, especially in the early stages of training. It is not however a replacement for hands-on clinical experience, clinical supervision and WPBAs.

In the second phase of interventional training the learner (from any background) should participate in an INR on-call rota to maximise exposure to learning opportunities.

2.6 Generic professional capabilities and good medical practice

The GMC has developed the generic professional capabilities (GPC) framework[4] with the Academy of Medical Royal Colleges (AoMRC) to describe the fundamental, career-long, generic capabilities required of every doctor. The framework describes the requirement to develop and maintain key professional values and behaviours, knowledge, and skills, using a common language. GPCs also represent a system-wide, regulatory response to the most common concerns about patient safety and fitness to practise within the medical profession. The framework will be relevant at all stages of medical education, training, and practice.

Good medical practice (GMP)[5] is embedded at the heart of the GPC framework. In describing the principles, duties and responsibilities of doctors, the GPC framework

[4] Generic professional capabilities framework. May 2017.

[5] Good medical practice. April 2014.

articulates GMP as a series of achievable educational outcomes to enable curriculum design and assessment.

The GPC framework describes nine domains with associated descriptors outlining the 'minimum common regulatory requirement' of performance and professional behaviour for those completing a CCT or its equivalent. Although not leading to the award of a CCT, this curriculum defines an expectation that credential learners will meet a similar standard.

Figure 1: The nine domains of Generic Professional Capabilities

The nine domains and subsections of the GPC framework are directly identifiable in the credential's content of learning. They are mapped to each of the credential CiPs, which are in turn mapped to the assessment blueprints. This is to emphasise that they must be demonstrated at every stage of training as part of the holistic development of responsible professionals.

This approach will allow early detection of issues most likely to be associated with fitness to practise and to minimise the possibility that any deficit is identified during the final phases of training.

3 Content of learning

The practice of interventional neuroradiology (INR) requires the generic and speciality knowledge, skills and aptitudes to diagnose and treat vascular conditions affecting the brain, the spinal cord, the head, neck and the spine. Interventional neuroradiologists are essential for the provision of life-saving treatments such as intracranial aneurysm treatment for sub-arachnoid haemorrhage (which has largely replaced more invasive neurosurgical operations) and mechanical thrombectomy for large vessel occlusion (a key milestone in the NHS Long Term Plan 2019, p65).

This credential focuses solely on mechanical thrombectomy for the treatment of acute ischaemic stroke and does not cover the wider scope of practice of a fully trained interventional neuroradiologist.

To achieve the Credential in Mechanical Thrombectomy for Acute Ischaemic Stroke the learner will be expected to demonstrate the capabilities described by the Capabilities in Practice (CiPs) outlined in this document. Each CiP has an expansion that provides further explanation of the outcome and a number of descriptors that underpin the CiP.

Each CiP is also mapped to the GMC's Generic Professional Capabilities and accompanied by suggested methods of formative assessment that may support progress towards achieving this CiP.

The descriptors are intended to provide guidance to trainees and trainers about the range of clinical contexts which may support achievement of the CiPs. However, **they are not intended to be prescriptive and do not provide an exhaustive list**. Learners may demonstrate their progress against the CiPs in a variety of different ways, reflecting their strengths and the resources available to them, and should be encouraged to find innovative ways to achieve this. They may also complete activities that provide evidence for more than one CiP.

The level at which learners meet each CiP is stage dependent and is expected to progress in a spiral fashion throughout training. Learners will develop at different rates and may be able to demonstrate a higher level of progress in some CiPs compared to others. The programme of assessment that forms part of this credential outlines the minimum expected levels of achievement at different stages of training. Sign off will require clinical and educational supervisors to make entrustment decisions on the level of supervision required for each CiP or underlying activity at each stage. More detail is provided in the programme of assessment section of the credential.

3.1 Capabilities in Practice

CIP 1: Appropriately select, tailor and report required neuroimaging investigations for each patient, accurately diagnose the clinical and imaging findings and arrange interventional neuroendovascular treatment as/when appropriate/indicated.

Expansion

Credential holders will discuss and advise on emergency imaging in patients with acute stroke. They will be able to interpret emergency neuroradiological imaging and provide accurate and actionable imaging reports which may recommend further imaging or clinical/interventional management. Credential holders will work closely with diagnostic and interventional neuroradiologists as part of a team and will contribute to MDT meetings and discussions.

Descriptors

- Understand the pathogenesis and natural history of neurovascular and other neurological conditions (See Table 1)
- Be aware of relevant clinical research and its application to evidence-based decision making

- Appropriately select and tailor imaging to patient context and the clinical question(s)
- Identify when further imaging is likely or unlikely to be beneficial
- Evaluate image quality and provide timely, accurate and clinically useful reports on imaging studies that help to direct patient care
- Integrate clinical and radiological information to plan and prioritise appropriate interventional procedures
- Contribute to a multidisciplinary team meeting (MDT)
- Appropriately manage imaging examination lists/procedures according to clinical need and professional expertise

Suggested evidence

- Multi-source feedback (MSF)
- Mini-Image Interpretation Exercise (Mini-IPX)
- Case-based Discussion (CBD)
- Multi-disciplinary Team Assessment (MDTA)
- Multiple Consultant Report (MCR)
- Logbook

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional skills
    - Practical skills
    - Communication and interpersonal skills
    - Dealing with complexity and uncertainty
    - Clinical skills: diagnosis and medical management; prescribing medicines safely; using medical devices safely
- Domain 3: Professional knowledge
    - Professional requirements
    - National legislative requirements
- Domain 4: Capabilities in health promotion and illness prevention
- Domain 5: Capabilities in leadership and team working
- Domain 6: Capabilities in patient safety and quality improvement
    - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups

CIP 2: Independently plan and perform all required components of the MT procedure competently and safely and perform vessel angioplasty/stent if required to maintain the circulation.

Expansion

Credential holders will have learnt advanced technical skills to be able to safely perform these emergency procedures and will actively maintain these skills.

Descriptors

- Assess capacity, obtain patient consent and care for vulnerable patients appropriately
- Lead the neurovascular team in radiology theatres and ensure periprocedural patient safety (WHO check, operative plan etc**.**)
- Gain vascular access using US guidance and manage complications related to arterial access and arterial closure devices
- Safeguard patients, member of staff and members of the public, including vulnerable groups, and act in accordance with current safety guidelines and legislation in respect of ionising radiation and other imaging techniques/equipment
- Perform diagnostic cervical vessel and cerebral angiography efficiently and safely, tailoring the examination according to anatomical, clinical and time requirements, minimising patient radiation dose (As Low As is Reasonably Achievable [ALARA]), and complying with IR(ME)R guidance
- Perform mechanical thrombectomy and cervical vessel angioplasty / stenting (if required) for patients with acute stroke due to vessel occlusion, where clinically appropriate
- Understand procedural adaptations required to account for anatomical or pathological variation and recognise procedural choices that are associated with risk
- Understand medical device performance, limitations and failure modes
- Generate accurate and comprehensible procedural records and tailor post-procedural management advice to patient needs
- Contribute effectively to decision making about patient management in a shared care environment (all inpatient settings – ward, High Dependency Unit (HDU), Adult Intensive Care Unit [AICU])
- Comply with personal, trust/health board and commissioning obligations to participate in local and national audit (particularly Sentinel Stroke National Audit Programme [SSNAP])
- Ensure that procedural workload is sufficient to maintain competencies and comply with guidance

Suggested evidence

- MSF

- Mini-IPX
- Radiology Directly Observed Procedures (Rad-DOPS)
- Procedure Based Assessment (PBA)
- CBD
- MDTA
- MCR
- Logbook
- Patient feedback

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional skills
  - Practical skills
  - Communication and interpersonal skills
  - Clinical skills: History taking, diagnosis and medical management; consent; humane interventions; prescribing medicines safely; using medical devices safely; infection control.
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 5: Capabilities in leadership and team working
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups
- Domain 9: Capabilities in research and scholarship

CIP 3: Recognise and manage the complications of the MT procedure, particularly those that are common or potentially catastrophic but remediable, understanding when and who to seek advice from in complex situations

Expansion

Credential holders are able to identify the clinical and radiological features of procedure related complications and manage these complications to provide optimal and safe patient care. They will seek advice particularly when complications are beyond their scope of practice and experience.

Descriptors

- Understand the procedural complications that may be encountered during mechanical thrombectomy
- Maintain procedural vigilance and continually modify technique to optimise benefit/minimise risk during a procedure
- Understand the likely clinical outcome, the therapeutic options and their relative risks when a procedural complication is encountered
- Recognise technical and performance limitations as operator and anticipate need for assistance
- Foster systems of work that facilitate timely advice and support from colleagues (INR, neurosurgery, anaesthetics, intensive care, neurologists and stroke physicians) for all operators, but particularly less experienced practitioners, or operators working in remote centres
- Communicate openly and honestly with the patient, family and colleagues to meet obligations under duty of candour and local or national clinical governance requirement
- Contribute to local audit, M&M and service improvement activity and to use relevant national reporting processes (such as the yellow card system) where necessary

Suggested evidence

- MSF
- Rad-DOPS
- PBA
- CBD
- MDTA
- MCR
- Patient feedback

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional skills
  - Practical skills
  - Dealing with complexity and uncertainty
  - Clinical skills: diagnosis and medical management; consent; humane interventions; prescribing medicines safely; using medical devices safely; infection control
- Domain 3: Professional knowledge
  - Professional requirements

- Domain 4: Capabilities in health promotion and illness prevention
- Domain 5: Capabilities in leadership and team working
- Domain 6: Capabilities in patient safety and quality improvement
- Domain 7: Capabilities in safeguarding vulnerable groups

CIP 4: Contribute to clinical ward-based and outpatient management of MT patients

Expansion

Credential holders retain some clinical responsibility for all patients undergoing MT until the patient is discharged from in-patient care. They will work in conjunction with the clinical and interventional neuroradiology team and the stroke team.

Descriptors

- Communicate complex information using terms that patients understand
- Assess patient's needs and facilitate the patient to make informed decisions
- Complete a rapid patient assessment and competent examination of the nervous system
- Demonstrate knowledge of ward-based care of patients with neurovascular diseases
- Demonstrate knowledge of management pathways and ward policies
- Communicate clearly with allied professional teams to optimise patient management
- Contribute to ward rounds and direct appropriate patient management
- Identify and manage complications of stroke
- Contribute to outpatient follow-up and assessment of patient outcomes including national audit

Suggested evidence

- MSF
- Mini-IPX
- CBD
- MDTA
- MCR
- Logbook
- Patient feedback

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional skills
  - Practical skills
  - Communication and interpersonal skills
  - Dealing with complexity and uncertainty
  - Clinical skills: History taking, diagnosis and medical management; consent; humane interventions; prescribing medicines safely
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 4: Capabilities in health promotion and illness prevention
- Domain 5: Capabilities in leadership and team working
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups

3.2 Presentations and Conditions

Management of acute stroke in this credential uses a wide range of imaging modalities and techniques to identify, characterise and treat cerebrovascular pathology, focussing mainly on mechanical thrombectomy. Any attempt to comprehensively list all presentations, conditions, imaging modalities and interventional techniques would be extensive, but inevitably incomplete, and would rapidly become out of date. Our approach is to provide general guidance and not exhaustive detail. Tables 1-4 outline the key clinical and radiological presentations and conditions presenting to credential learners for imaging and management, and the key practical procedures that learners are expected to have experienced. These tables are **not** comprehensive; they must be viewed as a guide and interpreted with common sense.

As a guide it is expected that learners will:

1. be familiar with the normal anatomy, physiology and pathology relevant to the credential
2. develop knowledge of the imaging findings and INR management strategies of the pathological processes that may be associated with acute stroke such as:
   - genetic / congenital / developmental conditions
   - trauma
   - infection
   - inflammatory
   - neoplasia
   - connective tissue disorders
   - autoimmune disorders

- neurological / nerve related disorders
- vascular pathology
- haematological diseases
- endocrine diseases
- degenerative diseases
- metabolic disorders
- iatrogenic diseases
- pregnancy associated conditions
- drugs side effects / interactions and complications

3. develop an appropriate imaging and clinical/INR management strategy for the above processes

4. understand the role and implications of pharmacological management in the above processes relevant to INR

5. develop clinical and communication skills to enable appropriate clinical management of the stroke patient

6. understand and use the principles of capacity and informed consent

Table 1: Presentations and conditions

Develop an appropriate imaging and clinical strategy for the following CLINICAL presentations	Analyse and develop an appropriate imaging/clinical strategy for the following RADIOLOGICAL presentations	Implement INR management strategies in the following conditions	Develop skills to the level of independent practise in the use and interpretation of the following diagnostic imaging modalities and techniques
Acute and chronic headache Cerebrovascular syndromes: ▪ stroke ▪ transient ischaemic attack (TIA) ▪ central retinal artery occlusion (CRAO) Head Injury Seizure Space occupying lesion/raised intracranial pressure	**1. Mass lesions** *Location, architecture, enhancement pattern, diffusion weighted imaging (DWI), principles of assessment of mass effect* **2. Non-traumatic Haemorrhage** *Subarachnoid haemorrhage (SAH)*: distribution, interpretation relative to time of ictus, use of additional imaging modalities *Parenchymal haemorrhage:* differential diagnosis (DDx), assessment on MRI, follow-up strategy *Subdural haemorrhage*: causes, further investigations, follow-up *Intraventricular Haemorrhage:* DDx, further imaging and follow up strategy e.g., need for angiography	Subarachnoid haemorrhage Subarachnoid haemorrhage with negative angiography Reversible cerebral vasoconstriction syndrome (RCVS) Acute third nerve palsy TIA Atheromatous stenosis of cervical and intracranial vessels Cervical or intracranial vessel dissection Anterior circulation stroke Posterior circulation stroke	Head CT for all relevant acute emergency conditions including head injury and CTA for suspected stroke Specialist CT & MRI techniques for the neurological conditions listed Cerebral angiography

Deteriorating level of consciousness / coma Acute/chronic focal cranial neuropathy including: ▪ Third nerve palsy ▪ Horner's syndrome ▪ Ophthalmoplegia ▪ Fifth trigeminal nerve (V) palsy	**3. Trauma** Haemorrhage (subdural and extradural) and parenchymal injury patterns, primary and secondary vascular injury. **4. Acute and chronic Ischaemia** Large vessel occlusion on CT/MR, parenchymal ischaemia on CT/MR (use of DWI, susceptibility weighted imaging), collateral flow, perfusion imaging *Vascular imaging*: vasculopathies / vasculitis, stenosis, occlusion syndromes, dissection *Hypoperfusion patterns*: watershed, diffuse hypoxic injury Cerebral amyloid **5. Medical conditions** Patterns of haemorrhage with coagulopathies, venous thrombosis (major sinuses, cavernous sinus, cortical vein), vascular occlusion syndromes (e.g., moya moya), collagen vascular diseases, other inherited vasculopathies (e.g., hereditary haemorrhagic telangiectasia (HHT), cavernoma syndromes)	Dural sinus or cortical vein thrombosis Radiological or clinical vasospasm (delayed ischaemic neurological deficit)	

3.2.1 Potentially catastrophic but remediable complications

There are some complications that occur infrequently which are remediable, but if not recognised or treated rapidly can be catastrophic for the patient. It is therefore important for credential learners to be able to identify and treat these rare complications.

Table 2: Potentially catastrophic but remediable complications

Be able to identify and treat
Iatrogenic vessel dissection, perforation, or occlusion
Coil or device-related thrombus
Malposition, migration or malfunction of a medical device
Management of embolisation to new territory
Diagnosis and management of contrast toxicity

3.2.2 Infrequent but important presentations

Some presentations occur infrequently and are best managed by consultant INRs. Credential learners (who will participate in INR on-call rotas in neuroscience centres) are however expected to be aware of them and to have, at the very least, a basic knowledge of the appropriate imaging and management strategies. They are **not** expected to have the interventional skills to treat these conditions.

Table 3: Infrequent but important presentations

Have a working knowledge of the following:
Severe epistaxis
Carotid blow-out
Penetrating injury of cervical or intracranial vessels
Pharmacological resistant dural venous sinus thrombosis

3.3 Practical Procedures

The table of interventional neuroradiology procedures (Table 4) describes the interventional techniques that a credential learner will be expected to be able to perform independently. The table works from basic preparatory steps (setting up an interventional trolley) through diagnostic angiographic manoeuvres (performing cerebral angiography) to higher-level procedures including aneurysm treatment (for the purposes of training) and mechanical thrombectomy for acute stroke.

The table includes the main interventional neuroradiology techniques that are required to diagnose and treat patients with acute stroke and the operative modifications required to manage the complications that may be associated with treatment of these diseases.

It is important for the credential learner to note that the list provides an overview rather than comprehensive outline of the techniques involved in patient treatment. Treatment approaches are regularly updated to account for expanding clinical evidence and continuous technical development.

The expectation of how learners engage with these procedures (e.g., awareness of, entrusted to perform independently etc.) is stage-dependent. All learners are expected to develop the skill set required to be able to cover an emergency, out of hours rota for stroke treatment and to have an in-depth knowledge of the relevant disease processes, potential treatment options, imaging and interventional skills to enable comprehensive patient care from referral to completion of the patient episode.

Unless stated otherwise, all procedures are for adult patients. Paediatric INR procedures are uncommon and should only be performed by fully trained INRs.

Table 4: Practical procedures for interventional neuroradiology

Perform the following interventional neuroradiology procedures
Access/closure:
Set up interventional trolley and flushes as per training centre protocols
Ultrasound-guided arterial access primarily via common femoral artery, but include radial, brachial, or direct carotid puncture
Use of femoral closure devices
Diagnostic angiography/interventional platform:
Cerebral angiography including use of advanced techniques such as 3D-rotational angiography and cross compression testing
Use of intermediate catheters and navigation of tri-axial catheter systems
Guide catheter exchange using exchange wire
Navigation of microcatheters and microguidewires
Microcatheter exchange using an exchange wire
Balloon test occlusion to assess the circle of Willis

Aneurysm treatment (during training):

Coil an intracranial aneurysm with appropriate use of additional techniques (balloon or stent assistance) when necessary

Treat an aneurysm using a flow-diverting stent or intra-saccular device, where supported by MDT discussion

Cervical vessel stenting or sacrifice for arterial dissection, vessel trauma or blow-out

Chemical or balloon angioplasty for cerebral vasospasm

Acute ischaemic stroke treatment:

Mechanical thrombectomy for acute ischaemic stroke using a long sheath/balloon guide catheter, a stentretriever and/or a clot aspiration technique

Cervical (or far less commonly intracranial) vessel angioplasty and stenting for atheromatous stenosis

Intra-arterial thrombolysis for acute ischaemic stroke

Managing complications:

Treat device-related arterial thrombus

Secure or retrieve a misplaced or faulty device

Rapidly and precisely occlude a bleeding pial artery

4 Teaching and learning methods

Responsibility for delivering the training needed to meet the credential requirements rests with the employers. The GMC's Promoting Excellence standards set out requirements for the management and delivery of postgraduate medical education and training and these should apply equally for this credential. The Gold Guide provides further guidance on the management and expectations of training, although not all of its rules will apply to credential learners.

Training is expected to mainly take place in accredited neuroscience centres which are already approved by the GMC as training locations for interventional neuroradiology. Therefore, educational and clinical supervision should be provided within existing structures.

Progression through the credential programme will be determined by annual (or more frequent) reviews of progression (see section 5.7) and the training requirements for each indicative year of training are summarised in the progression grids (see sections 5.4). The successful completion of the credential will be dependent on achieving the expected level in all CiPs and procedural skills. The programme of assessment will be used to monitor and determine progress through the programme.

The sequence of training should ensure appropriate progression in experience and responsibility and that, during the programme, the entire syllabus is covered, and unnecessary duplication and educationally unrewarding experiences are avoided.

The curriculum will be delivered through a variety of learning experiences and will allow learners to achieve the capabilities described through a variety of learning methods. There will be a balance of different modes of learning from formal courses to experiential learning 'on the job'. The proportion of time allocated to different learning methods may vary depending on the previous experience of the learner and the differing resources and structures of each training centre. Training should be constructed to enable learners to experience the full range of educational and training opportunities available and there will be robust arrangements for quality assurance in place to ensure consistent implementation of the curriculum.

This section identifies the types of situations in which a trainee will learn.

4.1 Work-based experiential learning

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

- Credential attachments with gradual reduction in supervision according to increasing capability as judged by trainers (apprenticeship model). A major component of training is achieved by the apprenticeship system with the learner undertaking an increasing number of diagnostic and interventional radiological tasks.
- Multidisciplinary team meetings: These interdisciplinary meetings provide excellent learning opportunities.
- Out-of-hours and emergency provision: On-call work should be a positive learning opportunity, and this requires appropriate levels of supervision by the consultant on-call with learners.

The degree of responsibility undertaken by the learner will increase as competency increases. There should be appropriate levels of supervision throughout training with increasing independence and responsibility as capabilities are achieved.

4.2 Optional work-based experiential learning

Time spent within other clinical teams to more fully understand clinical aspects of their work either as a clinical attachment or paired with an appropriate clinician to engage in co-learning, as agreed with clinical supervisors (e.g., a learner with a background in cardiology would benefit from time spent with stroke physicians).

4.3 Formal teaching

Formal teaching can take a variety of forms and **may** include:

- A programme of formal, regular teaching sessions to cohorts of learners
- Case presentations
- Journal clubs
- Research and audit projects
- Lectures and small group teaching
- Grand Rounds
- Radiological skills demonstrations and teaching
- Joint meetings with clinical specialties

- e-Learning programmes such as R-ITI and e-Brain
- Simulation
- Attendance at boot camp style courses

4.4 Independent self-directed learning

Learners will use this time in a variety of ways depending upon their stage of learning. Suggested activities include:

- Reading, including journals and web-based material
- Maintenance of personal portfolio (self-assessment, reflective learning, personal development plan, logbook)
- Audit, quality improvement and research projects
- Achieving personal learning goals beyond normal expectation

4.5 Formal study courses

Time should be made available for attendance at formal courses. Such courses may involve the use of simulation in a boot camp style.

4.6 Learning experiences

The delivery of the credential curriculum and assessments should enable learners to meet the capabilities required, cognisant of the training requirements for core radiology, special interest neuroradiology and sub-specialty interventional neuroradiology trainees as well as interventional radiology consultants undergoing training in mechanical thrombectomy.

Placement providers should shape delivery of the credential curriculum and assessments to ensure they are responsive to changes in treatments, technologies and care delivery models.

Providers should proactively engage patients, service users and learners in the development and delivery of education and training to embed the ethos of patient partnership within the learning environment.

Clinical and educational supervisors are encouraged to identify learner-centred educational opportunities in the course of clinical work, maximising the wide variety of learning opportunities in the interventional neuroradiology workplace. These may include:

- Learning from practice: Learners will spend a large proportion of work-based experiential learning involved in supervised practice in the diagnostic and interventional neuroradiology setting. Learning will involve closely supervised practice until competencies are achieved. The learning environment will be in all areas of the neuroscience centre.
- Learning with peers: There are many opportunities for learners to learn with and from their peers.
- Learning in formal situations: There are many opportunities for formal teaching in the diagnostic and interventional radiology setting in which credential learners will be based, and at regional, national and international meetings.
- Personal study: Time should be provided during training for personal study.

- Specific teacher inputs: Individual centres where the credential is being delivered will identify where specific teacher inputs can be provided. These will vary from centre to centre. Examples include:
    - Each learner having a dedicated supervisor for each attachment for work-based experiential teaching
    - Specific teaching in a related environment (e.g., stroke medicine) from a recognised specialist
    - Structured teaching sessions

4.7 Simulation

Simulation is recognised as a useful tool to supplement training in clinical situations. It provides experiential learning and an opportunity to reflect on and learn from mistakes in a safe environment.

A number of different types of simulation are available, which vary considerably in technological complexity, cost and availability. There are many scenarios in interventional neuroradiology where simulation can play a useful role in supporting delivery of this credential and each centre delivering the training is encouraged to incorporate these techniques wherever possible.

4.8 Quality improvement

It is expected that credential learners will be undertaking audit and/or quality improvement projects in their parent specialty and, if pre-CCT, that they will be undergoing assessment of those activities. Assessment of audit or quality improvement projects is therefore not included in the credential programme. Credential learners are however expected to participate in audit or quality improvement activities that are taking place within the department where they are training.

5 Programme of assessment

5.1 Purpose of assessment

The programme of assessment refers to the integrated framework of assessments in the workplace and judgements made about a learner during their training. The purpose of the programme of assessment is to robustly evidence, ensure and clearly communicate the expected levels of performance and to demonstrate satisfactory completion of training as required by the curriculum. In order to achieve this, the programme of assessment aims to:

- enhance learning by providing formative assessment, enabling learners to receive immediate feedback, understand their own performance and identify areas for development
- drive learning and enhance the training process by making it clear what is required of learners and motivating them to ensure they receive suitable training and experience
- ensure that learners possess the essential underlying knowledge required
- assess learners' actual performance in the workplace
- demonstrate that learners meet the requirements of GMP

- provide robust, summative evidence that learners are meeting the curriculum standards during the credential programme
- inform the annual review, identifying any requirements for targeted or additional training where necessary and facilitating decisions regarding progression through the credential
- recognise and acknowledge the potential for excellence and where learners are performing over and above expectations for their stage of training

Accountable, professional judgment is central to ensuring that learners have demonstrated the CiPs and met the expected levels of performance set out in the curriculum. The programme of assessment details how professional judgements are used and collated to support decisions on progression and satisfactory completion of training.

5.2 Programme of assessment

The credential is designed to meet the requirements of the GMC Framework for Excellence document:

- The programme of assessment is valid, fair, acceptable, feasible and effective. It supports assessors to make reliable judgements and is blueprinted to the curriculum.
- It has a positive educational impact, and the assessment burden is proportionate.
- The programme of assessment discriminates effectively between different levels of performance and includes critical progression points including completion of training.
- The programme of assessment incorporates summative assessments in the form of procedure-based assessments which allow learners to demonstrate they have met the learning outcomes in the curriculum.
- The programme of assessment provides principles to inform the management of learners who have not met the required learning outcomes at critical progression points.
- The programme of assessment offers opportunities for formative assessment and feedback to support learning, linked to learning outcomes.

The programme of assessment is comprised of several different individual types of assessment. Assessment will take place throughout the credential programme to allow learners to continually gather evidence of learning and to receive the formative feedback essential to improving clinical practice. Continuous review and assessment are a fundamental part of training. Learners are expected to demonstrate improvement and progression during each stage of training. It is important that they arrange and undertake assessments in a timely and educationally appropriate manner spread throughout the year. All assessments are linked to the relevant CiPs (e.g., through the blueprinting of assessment system to the CiPs).

A range of assessments, based on the judgement of multiple assessors, on multiple occasions, are needed to generate the necessary evidence required for global judgements to be made about satisfactory performance, progression in, and completion of, the credential. The educational supervisor will ensure that there is a local faculty of trainers capable of building a balanced judgement of a learner’s performance supported by workplace-based assessments. Such an approach will prevent any individual having undue influence regarding a learner’s progression.

Learners have a personal responsibility to undertake self-assessment as an integral part of their professional life. It is good educational practice for this to be stated clearly and discussed fully during induction.

5.3 Critical progression points

A critical progression point is a point in a curriculum where a learner transitions to higher levels of professional responsibility or enters a new or specialist area of practice, including successful completion of training. These transitions are often associated with an increase in potential risk to patients or those in training, so they need to be carefully managed and decisions to progress need to be based on robust evidence of satisfactory performance.

There are two critical progression points in this credential. Table 7 outlines the level at which learners will be expected to demonstrate competency in key procedures in order to pass these critical progression points, in addition to achievement of the CiPs as appropriate for their stage of training (see Table 6).

Learners undertaking the credential will be entering training with different skills and knowledge and some may not have the visuospatial abilities or manual dexterity required to safely deliver MT. Therefore, learners must pass a critical progression point at the end of the first indicative year of training in the credential before they are able to continue training. Adequate progression, detailed in progression grids, will be required in both diagnostic and interventional aspects of the credential.

The second critical progression point will mark the end of training and award of the credential. Learners are required to reach the levels described in the progression grids by completion of training.

5.4 Assessment of CiPs and practical procedures

Assessment of the CiPs involves looking across a range of key skills and evidence of progress to make an overall judgement about a learner's achievement of the CiPs in the context of their clinical practice at the current stage of training. This will be informed by the professional judgement of the trainer and take account of workplace-based assessments, supervisors' reports and the learner's own self-assessment. Assessment of the CiPs, or aspects of the CiPs, should take place throughout training and include formative feedback to the learner on their performance.

A clear scale, shown in Table 5, will be used to assess the CiPs, reflecting the need for supervisors to make entrustment decisions about the ability of learners to take on the particular responsibilities or tasks described in the CiPs, and the level of supervision that they require, as appropriate to their stage of training. The same scale is also used to assess the learner's progress in acquiring the skills needed to perform the practical procedures listed in Table 4.

Table 5: Level descriptors for the CiPs and practical procedures

Level	Descriptors	
1	Entrusted to observe only	no provision of clinical care
2	Entrusted to act with direct supervision	the supervising doctor is physically within the reporting room/IR suite and is immediately available to provide direct supervision
3	Entrusted to act with indirect/minimal supervision	the supervising doctor is not physically present within the reporting room/IR suite but is on hand in the department, is immediately available to provide advice and can attend physically if required to provide direct supervision
4	Entrusted to act unsupervised	the learner is working independently and at a level equivalent to a consultant

Tables 6 and 7 show the **minimum** expected progress against the CiPs and practical procedures for each stage of training.

Due to inherent practice risks, it will be rare for credential learners to work without supervision, even in later stages of learning. This is also the case for INR sub-specialty trainees. Some conditions and procedures are rare, and it takes more than the three years of full sub-specialty exposure to build the necessary skills and experience. INR procedures are normally carried out by supportive teams that allow continued development post-credential qualification.

In practice this means that a new INR consultant or credential holder will usually not join the on-call rota from day 1, instead joining after a few weeks or months depending on how they progress in both experience and confidence. When they do join the rota, it would be with an agreed mechanism enabling the provision of experienced INR cover to be accessible. This may include being available to attend in person to assist cases out of hours as well as reviewing the relevant imaging and/or discussing decision making in advance of a case.

For this reason, by the end of the credential, learners are only expected to reach level 3 in some of the CiPs and procedures listed in Tables 6 and 7. This mirrors the GMC-approved IR sub-specialty training curriculum.

Table 6: Progression grid for credential CiPs

CiP	Stage 1	Critical progression point	Stage 2	Stage 3	Award of credential
1. Appropriately select, tailor and report required neuroimaging investigations for each patient, accurately diagnose the clinical and imaging findings and arrange interventional neuroendovascular treatment as/when appropriate/indicated	2		3	4	
2. Independently plan and perform all required components of the MT procedure competently and safely, and perform vessel angioplasty/stent if required to maintain the circulation	1		2	3	
3. Recognise and manage the complications of the MT procedure, particularly those that are common or potentially catastrophic but remediable, understanding when and who to seek advice from in complex situations	2		3	3	
4. Contribute to clinical ward-based and outpatient management of MT patients	2		3	4	

Table 7: Progression grid for practical procedures

Procedures	Stage 1	Critical progression point	Stage 2	Stage 3	Award of credential
Access/closure:					
Set up interventional trolley and flushes as per training centre protocols	3		4	4	
US-guided arterial access primarily via common femoral artery, but include radial, brachial, or direct carotid puncture	3		4	4	
Use of femoral closure devices	4		4	4	
Diagnostic angiography/interventional platform:					
Cerebral angiography including use of advanced techniques such as 3D-rotational angiography and cross compression testing	2		4	4	
Use of intermediate catheters and navigation of tri-axial catheter systems	2		3	4	
Guide catheter exchange using exchange wire	2		3	4	
Navigation of microcatheters and microguidewires	2		3	4	
Microcatheter exchange using an exchange wire	2		3	4	
Balloon test occlusion to assess the circle of Willis	2		3	4	
Aneurysm treatment (for training purposes)**:**					
Coil an intracranial aneurysm with appropriate use of additional techniques (balloon or stent assistance) when necessary	2		3	3	
Treat an aneurysm using a flow-diverting stent or intra-saccular device, where supported by MDT discussion	1		2	3	
Chemical or balloon angioplasty for cerebral vasospasm	2		3	4	

Cervical vessel stenting or sacrifice for arterial dissection, vessel trauma or blow-out	2		3	4
Acute ischaemic stroke treatment:				
Mechanical thrombectomy for acute ischaemic stroke using a long sheath/balloon guide catheter, a stentriever and/or a clot aspiration technique	2		3	3
Cervical (or far less commonly intracranial) vessel angioplasty and stenting for atheromatous stenosis	2		3	3
Intra-arterial thrombolysis for acute ischaemic stroke	2		3	4
Managing complications:				
Treat device-related arterial thrombus	2		3	4
Secure or retrieve a misplaced or faulty device	2		3	3
Rapidly and precisely occlude a bleeding pial artery	2		3	3

5.5 Reflection

The RCR's e-portfolio contains a number of documents to support reflection, including blank reflection forms and templates that provide prompts for different types of reflection. Learners may set any reflections recorded in the e-portfolio to private so that they can only be viewed by the learner or make them available to their supervisors on their timeline. Further guidance on effective reflection is available on the GMC website.

Learners are also required to keep logbooks of practical procedures to document the skills and experience attained and to facilitate reflective learning. See section 5.6.5 for details of the logbook requirements.

5.6 Evidence of progress

Practice will be assessed using an integrated package of formative workplace-based assessments (WPBAs). The assessments are supported by structured feedback and are fit for purpose, having undergone evaluation in terms of their feasibility, reliability, validity and reproducibility in relation to specialty training in clinical and interventional radiology or neurosurgery.

The methods of assessment listed in this section of the curriculum will provide evidence of progress, with the requirements for each stage of training stipulated in the progression grids. Evidence of progress may also be gathered from other sources and learners are encouraged to demonstrate their progress against the CiPs in a variety of different ways, reflecting their strengths, areas of interest and the resources available to them. The learner will collect

evidence to support their self-assessment, and the educational supervisor will use it to reach a global assessment.

5.6.1 E-portfolio

On enrolling with the RCR learners will be given access to the RCR's e-portfolio. This is a record of a learner's development and progress towards achieving the CiPs. All appraisal meetings, personal development plans and WPBAs should be recorded in the e-portfolio. Learners are encouraged to reflect on their learning experiences and to record these in the e-portfolio.

The e-portfolio provides a record of objective evidence of capability and satisfactory performance. It will contribute to the educational supervisor's report and ARCP and may also be used in interviews. Successful completion of the credential requires evidence, recorded in the e-portfolio, that the trainee has met all of the CiPs.

It is the learner's responsibility to ensure the e-portfolio is kept up to date, arrange assessments and ensure they are recorded, prepare drafts of appraisal forms, maintain their personal development plan, and record their reflections on learning and their progress through the credential. It is the supervisor's responsibility to use the evidence recorded in the e-portfolio (such as outcomes of assessments, reflections and personal development plans) to inform appraisal meetings. They are also expected to update the learner's record of progress through the credential, write end-of-attachment appraisals and supervisor's reports.

Supervisors and review panels may use the e-portfolio to monitor the progress of learners for whom they are responsible. The RCR will also use summarised, anonymous data from the e-portfolios to support its work in quality assurance.

5.6.2 Formative assessment

Workplace-based assessment (WPBA) is the cornerstone of assessment for day-to-day practice. Reflection and feedback are an integral component to all WPBAs to enhance and drive learning. The assessments should be seen as opportunities for identifying strengths and areas for further development; they are not tests that must be passed.

In order for learners to maximise benefit, reflection and feedback should take place as soon as possible after an assessment. Feedback should be of high quality and should include an action plan for future development. Both learner and trainer should recognise and respect cultural differences when giving and receiving feedback.

A range of assessment tools are available to support WPBA and these are listed below.

Multi-source Feedback (MSF)

This tool is a method of assessing generic skills such as communication, leadership, team working, reliability etc. across the domains of Good Medical Practice. This provides systematic collection and feedback of performance data on a learner, derived from a number of colleagues. For each assessment, the learner should nominate 15 raters. 'Raters' are individuals with whom the learner works, including supervising consultants, INRs, doctors in training more senior than the learner under assessment where available, and experienced radiographic, nursing or allied health professional colleagues.

- The recommended mix of raters/assessors is:
  - at least 2 INR trainers
  - 1-4 senior doctors from different specialties with whom you regularly work
  - 1-2 doctors in training (depending on local availability)
  - 2-4 radiographers
  - 2-4 nurses/allied health professionals
  - 2-4 other team members including clerks, secretaries, and auxiliary staff

The learner will not see the individual responses by raters. Feedback is given to the learner by the educational supervisor.

MSF should usually take place once a year, although the educational supervisor may choose to recommend an additional MSF to investigate a relevant behavioural issue or check progress after an adverse MSF. It is mapped to a self-assessment tool with identical domains.

Mini Imaging Interpretation Exercise (Mini-IPX)

This tool evaluates an observed radiology interpretation/reporting episode. The mini-IPX can be used at any time and in any setting when an assessor is available. Assessors must be trained in giving feedback and understand the role of assessment and a different assessor should be used for each mini-IPX wherever possible. Learners should agree the timing, problem and assessor, although assessors may also carry out unscheduled assessments. Learners should receive immediate feedback to aid learning.

Radiology Directly Observed Procedures (Rad-DOPs)

In the initial phase of practical training, it would be anticipated these would constitute the majority of WPBAs. As a candidate progresses through the programme and approaches autonomous practice, procedure-based assessments (PBAs) would constitute the majority of WPBAs documenting competence level. During DOPs, the supervisor may intervene and guide the candidate through the procedure. These are briefer than PBAs and may focus on a single technical element of a procedure, e.g., establishing vascular access.

Procedure Based Assessment (PBA)

At the most advanced stage, a PBA is documented as the procedure is carried out by the candidate with the supervisor intervening only where necessary to assure patient safety. In this situation the PBA can be viewed as a summative assessment. Partial completion of elements of the PBA may be appropriate at earlier stages of training, e.g., documenting autonomous competency to complete the consent process for a procedure while still conducting elements of the procedure under direct supervision.

Case Based Discussion (CBD)

The CBD assesses the performance of a learner in his or her management of a patient, and it provides an indication of competence in areas such as clinical reasoning, decision-making and application of medical knowledge in relation to patient care. It also serves as a method to document conversations about, and presentations of, cases by learners. The CBD should

include discussion about a written record (such as written case notes, outpatient letters or discharge summaries).

Multidisciplinary Team Assessment (MDTA)

The MDT Assessment Tool is designed to provide feedback on a learner's ability to contribute effectively to multidisciplinary team working and to assume a leadership role in multidisciplinary meetings. As with other WPBAs, it is based on the assessor observing a learner and providing feedback.

Multiple Consultant Report (MCR)

This is designed to help to capture the opinions of consultants who have supervised the learner. They are asked to comment on clinical knowledge, skills and various aspects of clinical performance.

This assessment is additional to the Multi Source Feedback tool (MSF) and should only be completed by consultants. It is intended to focus specifically on clinical performance. The responses given will contribute to the educational supervisor's report by giving an accurate description of the learner's abilities. Please note that the learner will see the comments.

A list of appropriate respondents to the MCR should be agreed by the learner and educational supervisor at the beginning of the credential, and the potential respondents should be notified at this time that a report may be required. The list should be confirmed immediately before feedback is requested. Learners should aim to obtain responses from at least two consultant colleagues.

Educational Supervisor's Report

The educational supervisor will periodically (at least every six months) draw together the results of a learner's educational activities to give an overview of their progress in a formal structured educational supervisor's report. The overall judgment of a learner will include a triangulated view of the doctor's performance, which will include their participation in educational activities, appraisals, the assessment process and recording of this in the e-portfolio. The educational supervisor's report can incorporate commentary or reports from longitudinal observations, such as from supervisors or formative assessments demonstrating progress over time.

5.6.3 **Assessment blueprints**

Table 8 shows the possible methods of assessment for each CiP. It is not expected that every method will be used for each capability and additional evidence may be used to help make a judgement on entrustment.

Table 8: Blueprint of WPBAs to the CiPs

Capabilities in Practice	MSF	Mini-IPX	Rad-DOPS	PBA	CbD	MDTA	MCR
1. Appropriately select, tailor and report required neuroimaging investigations for each patient, accurately diagnose the clinical and imaging findings and arrange interventional neuroendovascular treatment as/when appropriate/indicated	x	x			x	x	x
2. Independently plan and perform all required components of the MT procedure competently and safely, and perform vessel angioplasty/stent if required to maintain the circulation	x	x	x	x	x	x	x
3. Recognise and manage the complications of the MT procedure, particularly those that are common or potentially catastrophic but remediable, understanding when and who to seek advice from in complex situations	x		x	x	x	x	x
4. Contribute to clinical ward-based and outpatient management of MT patients	x	x			x	x	x

5.6.4 Numbers of workplace-based assessments

Workplace-based assessments should be undertaken in a timely and educationally appropriate manner throughout the indicative training year. Table 9 details the indicative minimum number of each assessment that is expected.

The numbers included are for guidance. Supervisors should make professional judgements based on quality not quantity, however it is anticipated that learners will undertake at least the number detailed and likely many more, as the WPBAs are the vehicles by which the learner will guarantee one-to-one teaching and ensure appropriate curriculum coverage.

Table 9: Guidance on expected minimum numbers of assessments

Expected minimum number of workplace-based assessments in each indicative stage/year			
	Stage 1	**Stage 2**	**Stage 3**
MSF	1	1	1
Mini-IPX	12	12	12
Rad-DOPS	12	9	9
PBA	3	6	6
CBD	6	6	6
MDTA	2	2	2
MCR	1	1	1

5.6.5 Logbook

Learners are expected to maintain a procedural logbook and Table 10 shows the indicative **minimum** numbers required throughout training, recognising that some will achieve competency in individual procedures more quickly than others.

Table 10: Indicative logbook requirements

Activity	Index No.
Cranio-cervical CTA reporting	150
CT angiogram source images (CTASI) evaluation, or perfusion studies	50
Cranio-cervical MRA reporting	150
Cerebral catheter angiography (overlap with coiling procedure allowed)	100
Navigation of guide catheter systems (cervical and intracranial)	100
Intracranial navigation of microcatheter / microwire systems	100
*Coiling of an intracranial aneurysm	80

*Device-assisted coiling techniques (balloon, stent, other)	40
*Mechanical Thrombectomy for acute ischaemic stroke	40
*Carotid, vertebral or intracranial angioplasty / stent for atheroma	10
Evidence of participation in M&M and clinical audit meetings	
Evidence of attendance at relevant educational meetings and satisfactory CPD	

*It is anticipated that 50% of these procedures will be undertaken as the principal operator.

Procedures undertaken using simulation can be a satisfactory means of delivering the more basic elements of the curriculum. In the later stages, simulation can supplement real-world experience but should not replace it.

5.7 Decisions on progress – annual review of progress

Individual progress will be monitored through regular review. This process will be used to integrate and systematically review evidence about a learner's performance and progress in a holistic way to facilitate decisions regarding progression through training, as well as identifying any requirements for targeted or additional training where necessary.

To ensure consistency of standards and impartiality in this new programme, the review of learners following this programme will be carried out by a national panel constituted by the lead statutory education body and based on recommendations from the RCR. The panel will likely meet twice a year to enable timely review of learners who have started training at different times and will be progressing at different rates.

The evidence to be reviewed by the panel should be collected in the learner's e-portfolio. We strongly recommend that learners have an informal e-portfolio review with their educational supervisor prior to the annual review. These provide opportunities for early detection of learners who are failing to gather the required evidence.

Learners will not be expected to attend in person or via videoconference unless there are specific issues or concerns to discuss. The panel will review evidence in the e-portfolio, including educational supervisors' reports.

The requirements for a satisfactory outcome at the end of each stage of training are detailed in section 5.4. These should be used to guide trainees, supervisors and the review panel.

Satisfactory progression across all domains will lead to progress into the next stage of training.

Unsatisfactory progression will be informed by some or all of the following (the decision being undertaken by the review panel): failure to reach the expected level of entrustment by the end of the indicative training year; inadequate or poor outcomes in workplace-based assessments; and areas of concern within the educational supervisor's report. This will result in one of three outcomes depending on stage of training:

- Conditional progress into the next stage of training: the review panel will make specific recommendations to the trainee and their educational supervisor who should then work together to formulate an action plan to redress deficiencies in performance. The action plan should be shared with the review panel and progress will be re-assessed as appropriate within the next stage of training.
- Directed training without progression: if the learner is so far short of the objectives for their stage of training such as to prevent them continuing into the next stage of training, the panel may recommend directed training to achieve those objectives. Specific recommendations will be made to the learner and their educational supervisor who should then work together to formulate an action plan. The action plan should be shared with the review panel and progress will be reassessed as appropriate within the next stage of training. The review panel recommends that repetition of a period of training should only be recommended for exceptional reasons and only when the learner is demonstrating full engagement in training and at the discretion of the employer.
- Release from the programme: not all learners may be suited to the manual dexterity required to safely deliver MT. For that reason, there is a critical progression point at the end of the first indicative year of training. If the learner has failed to meet the expected levels of entrustment, has consistently poor outcomes in assessments and/or serious concerns have been raised in the educational supervisor's report, the panel may recommend release from the programme.

If progression has been unsatisfactory and progress into the next stage of training is conditional, this would normally be reviewed the next time the panel meets (e.g., after another six months). Any additional interim review will only be expected in exceptional circumstances.

5.7.1 Local appraisal

The review panel will only be assessing the learner's progress through the credential training. It is therefore essential that learners maintain their connection with the GMC for revalidation purposes through an appropriate designated body and engage with that organisation's governance systems for annual appraisal and revalidation. The output from the credential review should feed into the learner's full scope of practice review and appraisal.

5.7.2 Appeals

There are formal mechanisms for appealing against decisions taken at all stages of training. Appeals against a decision of the review panel or against failure to award the credential will be undertaken by an independent panel consisting of the following representatives:

- An interventional neuroradiologist who was not on the review panel that made the decision being appealed and who is also not a member of the credential project board or from the learner's training site
- A member of the credential project board who is a consultant in the learner's parent specialty (if possible) and who is not from the learner's training site
- A representative of the RCR
- A lay representative

Decisions will be made solely on the outcomes of competency progression.

6 Feedback, supervision and appraisal

This section of the curriculum describes how learners will be supervised, how they will receive feedback on performance, and the requirements for trainers.

6.1 Feedback

Access to high quality, supportive, timely and constructive feedback is essential for the professional development of the learner. Learner reflection is an important part of the feedback process and exploration of that reflection with the trainer should be a two-way dialogue. Effective feedback is known to enhance learning and combining self-reflection to feedback promotes deeper learning. This process should take place throughout training in both formal and informal settings. Opportunities for feedback will arise during appraisal meetings, when learners are undergoing workplace-based assessments, in the workplace setting, and through discussions with supervisors, trainers, assessors and those within the team. Learners must develop the ability to seek and respond to feedback on clinical practice from a range of individuals.

6.2 Supervision

All elements of work in the credential must be supervised, with the level of supervision varying depending on the experience of the learner. As training progresses, the learner should have the opportunity for increasing autonomy, consistent with safe and effective care for the patient.

Organisations must make sure that each learner has access to a named clinical supervisor and a named educational supervisor. It is preferred that a learner has a single named educational supervisor for the duration of training. For this credential the educational supervisor should be a consultant INR. The clinical supervisor may change during the training and will usually be the consultant to whom a learner is directly responsible for that element of training.

Learners undertaking the credential will, from the delivery and educational governance perspective, be within the neuroradiology/interventional neuroradiology educational support structures as part of the local radiology training programme and school of radiology (where applicable). It is therefore expected that educational and clinical supervisors for the credential will already be performing the same role for INR specialty trainees and therefore should be formally recognised by the GMC to carry out those roles. Some individuals may undertake more than one of these roles simultaneously. It is essential that training in assessment is provided for trainers and trainees in order to ensure that there is complete understanding of the assessment system, assessment methods, their purposes and use. Training will ensure a shared understanding and a consistency in the use of the WPBA and the application of standards.

Opportunities for feedback to trainees about their performance will arise through the use of the WPBA, regular appraisal meetings with supervisors, other meetings and discussions with supervisors and colleagues, and feedback from ARCP.

The first year in the credential may be difficult for some learners, especially if they have come from a non-neuroscience background, or not previously been based in a large neuroscience centre. Supervisors are encouraged to offer advice, a mentor system, and a counselling service during the year. The following milestones should be acknowledged:

- The learner should meet with their clinical and educational supervisors at the start of their appointment, and again after two-three months. These meetings should be documented in the e-portfolio.
- The learner's practice must be closely supervised, and patient safety is of paramount importance. Such aspects are monitored by the clinical supervisor and documented in the e-portfolio. Formal mechanisms for feeding back any concerns raised by the clinical supervisor, to the learner, and the educational supervisor, should be in place.
- All training in the credential should be conducted in locations that are approved for radiology specialty training by the GMC with appropriate standards of clinical governance and that meet relevant health and safety standards for clinical areas.
- Learners must work with a level of clinical supervision commensurate with their clinical experience and level of competence. This is the responsibility of the relevant clinical supervisor after discussion with the learner's educational supervisor and the designated clinical governance lead. In keeping with the principles of Good Medical Practice, learners should know that they must limit their clinical practice to within their level of clinical competence and seek help and support without hesitation.
- Learners should receive support to be able to achieve the learning outcomes required, including access to appropriate diagnostic and interventional neuroradiological caseload and workplace-based assessments to evidence that they are meeting requirements of the credential curriculum.
- Learners should feel that they are valued members of the healthcare team, receive appropriate and timely induction into the learning environment, named clinical and educational supervisors and understand their role and the context of their placement.

6.2.1 Educational supervisor

The educational supervisor is responsible for the educational agreement, and for bringing together all relevant evidence to form a summative judgement about progression at the end of the placement or a series of placements. The educational supervisor is appropriately trained to be responsible for the overall supervision and management of a learner's educational progress during the course of the credential. The educational supervisor regularly meets with the learner to help plan their training, review progress and agree learning outcomes.

The educational supervisor is integral to the appraisal process. A learner's appraisal with the educational supervisor will include feedback on performance and review of outcomes of assessments.

Local education providers must ensure that educational supervisors have adequate support and resources to undertake their training role. This will include training in equality and diversity.

For the credential it is expected that the educational supervisor will be a consultant interventional neuroradiologist. Learners who are pre-CCT should retain a trained educational supervisor from their parent specialty.

The educational supervisor will:

- ensure that the programme is appropriate for the learner's needs
- be responsible for the learner's educational agreement
- help the learner by reviewing their learning needs in the light of achieved goals
- carry out and/or collate assessments from clinical supervisors, trainers and other assessors
- review the learner's e-portfolio
- conduct appraisals and give supportive feedback on the results of MSF
- complete the structured supervisor's report at the appropriate times prior to the progression review panel
- support the learner through any difficulty
- tell the clinical director, head of service or medical director and those responsible for training, of serious weaknesses in their learner's performance that have not been dealt with
- tell the learner the content of any information about them that is given to someone else
- ensure that all training opportunities meet the requirements of equality and diversity legislation

The educational supervisor, when meeting with the learner, should discuss issues of clinical governance, risk management and the report of any untoward clinical incidents involving the learner. If the clinical supervisor should have any concerns about the performance of the trainee, or there were issues of doctor or patient safety, these would be discussed with both the learner and the educational supervisor. In turn the educational supervisor may consult with the learner and the clinical director. These processes, which are integral to learner development, must not detract from the statutory duty of the employer to deliver effective clinical governance through its management systems.

6.2.2 Clinical supervisor

A clinical supervisor will usually be the consultant to whom a learner is directly responsible for their clinical work and there will be frequent contact between them. They will be appropriately trained to lead on reviewing the learner's practice throughout a post and will provide constructive feedback, as well as contributing to the educational supervisor's report. It is expected that a credential learner will have a minimum of two clinical supervisors during the credential training and that these supervisors will be consultant interventional neuroradiologists.

Local education providers must ensure that clinical supervisors have adequate support and resources to undertake their training role. This will include training in equality and diversity.

The clinical supervisor is responsible for:

- ensuring that their credential learners are never put in a situation where they are asked to work beyond their competence without appropriate support and supervision. Patient safety must be paramount at all times
- guaranteeing suitable induction to the INR department
- meeting with the learner at appropriate points in the training pathway to discuss what is expected, learning opportunities available and the learner's training needs
- agreeing how the learning objectives for this period of training will be met and confirming how formative feedback and summative judgements will be made
- ensuring that the clinical experience available to the learner is appropriate and properly supervised
- ensuring that all training opportunities meet the requirements of equality and diversity legislation
- monitoring, supporting and assessing the learner's day-to-day clinical and professional work
- providing regular feedback on the learner's performance
- undertaking and facilitating WPBA
- allowing the learner to give feedback on the experience, quality of training and supervision provided
- discussing serious concerns with the educational supervisor about a learner's performance, health or conduct
- meeting with the learner to assess whether they have met the necessary outcomes and completing an end of post review form for each post

6.2.3 Learners

Learners should make the safety of patients their first priority. Furthermore, they should not be practising in clinical scenarios which are beyond their experience and competencies without supervision. Learners should actively devise individual learning goals in discussion with their trainers and should subsequently identify the appropriate opportunities to achieve said learning goals. Learners would need to plan their WPBAs accordingly to enable their WPBAs to collectively provide a picture of their development during the credential training period. Learners should actively seek guidance from their trainers and supervisors in order to identify the appropriate learning opportunities and plan the appropriate frequency and types of WPBAs according to their individual learning needs. It is the responsibility of learners to seek feedback following learning opportunities and WPBAs. Learners should self-reflect and self-evaluate regularly with the aid of feedback. It is also expected that a logbook of cases is maintained and reviewed in detail at appraisal meetings. Furthermore, learners should formulate action plans with further learning goals in discussion with their trainers.

6.3 Appraisal

All learners should undergo an annual appraisal as required for NHS professionals as part of the revalidation process. For both pre- and post-CCT learners these should be conducted under the auspices of the parent specialty but must cover the full scope of practice and take into account the learner's time training in the credential.

In addition, a formal process of appraisals and reviews should be followed specifically focussed on the credential. This process ensures adequate supervision during training, provides continuity between different elements of training and different supervisors, and is one of the main ways of providing feedback to learners. Arranging a review is primarily the responsibility of the learner. A “typical” year of appraisals involving both clinical and educational supervisors is detailed below. All appraisals should be recorded in the e-portfolio.

6.3.1 Annual induction appraisal

When learners start in a new indicative training year following a successful review, they must arrange a meeting with their educational supervisor. The induction appraisal is an essential starting point for negotiating educational goals and discussing learning opportunities, the assessment process and use of the e-portfolio. This forms the basis for the educational agreement between the educational supervisor and learner.

6.3.2 Clinical supervisor: induction appraisal

When learners start a new element of training (for example, moving from diagnostic training into interventional), they must arrange a meeting with their clinical supervisor (this role may be discharged in some cases by the educational supervisor). The appraisal discussions should cover the educational objectives for the upcoming period of training and be used to inform the personal development plan (PDP).

6.3.3 Clinical supervisor: mid-point appraisal

A mid-point meeting during a period of training, although not mandatory is highly recommended. It gives the learner and clinical supervisor the opportunity to look at the achievements of the learner and highlights areas for future development, in terms of the PDP and credential CiPs.

6.3.4 Clinical supervisor: end of training period appraisal

Towards the end of a period of training, the learner and clinical supervisor will meet again for an appraisal. They will need to review the e-portfolio, the PDP and the results of assessments made during the period covered. This process will involve review of comments from colleagues who have observed the learner’s performance in practice and/or in individual assessments. If the educational supervisor is different to the clinical supervisor, there should be a robust communication system to ensure a continuous, appropriate, and timely flow of evidence. This should include a ‘supervisor’s report sign off’ document confirming satisfactory performance and progress. It should detail any outstanding issues that still need to be addressed.

6.3.5 Educational supervisor’s mid-year appraisal

A mid-year appraisal with the educational supervisor is an opportunity to look at the learner’s progress against the agreed educational objectives within the e-portfolio.

6.3.6 End of training year appraisal

The results of educational activities for an indicative year of training in the credential will be drawn together and included in a formal structured educational supervisor’s report. This will cover the overall performance of the learner in all elements of training in the credential. The overall judgment of a learner, and the educational supervisor’s recommendations of

satisfactory progress, will be based on a triangulated view of the learner's performance. This will include their participation in educational activities, appraisals, the assessment process and recording of this in the e-portfolio.

The outcome of the final appraisal discussion should be agreed by both the learner and the educational supervisor and recorded in the structured supervisor's report in the e-portfolio.

7 Appendices

7.1 Appendix A: Quality assurance

7.1.1 Incorporating quality into the credential programme

The credential curriculum has been written with the intention that it meets the GMC's "Excellence by Design" standards.

The curriculum document itself includes the following mentions of quality assurance:

> **Section1.7:** "Quality assurance of the training being delivered will be maintained through existing structures. All training will take place in sites that are GMC-approved for radiology and neurointerventional radiology training and will be overseen by trained clinical and educational supervisors.
>
> The Royal College of Radiologists will maintain and support the credential alongside current training in clinical and interventional neuroradiology."
>
> **Section 4:** "Training should be constructed to enable learners to experience the full range of educational and training opportunities available and there will be robust arrangements for quality assurance in place to ensure consistent implementation of the curriculum."
>
> **Section 5.6.1:** "Supervisors and review panels may use the e-portfolio to monitor the progress of learners for whom they are responsible. The RCR will also use summarised, anonymous data from the e-portfolios to support its work in quality assurance."

Educational and clinical supervisors are expected to be formally recognised by the GMC to carry out their roles. The GMC criteria for trainer recognition comprise seven areas:

- Ensuring safe and effective patient care through training
- Establishing and maintaining an environment for learning
- Teaching and facilitating learning
- Enhancing learning through assessment
- Supporting and monitoring educational progress
- Guiding personal and professional development
- Continuing professional development as an educator

7.1.2 Existing QA mechanisms for specialty trainees applied to credential learners

Educational governance arrangements already exist to ensure the quality management of neuroradiology / interventional neuroradiology training departments. Measures include GMC trainee and trainer surveys, ARCP outcomes, access to appropriate numbers and categories of cases (logbook), patient outcomes (databases) and successful completion of the curriculum.

All credential training posts will be in a GMC-approved training centre, capable of full curriculum delivery, likely neuroscience centres with co-existing training in interventional neuroradiology. Some neuroscience centres work in a hub and spoke model. If a spoke department, not currently approved for training, wished to undertake the training of a

credential learner it would be required to apply to the GMC for approval in the same way any training location for specialty trainees does. That application should be supported by the regional neuroscience centre's neuroradiology department and relevant radiology training scheme and school of radiology.

For pre-CCT credential learners QA will be delivered within the current mechanisms for QA of training in clinical and interventional radiology, which includes neuroradiology and interventional neuroradiology. This will be through the Statutory Education Bodies. All those involved in assessment and supervision will be required to be GMC-approved and have had the appropriate training.

Learners who are post-CCT in their parent specialty will be training in the same quality assured and GMC-approved environment as those who are pre-CCT. They can therefore be confident that the training they are receiving is of the same standard as that expected for those on a specialty training pathway.

All learners will continue to be subject to the usual rules for appraisal and revalidation in their parent specialty. Such mechanisms are required to cover the doctor's "full scope of work" and should therefore include time spent training in the credential.

7.1.3 Credential-specific QA activities

The RCR, as the awarding body for the credential may undertake some or all of the following QA activities.

Progression reviews

The primary purpose of the progression reviews is to take decisions about individual trainees, but they will provide valuable insight into the quality of training.

To ensure consistency of standards and impartiality in this new programme, the review of doctors following this programme will be carried out by a national panel constituted by the lead Statutory Education Body (SEB). The panel will meet approximately twice a year.

Visits to training sites

The lead SEB may choose to visit some or all sites where credential learners are being trained. Such visits are likely to include meetings with learners and trainers and review of facilities. Sites would be asked to complete a pre-visit questionnaire. If this occurs the approach will be informed by the GMC's "Promoting Excellence" standards but will necessarily be narrower in scope.

Any such visits would be coordinated with local SEB offices to ensure there is clarity over the purpose and scope of visits, and that they do not conflict with similar activity.

Data monitoring

The RCR will monitor use of the e-portfolio, initially quarterly, to gather a picture of the use of assessments and other activities. This will only be to consider patterns of use, not to review the content of individual assessment forms etc.

Surveys

Six-monthly or annual surveys to learners and trainers asking the same questions each time to track improvements or areas that are consistently problematic.

Occasional surveys, if needed, focussing on a specific issue or a specific element of the credential

7.1.4 Raising concerns

In addition to planned QA activities, there will be a route for learners and trainers to raise concerns and a mechanism for addressing those concerns.

The planned process is as follows:

- Dedicated RCR email address monitored by members of the Workforce Development and Training Team.
- Simple issues addressed, where possible, by the team.
- Complex issues referred as appropriate for further advice or action, e.g.
  - Concern about specific training elements – to the credential lead dean for advice and possibly for them to raise with the local trainers
  - Concern about access to appropriate teaching or other resources as required by the curriculum – RCR raises with local INR lead or other appropriate individual within the training department.
  - Serious concerns – brought to the lead dean for discussion and action.
- All concerns, small and large, to be logged and recorded for review to identify common concerns or themes and to consider changes that could be made to address them in the long term.

The concerns log and resulting actions may provide additional data for the evaluation.

7.2 Appendix B: Equality and Diversity

The Royal College of Radiologists will comply, and ensure compliance, with the requirements of the Equality Act 2010.

We believe that equality of opportunity is fundamental to all radiological and clinical practice and to the many and varied ways in which individuals become involved with the RCR, either as members of staff and Officers; as advisers from the medical profession or in a lay capacity; as members of the RCR's professional bodies or as specialty trainees, credential learners and examination candidates.

Accordingly, it warmly welcomes contributions and applications from as diverse a population as possible, and actively seeks to recruit people to all its activities regardless of protected characteristic.

The employing organisation for each credential learner is expected to ensure that those in their employment are covered by local equality and diversity standards and that these are applied to the recruitment process as well as for the duration of training. In addition, the quality assurance of training procedures will seek evidence of how training in the credential complies with the equality and diversity standards that are expected in all medical training as set by the GMC.

Compliance with anti-discriminatory practice will be assured either by the employing organisation or by the RCR through:

- monitoring of recruitment processes.
- ensuring learners have an appropriate, confidential and supportive route to report examples of inappropriate behaviour of a discriminatory nature. Employers must also ensure contingency mechanisms are in place if trainees feel unhappy with the response or uncomfortable with the contact individual.
- ensuring all assessments discriminate on objective and appropriate criteria and do not unfairly disadvantage trainees with any of the Equality Act 2010 protected characteristics. All efforts shall be made to ensure the participation in training of people with a disability (other than that which would make it impossible to practise safely) through reasonable adjustments.

The RCR takes its obligations under the relevant equal opportunities legislation seriously.

7.3 Appendix D: Credential development and review

7.3.1 Development

The credential was developed by a multi-disciplinary project board convened under the auspices of the Clinical Radiology Specialty Training Board (STB) of the Faculty of Clinical Radiology of the Royal College of Radiologists and chaired by the Clinical Radiology Medical Director for Education and Training.

Membership of the INR (Acute Stroke) Credential Project Board was drawn from across a range of organisations representing specialties with an interest in the development of the credential. These included:

- British Association of Stroke Physicians (BASP)
- British Neurovascular Group (BNG)
- British Society of Interventional Radiology (BSIR)
- British Society of Neuroradiology (BSNR)
- Neurology Specialty Advisory Committee
- Society of British Neurological Surgeons (SBNS)
- Stroke Medicine Sub-Specialty Advisory Committee
- UK Neurointerventional Group (UKNG)

Membership of the Project Board also included representation from NHS and arms-length bodies as follows:

- National Clinical Director for Diagnostics, NHS England
- National Clinical Director for Stroke, NHS England
- Commissioning Lead for Thrombectomy, NHS England
- COPMeD Lead Dean for Clinical Radiology and Health Education England Clinical Radiology workforce lead
- Chair, National Neurosciences Advisory Group/Clinical Reference Group
- Associate Medical Director, Welsh Health Specialist Services Committee
- Chair, National Advisory Committee for Stroke, Scotland

Trainees from the specialties of interventional neuroradiology and neurosurgery were also members of the project board. The project board also included a lay member who has considerable experience as a lay member of both RCR's Specialty Training Board and its Clinical Radiology Curriculum Committee.

The draft curriculum was circulated for consultation and comment to a wide range of stakeholders. These included: relevant Specialty Interest Group leads; the Specialty Advisory Committees of relevant specialties; clinical and interventional radiology and interventional neuroradiology consultants and trainees; radiology clinical directors; NHS Employers; charities such as the Stroke Association; and patient groups such as the NHS Patient Experience Team.

7.3.2 Intended use

The credential curriculum is freely available to trainees and trainers on the RCR website. Both learners and their trainers are expected to have a good knowledge of the credential curriculum and should use it as a guide for delivery of the training. Clinical and educational supervisors should use the credential curriculum as the basis of their discussion with learners, particularly during the appraisal process. Each learner will engage with the curriculum by maintaining an e-portfolio. The learner will use the curriculum to develop learning objectives, self-assess accomplishments, and reflect on learning experiences.

7.3.3 Review

The rapidly changing and advancing technologies in radiology and stroke care mean that the credential needs to be responsive to such changes to ensure credential training reflects modern practice. The clinical content of the credential also sits wholly within the curriculum for the sub-specialty of interventional radiology, therefore any changes made to the sub-specialty curriculum that are of relevance to the content of the credential will cascade to the Credential Board from the RCR's Curriculum Committee.

In reviewing the sub-specialty curriculum, the Curriculum Committee makes use of opportunities for the curriculum to be discussed at regular meetings of relevant Special Interest Groups such as the BSNR, as well as the Curriculum Committee, the Professional Support and Standards Board and the Specialty Training Board. These provide opportunities for amendments to be proposed and considered in advance of formal review.

In addition to the Curriculum Committee processes for review, it is intended that the credential itself will also be reviewed every five years. All reviews will have trainee and lay representation and consider an equality and diversity impact assessment.

7.3.4 Summary of changes

Following the rebrand of the RCR, a new RCR logo, general design and colours have been applied throughout the document.

Two hyperlinks have been re-linked to current/available documents, due to the launch of a new rebranded RCR website:

- Page 4, reference 2 – Link to RCR Workforce Census 2022.
- Page 7, link to RCR, BSNR, UKNG, BSIR Supplementary guidance.

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