SHAHEED ZULFIQAR ALI BHUTTO MEDICAL UNIVERSITY

MD CLINICAL RADIOLOGY

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CLINICAL RADIOLOGY CURRICULUM

FIVE YEAR TRAINING PROGRAM

Contents

1.1 The purpose of the curriculum

The purpose of this curriculum is to meet patient and service need by ensuring that trainees develop the specialty-specific capabilities necessary to become a consultant radiologist, alongside the generic professional capabilities expected of all doctors. The curriculum provides a training framework, describing the standard required to achieve a MD qualification and the expected levels of progress at critical progression pointsduring training.

Clinical radiology is the use of imaging to diagnose, treat and monitor various disease processes and injuries. Patients are referred to clinical radiologists for assistance in both diagnosis and deciding on the best management of a patient's condition. Radiology services are available 24 hours a day to deal with emergency cases, whether it is an elderly person with a suspected brain haemorrhage, a child with symptoms of meningitis or the victim of a motorcycle accident. Radiologists are trained to use and interpret all diagnosticimaging methods ("modalities"). These include radiographs (X-rays), ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET) and hybrid forms (e.g. PET/CT).

Radiologists use their medical training combined with their specific radiology training to guide the referring clinician to the most appropriate investigation, taking into account side-effects, safety and the clinical relevance of specific tests. The radiologist interprets the findings from this investigation, allowing diagnosis and appropriate treatment, and also recommends any additional imaging required.

Rapid advances in technology and our understanding of the features of disease on diagnostic images allow imaging to be used at earlier and earlier stages of the diagnostic process. Similarly, changes in the characteristics of disease with treatment can be detected and imaging follow up is now frequently used to monitor disease. Earlier diagnosis leads to earlier treatment, which has been seen to improve survival rates drastically (e.g. cancer) and reduce the overall cost to health services.

All radiologists are trained in a number of image-guided procedures such as performing biopsies and inserting tubes and drains, as well as performing diagnostic procedural work such as fluoroscopy.

Radiologists operate in and across a wide number of settings from more general roles in small acute hospitals to providing specialised services in tertiary centres. The curriculum aims to produce clinical radiologists who are appropriately trained but also flexible and adaptable enough to fit into this wide range of roles.

1.2 The need for the curriculum

The clinical radiology curriculum has been developed in response to patient, population, professional, workforce and service needs.

Radiology plays a pivotal role in directing care of patients referred to emergency services due to trauma or other acute presentations. Rapid access to high quality diagnostic imaging is vital in making swift and correct diagnoses in acute situations, allowing appropriate triage

and impacting on transit times through emergency departments and ultimately on inpatient capacity and length of stay.

The curriculum aims to produce clinical radiologists with the ability to provide general and emergency radiology in any clinical environment and specialist skills in one or more areas. This allows provision of acute imaging services vital to supporting the swift and accurate diagnoses of patients reporting to emergency departments, as well as meeting the increasing demand for specialist diagnostic and treatment services.

Patient management is enhanced by multidisciplinary team meetings in which radiologists are pivotal members with leadership roles, with very few decisions made about patient management without radiology input.

Developing and training other practitioners in aspects of diagnostic imaging and intervention requires radiologists with leadership, management and education skills.

This curriculum aims to equip radiologists with the skills to fully engage in these roles.

1.3 Scope of training

Specialty training in clinical radiology will normally be a five-year programme that will include exposure to all imaging modalities, body systems and patient groups with the objective of producing clinical radiologists who at the time of Completion of Training will be equipped to deliver a general,acute and emergency service.

Patients who require access to specialist diagnostic and treatment services require radiologists with advanced skills who can deliver specialist imaging in addition to general radiology. Whilst working as a consultant, most clinical radiologists will focus on one or two areas of special interest in order to be able to provide this. The curriculum allows for some focus on areas of special interest at the end of training whilst ensuring that trainees will maintain the skills and flexibility required to adapt to the needs of the local service at the time and in the future.

The curriculum includes the interventional capabilities, such as image-guided biopsies, required by general radiologists but excludes the specialist skills acquired by those who follow the interventional radiology sub-specialty curriculum.

1.4 Structure of training

Clinical radiology training is entered following completion of house job training as a minimum. Trainees may be given preference who have gained additional experience in other programmes (e.g. internal medicine, surgery etc.) before commencing clinical radiology training.

Trainees will rotate through modality and systems-based attachments in order to gain experience and skills in all of these fields. These attachments include: breast radiology; cardiac radiology; thoracic radiology; gastro-intestinal radiology; molecular imaging and radionuclide radiology; paediatric radiology; musculoskeletal radiology; neuroradiology; head and neck radiology; uro-gynaecological radiology; and core interventional radiology. Higher sub-specialty training in interventional radiology is included in a separate curriculum.

From ST4 trainees will also begin to transition to further study in an area of special interest. As a guideline, we recommend that they should spend 60% of their time during ST4 maintaining and further developing their general radiology skills, and 40% of their time beginning to apply these generalist skills to their area of special interest. Special interest training will allow development of crucial generic skills, for example managing multidisciplinary team meetings, providing an expert opinion and adapting to technological developments and research.

At ST5, there will be a greater focus on specialist skills, with a guideline of 40% of trainee's time spent on maintaining general radiology skills and 60% spent on developing their area of special interest. The training pathway diagram in Figure 1 illustrates this structure.

Figure 1: Training pathway for clinical radiology

Trainees should consider shortage areas aligned to local patient and service needs, with a view to where vacancies lie. Availability of places is mainly dependent on training capacity at present; however we will be working with the SZABMU allied institutes to assess and strengthen the systems in place for identifying local workforce needs and how this can inform programme design.

1.5 Capabilities in Practice

To achieve completion of training certificate, trainees are expected to demonstrate the capabilities described by the generic and specialty-specific high level outcomes, or 'capabilitiesin practice' (CiPs), asdetailed below:

1.5.1 Generic Capabilities in Practice

1. Demonstrate the professional values and behaviours expected of all doctors as outlined in Good medical practice.
2. Successfully function within the health service and healthcare systems in Pakistan within public and private sector.

   Like all consultants working within the clinical set-up radiologists need to understand organisational and management systems so that they can engage positively with them and optimise patient care.
3. Engage in reflection, clinical governance and quality improvement processes to ensure good practice.

   Consultant radiologists are expected to stay up to date with their knowledge and skills, and look for ways to improve the quality of their services.
4. Engage in evidence-based practice and safeguard data, including imaging data.

   Consultant radiologists require the skills used by all doctors to practise evidence-based medicine.
5. Act as a clinical teacher and supervisor.

   Consultant radiologists teach medical students, junior doctors and other healthcare professionals.
6. Work well within a variety of different teams, communicating effectively with colleagues and demonstrating the skills required to lead a team.

Clinical radiology relies on a multi-professional team and good communication isan essential component of sound practice, team working and patient centred care. Consultant radiologists must be able to resolve conflict, develop good working relationships and support team development and possess the qualities and behaviours necessary to lead but also to follow, when necessary, in dealing with difficult situations and conflicting attitudes.

1.5.2 Specialty-specific Capabilities in Practice

7. Appropriately select and tailor imaging to patient context and the clinical question(s).

   Consultant radiologists will discuss clinical cases with referrers and allied imaging professionals and advise on appropriate imaging according to the individual patient, clinical background and the clinical question posed. Imaging investigations have varying health and safety risks to patients and the public that need to be considered. Consultant radiologists weigh up the relative clinical risk/benefit when advising on imaging according to clinical information provided by referrers.

8. Provide timely, accurate and clinically useful reports on imaging studies.

   Consultant radiologists provide actionable reports on imaging studies that are performed on patients. They will discuss findings with referrers as required. They will be able to report investigations for common presenting complaints. In addition, they will be able to report more complex investigations as appropriate to their special interest. This may include recommendations regarding onward imaging investigations, imaging follow up and/or other clinical management based on their expert knowledge.

9. Appropriately manage imaging examination lists/procedures according to clinical need and professional expertise.

   Consultant radiologists will be able to obtain consent and directly examine a patient in real time with imaging such as ultrasound and perform image-guided procedures.

10. Evaluate image quality and utilise the knowledge of imaging sciences to optimise image quality.

    Consultant radiologists need to be able to evaluate image quality and utilise knowledge of imaging physics to maximise the diagnostic certainty of an imaging test.

11. Safely manage the imaging and image-guided intervention needed to support emergency care.

    Imaging is required to support the 24/7 emergency service provided by the public and private sector. Consultant radiologists will be competent in interpreting and performing imaging examinations and/or procedures that are required in the emergency context and where appropriate will suggest use of image-guided intervention or onward referral.

12. Effectively contribute a clinical/imaging opinion to a multidisciplinary team (MDT) meeting.

    Imaging is often central to decision making regarding patient management and onward investigation. Consultant radiologists review imaging of cases to be discussed at MDT meetings and present relevant findings pertinent to clinical decision making. They will provide explicit recommendations regarding onward imaging investigations and/or image-guided procedures based on their expert knowledge.

1.6 Flexibility of training

The curriculum supports flexibility and transferability of outcomes across related specialties and disciplines, reflecting key interdependencies between the clinical radiology curriculum and other training programmes, outlined below.

Nuclear medicine

Nuclear medicine physicians are responsible for the administration of unsealed radioactive substances to patients for the purposes of diagnosis, therapy or research. There is significant overlap with the work of radiologists who use radionuclide radiology imaging techniques for diagnosis, and we have undertaken joint stakeholder engagement activity.

Cardiology

The cardiology specialty training curriculum contains mandatory core and optional advanced level elements of imaging, including cardiac CT, MR and nuclear imaging.

Breast clinicians

Breast clinicians are doctors who provide a holistic approach to the investigation and management of breast disease. They have skills in clinical examination, interpretation of imaging including mammography and ultrasound, the use of interventional procedures, and the management of benign breast disease. They may work in both diagnostic clinics andthe Breast Screening Programme.

1.7 Generic professional capabilities and good medical practice

The students are expected to develop the Generic professional capabilities (GPC) framework to describe the fundamental, career-long, generic capabilities required of every doctor. The framework describes the requirement todevelop and maintain key professional values and behaviours, knowledge, and skills, using a common language. GPCs also represent a system-wide, regulatory response to the mostcommon 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)[7] is embedded at the heart of the GPC framework. In describing the principles, duties and responsibilities of doctors, the GPC framework 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 acquiring a CCT or its equivalent.

Figure 2: The nine domains of Generic Professional Capabilities[6]

The domains and subsections of the GPC framework are directly identifiable in the clinical radiology curriculum. They are mapped to each of the generic and specialty CiPs, which are in turn mapped to the assessment blueprints. This is to emphasize 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.

2 Content of learning

The practice of clinical radiology requires the generic and specialty-specific knowledge, skills, attitudes and procedural competency to diagnose, and sometimes manage, patients referred for imaging to investigate a wide range of symptoms and conditions and perform image-guided procedures. It involves particular emphasis on diagnostic reasoning, communicating uncertainty and working with referrers to ensure appropriate speciality opinion or care is sought when required.

To achieve CCT trainees are expected to demonstrate achievement of the generic and specialty-specific high level outcomes, known as 'capabilities in practice' or 'CiPs'. The CiPs describe the professional capabilities required of a consultant clinical radiologist. Each CiP has a number of descriptors that underpin it, is mapped to the training completion and accompanied by suggested evidence that may demonstrate 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. Trainees may demonstrate their progress against the CiPs in a variety of different ways, reflecting their strengths, areas of interest 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 trainees meet each CiP is stage dependent and is expected to progress in a spiral fashion throughout training. Trainees will develop at different rates and may be able to demonstrate a higher level of progress in some CiPs compared to others. Excellent trainees may be able to evidence higher achievement at an earlier stage, provide a broader portfolio of evidence, or provide evidence that shows a deeper level of learning. The programme of assessment that forms part of this curriculum outlines the minimum expected levels of achievement at critical progression points in training, where trainees take on significantly more responsibility or where training or patient risk may potentially increase. 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 critical progression point. More detail is provided in the programme of assessment section of the curriculum.

2.1 Generic CiPs

CiP 1

Demonstrate the professional values and behaviours expected of all doctors as outlined in Good medical practice.

As doctors, consultant radiologists adhere to the principles of 'Good medical practice' as stipulated by the PMC.

Descriptors

- Make the care of and effective communication with patients their first concern
- Provide a good standard of practice and care
- Take prompt action if patient safety, dignity or comfort is being compromised
- Protect and promote the health of patients and the public
- Treat patients as individuals and respect their dignity, showing sensitivity to religious, cultural and socioeconomic factors
- Work in partnership with patients, their families and carers
- Work with colleagues in the ways that best serve patients' interests
- Be honest and open and act with integrity
- Never discriminate unfairly against patients or colleagues
- Never abuse their patients' trust in you or the public's trust in the profession

Suggested evidence

- MSF
- Mini-IPX
- Rad-DOPS
- MDTA
- Patient feedback

CiP 1

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: consent
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 4: Capabilities in health promotion and prevention
- Domain 5: Capabilities in leadership and teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups
- Domain 8: Capabilities in education and training
- Domain 9: Capabilities in research and scholarship

CiP 2

Successfully function within the health service and healthcare systems in Pakistan.

Like all consultants working within the public and private system, radiologists need to understand organisational and management systems so that they can engage positively with them and optimise patient care

Descriptors

- Understand the structure and organisation of the health service and system including the independent sector and the wider healthcare landscape
- Understand how services are commissioned, funded and audited
- Understand how services are deemed to be clinically effective and cost effective
- Understand how resources are managed, being aware of competing demands and the importance of avoiding waste
- Understand the concept of health screening and appraise whether a proposed screening test is appropriate in the context of imaging
- Apply equality and diversity frameworks and ensure that an equal, non-discriminatory approach is adopted in interactions with both patients and colleagues
- Demonstrate appropriate awareness of, and maintain a professional approach to the use of social media and public communications.
- Adhere to all relevant professional communication policies

Suggested evidence

- QIPAT
- Reflection
- Leadership/management courses/modules

Mapping to GPCs

- Domain 2: Professional Skills
  - Practical skills
- Domain 3: Professional knowledge

CiP 3

Engage in reflection, clinical governance and quality improvement processes to ensure good practice.

Consultant radiologists are expected to stay up to date with their knowledge and skills, and look for ways to improve the quality of their services.

Descriptors

- Facilitate and lead on quality improvement and audit projects to improve patient care and experience
- Promote a culture of openness and accountability including awareness of the duty of candour to patients
- Appropriately raise concerns including errors
- Share good practice
- Advocate clinical quality improvement
- Engage in clinical governance meetings including peer feedback meetings
- Demonstrate commitment to continuing professional development by maintaining and/or developing skills relevant to higher training special interest area and/or local service need
- Appropriately raise concerns regarding negative professional behaviour e.g. bullying
- Recognise and acknowledge where personal issues impact upon good practice and seek appropriate help

Suggested evidence

- QIPAT
- Reflection

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional Skills
  - Communication and interpersonal skills
- Domain 3: Professional knowledge
  - Professional requirements
- Domain 5: Capabilities in leadership and teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
  - Quality Improvement

CiP 4

Engage in evidence-based practice and safeguard data, including imaging data.

Consultant radiologists require the skills used by all doctors to practise evidence-based medicine.

Descriptors

- Demonstrate an understanding of the principles of research, research methods and the translation of research into clinical practice
- Identify and critically appraise literature to inform practice
- Understand and critically appraise new technological developments including radiological applications of Artificial Intelligence (AI)
- Interpret and communicate research evidence in a meaningful way to patients to support them in making informed decisions about treatment
- Follow guidelines on ethical conduct in research and consent for research
- Apply information governance principles to safeguard imaging data in the context of research
- Adhere to Data Protection Regulations and be familiar with Freedom of Information regulations

Suggested evidence

- Reflection
- Attendance and participation in a journal club
- Presentation and/or publication of research
- Attendance of research meetings and/or courses
- Postgraduate qualifications e.g. Postgraduate certificate, Masters etc.
- GCP training
- Contribution to writing grant applications
- Contribution to applications to Ethics Review Board (ERB), DRAP etc.

Mapping to GPCs

- Domain 2: Professional Skills
  - Practical skills
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 9: Capabilities in research and scholarship

CiP 5

Act as a clinical teacher and supervisor.

Consultant radiologists teach medical students, junior doctors and other healthcare professionals.

Descriptors

- Provide teaching, supervision and assessment of clinical trainees and other healthcare professionals
- Understand the role of and develop the ability to act as a Clinical Supervisor to the standard required by the PMC
- Apply information governance principles to safeguard imaging data in context of education

Suggested evidence

- Teaching observation
- Reflection
- Evidence of delivering undergraduate/postgraduate teaching
- Evidence of teaching and/or assessment design/management/governance
- Learner feedback forms
- Postgraduate qualification in medical education

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional Skills
  - Practical skills
  - Communication and interpersonal skills
- 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 8: Capabilities in education and training

CiP 6

Work well within a variety of different teams, communicating effectively with colleagues and demonstrating the skills required to lead a team.

Clinical radiology relies on a multi-professional team and good communication is an essential component of sound practice, team working and patient centred care. Consultant radiologists must be able to resolve conflict, develop good working relationships and support team development and possess the qualities and behaviours necessary to lead but also to follow, when necessary, in dealing with difficult situations and conflicting attitudes.

Descriptors

- Promote and actively participate in multidisciplinary and interprofessional team working, communicate effectively and recognise and respect the roles of all members of the team
- Effectively lead a multi-professional team allowing all voices to be heard and considered and foster an atmosphere of collaboration
- Critically appraise performance of colleagues, peers and systems, appropriately escalate concerns and promote an open and transparent culture of learning and development
- Show awareness of own leadership style and how this impacts on others
- Demonstrate flexibility in behaviour and ability to adapt techniques and approaches within the multi-professional team to improve engagement in difficult situations
- Supervise, challenge and mentor colleagues and peers to enhance performance
- Recognise own limitations and comprehend situations where others are better equipped to lead or where delegation is appropriate

Suggested evidence

- MSF
- Mini-IPX
- Rad-DOPS
- MDTA

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional skills
  - Practical skills
  - Communication and interpersonal skills
  - Dealing with complexity and uncertainty
- Domain 5: Capabilities in leadership and teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety

2.2 Specialty-specific CiPs

CiP 7

Appropriately select and tailor imaging to patient context and the clinical question(s).

Consultant radiologists will discuss clinical cases with referrers and allied imaging professionals and advise on appropriate imaging according to the individual patient, clinical background and the clinical question posed. Imaging investigations have varying health and safety risks to patients and the public that need to be considered. Consultant radiologists weigh up the relative clinical risk/benefit when advising on imaging according to clinical information provided by referrers.

Descriptors

- Collaborate effectively with referrers to determine the most appropriate imaging pathway for a given presentation
- Exercise evidence-based practice by utilising current peer-reviewed literature to inform imaging selection for all patient groups
- Protocol CT and MRI scans appropriately
- Safeguard patients, including vulnerable groups, and act in accordance with current safety guidelines and legislation in respect of ionising radiation and other imaging techniques/equipment
- Be able to advise referrers and patients regarding radiation exposure tailored to individual clinical contexts to facilitate informed decision making

Suggested evidence

- Mini-IPX
- Rad-DOPS
- MDTA

CiP 7

Mapping to GPCs

- Domain 1: Professional values and behaviours
- Domain 2: Professional Skills
  - Practical skills
  - Communication and interpersonal skills
  - Clinical skills: 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 teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups

CiP 8

Provide timely, accurate and clinically useful reports on imaging studies.

Consultant radiologists provide actionable reports on imaging studies that are performed on patients. They will discuss findings with referrers as required. They will be able to report investigations for common presenting complaints. In addition, they will be able to report more complex investigations as appropriate to their special interest. This may include recommendations regarding onward imaging investigations, imaging follow up and/or other clinical management based on their expert knowledge.

Descriptors

- Possess a sound understanding of radiological anatomy, normal variants and artefacts as demonstrated on all of the common imaging modalities.
- Combining a sound knowledge of radiological anatomy, physiology and pathology, adopt a safe, systematic approach to interpretation of imaging
- Formulate a clinically useful written report targeted appropriately to the referrer, providing where appropriate a refined differential diagnosis, and demonstrate clinical judgement by providing recommendations for further investigation and/or management
- Communicate pertinent imaging findings to referrers, and where appropriate to patients, in a time-appropriate manner, including significant, unexpected or incidental findings
- Demonstrate insight into level of personal expertise and appropriately refer/seek second opinion
- Identify and appropriately respond to imaging findings that raise safeguarding concerns
- Demonstrate insight into diagnostic certainty and clearly communicate this within written and verbal reports

Suggested evidence

- Mini-IPX
- Rad-DOPS
- MDTA
- MD Examinations

CiP 8

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
- Domain 3: Professional knowledge
  - National legislative requirements
- Domain 5: Capabilities in leadership and teamworking
- Domain 7: Capabilities in safeguarding vulnerable groups

CiP 9

Appropriately manage imaging examination lists/procedures according to clinical need and professional expertise.

Consultant radiologists will be able to obtain consent and directly examine a patient in real time with imaging such as ultrasound and perform image-guided procedures.

Descriptors

- Explain imaging examinations, risks and findings facilitating informed patient choice
- Obtain informed consent for relevant imaging examinations and/or procedures from all patients including vulnerable groups, showing sensitivity to issues of equality and diversity
- Understand and safely prescribe or stop medication relevant to imaging and procedures as appropriate
- Manage adverse reactions (including anaphylaxis) to administered contrast and drugs
- Maintain an up to date knowledge of cardiopulmonary resuscitation (CPR) techniques
- Implement current health and safety and infection control techniques in the context of imaging examinations/ procedures
- Demonstrate insight into level of personal expertise and appropriately refer/seek second opinion

Suggested evidence

- Rad-DOPS
- Appropriate evidence of training in management of anaphylaxis and resuscitation

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; using medical devices safely; infection control and communicable disease
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups

CiP 10

Evaluate image quality and utilize the knowledge of imaging sciences to optimize image quality.

Consultant radiologists need to be able to evaluate image quality and utilize knowledge of imaging physics to maximize the diagnostic certainty of an imaging test.

Descriptors

- Evaluate image quality and feed back to the imaging team appropriately to facilitate maintenance of equipment and/or improve practice
- Appropriately refer to image quality within written reports when there is impact on diagnostic certainty

Suggested evidence

- Mini-IPX
- Rad-DOPS
- MTA (Mid-Term Assessment)

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; using medical devices safely
- Domain 5: Capabilities in leadership and teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
  - Quality improvement

CiP 11

Safely manage the imaging and image-guided intervention needed to support emergency care.

Imaging is required to support the 24/7 emergency service provided by the public and private sector. Consultant radiologists will be competent in interpreting and performing imaging examinations and/or procedures that are required in the emergency context and where appropriate will suggest use of image-guided intervention or onward referral.

Descriptors

- Produce reports in a timely manner according to clinical need in the context of emergency care
- Maintain knowledge and skills required to perform, interpret and report imaging in an emergency setting
- Maintain an up to date knowledge of appropriate equipment for image guided biopsies and drains
- Perform or arrange (as appropriate) any clinically urgent image-guided interventional procedures

Suggested evidence

- MSF
- Mini-IPX
- Rad-DOPS

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
- 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 12

Effectively contribute a clinical/imaging opinion to a multidisciplinary team (MDT) meeting.

Imaging is often central to decision making regarding patient management and onward investigation. Consultant radiologists review imaging of cases to be discussed at MDT meetings and presents relevant findings pertinent to clinical decision making. They will provide explicit recommendations regarding onward imaging investigations and/or image-guided procedures based on their expert knowledge.

Descriptors

- Review imaging studies to provide an answer to a clinical question posed by the MDT
- Integrate clinical, pathological and radiological information to refine a differential diagnosis
- Contribute to/lead the decision making of the MDT by clearly articulating a clinical opinion
- Maintain knowledge of local and national guidelines alongside current peer-reviewed literature to ensure recommendations are evidence-based, clinically relevant and safe

Suggested evidence

- MSF
- MDTA
- QIPAT
- Mini-IPX

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
- Domain 3: Professional knowledge
  - Professional requirements
  - National legislative requirements
- Domain 4: Capabilities in health promotion and prevention
- Domain 5: Capabilities in leadership and teamworking
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 9: Capabilities in research and scholarship

Key to suggested evidence			
MD	Doctor of Medicine	**Mini-IPX**	Mini-imaging interpretation exercise
GCP	Good Clinical Practice	**MSF**	Multisource feedback
MDTA	MDT Assessment	**QIPAT**	Quality improvement project and audit assessment tool
DRAP	Drug Regulatory Authority of Pakistan	**Rad-DOPS**	Radiology-direct observation of procedural skills

2.3 Presentations and conditions

Clinical radiology utilises a wide range of imaging modalities and techniques to identify and characterise pathology in the body and can be used to investigate any body system or anatomical region. Clinical radiology trainees are expected to become competent in vetting, protocolling, performing and/or reporting all of the commonly used imaging modalities (e.g. radiographs, fluoroscopy, ultrasound, CT, MRI, radionuclide studies) and to remain up to date with validated new techniques, imaging procedures and protocols.

Any attempt to comprehensively list all clinical presentations, pathological conditions, imaging modalities and 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 1-3 outline at a high level the key clinical presentations and conditions presenting to clinical radiology for imaging and the key practical procedures that trainees are expected to have experience of. **These tables are not comprehensive; they must be viewed as a guide and interpreted with common sense.**

Table 1 describes key clinical presentations and conditions for each of the main body systems. Particular presentations and conditions are listed either because they are common or serious. Clearly some conditions may manifest in a number of body systems and some presentations may be caused by pathology in one or more system, however for conciseness each condition and presentation appears once in the syllabus or on a limited number of occasions.

It is expected that trainees will:

1. be familiar with the normal anatomy and normal variants in each system
2. develop knowledge of the imaging findings of the pathological processes and post treatment appearances affecting each body system including:
    - genetic / congenital / developmental conditions
    - trauma
    - infection
    - inflammation
    - neoplasia
    - connective tissue disorders
    - autoimmune disorders
    - neurological disorders
    - vascular pathology
    - haematological diseases
    - endocrine diseases
    - degenerative diseases
    - metabolic disorders
    - iatrogenic conditions
    - pregnancy associated conditions
    - psychiatric associated conditions

By the end of their training all radiology trainees will be expected to advise on the optimum imaging strategy for a given presentation or condition, including selection of the most appropriate modality and protocol for the examination. This should include radionuclide or molecular imaging techniques where appropriate.

All radiologists are required to be trained in a number of basic image guided procedures such as performing biopsies and inserting tubes and drains, as well as performing diagnostic procedural work such as fluoroscopy. It is expected that all trainees will have knowledge of appropriate interventional radiology strategies when investigating the range of common presentations and conditions given in Table 1 and demonstrate the ability to select and use basic interventional radiology techniques. Appropriate adaptations or adjustments should be made to allow trainees with physical disabilities to access this aspect of the curriculum.

Table 1: Common and/or important presentations and conditions for clinical radiology

Key to Skills in Imaging Modalities and Techniques

Proficient: These are examples of imaging procedures in which all radiology trainees will develop skills to Level 4 (independent practice at the level of a day 1 consultant) by completion of training.

Experience: These are examples of imaging procedures in which as a minimum all radiologists will have knowledge of the role, indication, contra-indications and limitations. They will be able advise on when and how to refer for these procedures even if they do not undertake the examination personally. Trainees specialising in these areas would be expected to become proficient in these competences.

Specialist: These are examples of examinations and procedures which are necessary to support specialist services. They are additional skills which will be developed by a limited number of radiology trainees, in response to service need.

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Breast Radiology	Breast lump Nipple changes /discharge Skin changes Inflammation Recall from screening Implant related concerns Male breast concerns Breast pain Incidental breast abnormality on cross-sectional imaging Axillary lump	Breast tumour: ▪ primary: in situ/invasive ▪ metastatic: regional/distant ▪ recurrent ▪ metastatic from elsewhere Benign and atypical breast lesions Implant rupture Gynaecomastia	Experience: Mammography, ultrasound breast and axilla, MRI, US guided aspiration and biopsy, localisation procedures Specialist: Advanced biopsy and localisation techniques

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Cardiac Radiology	Acute chest pain Stable chest pain Cardiovascular chest trauma Exertion shortness of breath Stroke and paradoxical embolism Syncope Sudden collapse Palpitation with confirmed arrhythmia	Cardiac arrhythmias Cardiac failure Coronary heart artery disease and its complications Valvular heart disease Common congenital heart disease Heart muscle disease/ cardiomyopathy Heart failure Diseases of the arteries including aortic dissection Acute aortic syndrome Diseases of the pulmonary circulation Heart muscle disease/ cardiomyopathy Pericardial diseases Pulmonary embolism Stroke and paradoxical embolism Cardiac tumours and masses	Proficient: Plain radiography of cardiac disease, CT including ECG gated cardiac and thoracic aorta CT Experience: cardiac MRI, nuclear cardiology Specialist: echocardiography

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Gastro-Intestinal and hepatobiliary Radiology	The acute abdomen Abdominal trauma Abdominal pain - acute / chronic Abdominal mass Dysphagia Change in bowel habit Gastrointestinal haemorrhage Anaemia Weight loss Diarrhoea, steatorrhea Jaundice / abnormal LFTs	GI tract tumours Liver tumours Pancreatico-biliary tumours Diseases of the oesophagus, stomach, small bowel colon and rectum Malabsorption Continence disorders Diseases of the gallbladder, and biliary tree Diseases of the pancreas including acute and chronic pancreatitis Diseases of the liver – focal and diffuse. Herniae, volvulus and intussusception	Proficient: Plain film, fluoroscopic contrast studies of the GI tract, ultrasound, CT / CT angiography, MRI / MRCP/MR enterography, image guided biopsy and drainage Experience: CT colonography, radionuclide GI and abdominal imaging and image guided NG tube insertion Specialist: Endoscopy / ERCP /endoscopic ultrasound / percutaneous biliary drainage / advanced biopsy e.g. trans- jugular and plugged, TIPSS and see IR curriculum

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Head and Neck Radiology	Neck lump Stridor and hoarseness Swallowing difficulties Hearing loss Tinnitus and vertigo Facial, oral, dental and neck pain and swelling Facial and skull base trauma Trismus and TMJ dysfunction Epistaxis Otalgia and aural discharge Epiphora Proptosis Nasal polyps Anosmia / hyposmia	Head , neck and skull base tumours Lymph node pathology Thyroid and parathyroid diseases Orbital disease Temporal bone, inner and middle ear disorders Vestibular dysfunction TMJ diseases Cranial nerve disorders Salivary gland disease Paranasal sinus disease Dental disease Vascular and lymphatic malformations	Proficient: Plain film, fluoroscopy / contrast swallow, ultrasound, CT, MRI Experience: US/CT guided biopsy, radionuclide imaging Specialist: Sialography, dacryocystography

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Musculoskeletal Radiology	Bone pain /deformity Joint pain /deformity Back pain Soft tissue/bony lump Acute and chronic injuries of tendons, muscles and ligaments Symptoms of cord or nerve root compression Scoliosis Rash and weakness	Trauma (acute and chronic) Infection Tumours/tumour-like lesions Spinal cord/cauda equina compression Haematological disorders Metabolic bone disorders Endocrine bone disorders Degenerative and infective disc disease Congenital and developmental lesions Multisystem rheumatic disorders Connective tissue disorders Crystal related arthropathies Osteoarthritis Osteoporosis Rheumatoid arthritis Spondyloarthritidies	Proficient: Plain film, fluoroscopy, ultrasound, CT, MRI (spine, knee, and pelvis), image guided injection, aspiration Experience: Radionuclide imaging, MRI of smaller joints, MR arthrography, image guided biopsy Specialist: Advanced intervention e.g. vertebroplasty, ablation

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Neuroradiology	Abnormal sensory or motor function Speech disturbance Autonomic dysfunction Abnormal behaviour Confusion Memory loss and intellectual decline Head injury Headache Seizures Visual loss Cranial nerve palsy and pain Symptoms of cord or nerve root compression Congenital malformations/ syndromes	Head and spine trauma Intracranial and spinal haemorrhage Ischaemia and infarction Venous sinus thrombosis Atheroma and dissection Vascular malformations Brain and spinal cord tumours Dementia and cognitive disorders Chronic neurological disability Motor neuron disease Movement disorders e.g. Parkinson's disease CNS infections e.g. meningitis, encephalitis and abscess Demyelination Neurosarcoid and vasculitis Headache syndromes e.g. migraine Epilepsy Congenital disorders and phakomatoses Myopathies Peripheral neuropathy (acute and chronic) Suspected cord compression & Cauda equina syndrome	Proficient: Head CT for all relevant acute emergency conditions including head injury and CTA for suspected stroke, MRI spine for cord / cauda equina compression Experience: Specialist CT & MRI techniques for the neurological conditions listed Specialist: Cerebral angiography / spinal intervention e.g. facet joint injections, vertebroplasty (See separate curriculum for Interventional Neuroradiology)

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Obstetric and Gynaecological Radiology	Dysfunctional menstrual bleeding Abnormal vaginal bleeding Abdominal/pelvic pain Pelvic mass Abdominal distension Primary and secondary amenorrhoea Abnormal tumour markers Infertility Prolapse symptoms Postpartum complications	Ovarian cysts and tumours Polycystic ovaries Congenital uterine anomalies Uterine tumours Cervical tumours Adenomyosis Endometriosis Pelvic Inflammatory Disease Fallopian tube disease Pelvic floor dysfunction Early pregnancy and complications Ectopic pregnancy Gestational trophoblastic disease Postpartum complications	Proficient: Ultrasound (transabdominal), CT, MRI Experience :Trans-vaginal ultrasound Specialist: Obstetric ultrasound and MRI

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Paediatric Radiology	Abdominal pain, vomiting, mass Cough, breathlessness, wheeze, stridor Precocious/delayed puberty, ambiguous genitalia Failure to thrive Limp Trauma including suspected non accidental injury UTI, haematuria, testicular pain Pelvic pain, mass Headache, diplopia, epilepsy, back pain, paralysis	Acute neonatal and childhood abdominal conditions Acute and chronic chest conditions in neonates and children Cardiac and mediastinal abnormalities Conditions affecting the genitalia Childhood tumours Non-traumatic childhood skeletal conditions Accidental and non accidental injury in children Disorders of the urinary tract Acute neurological conditions Congenital conditions Systemic diseases in children	Proficient: Plain film, ultrasound, CT, MRI Experience: Fluoro- guided contrast procedures of GI and GU tract , radionuclide imaging Specialist: Image guided biopsy, intervention e.g. line insertion

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Thoracic Radiology	Dyspnoea Cough Haemoptysis Chest pain Chest wall mass Hoarseness Stridor/wheeze Thoracic trauma Abnormal lung function tests Incidental lung nodule	Respiratory tract tumours Pleural diseases including pneumothorax Mediastinal and hilar masses Airspace pathology including respiratory infection small airways disease Bronchiectasis Chronic obstructive pulmonary disease Interstitial, inflammatory, granulomatous and autoimmune lung disease Immune mediated respiratory disease Occupational lung disease Cystic lung disease Smoking related disease Pulmonary vascular disease and pulmonary embolism Trauma Acute lung injury/ARDS	Proficient : Plain films, pleural ultrasound, CT including CTPA/ HRCT, US & CT guided drainage of pleural fluid Experience: Image guided biopsy, radionuclide imaging Specialist: MRI /other hybrid imaging/ ablation

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Uroradiology	Haematuria Dysuria Polyuria Proteinuria Loin pain Urosepsis Renal failure Hypertension Micturition difficulties Raised PSA Scrotal pain Scrotal mass Renal and genitourinary trauma	Renal tumour Ureteric/bladder tumour Prostate tumour Testicular tumour Adrenal tumour Acute and chronic renal failure Renal replacement therapies Nephrotic syndrome Urolithiasis Renovascular disease Cystic renal disease Urinary tract infections Urinary tract obstruction Benign prostatic hyperplasia	Proficient: Plain film, Ultrasound, CT, MRI Experience: Fluoro-guided contrast studies of GU tract , radionuclide imaging Specialist: Nephrostomy, antegrade ureteric stent, varicocele embolisation and see IR curriculum
Vascular (Basic)	Painful limb with reduced or absent pulses Pulsatile mass Trauma Haemorrhage Swollen limb	Acute ischaemia Chronic ischaemia Diabetic vasculopathy Aneurysm Vasculitidies AVM Deep venous thrombosis SVC obstruction	Proficient: Plain film, Duplex ultrasound for DVT, CT Angiography Venography and contrast studies of lines Vascular access and basic catheter and guidewire manipulation Experience: CT venography, MRA/ MRV Specialist: See separate IR curriculum

Area	Develop an appropriate imaging strategy for the following presentations	Recognise imaging features of the following conditions	Develop skills in the following imaging modalities and techniques
Haematology & Oncology – not mentioned elsewhere	Anaemia Lymphadenopathy Paraproteinaemia Splenomegaly Weight loss Hypercalcaemia	Haematological malignancies (including lymphomas) Bone marrow failure Haemoglobinopathies Paraneoplastic conditions	Proficient: Plain film, ultrasound, CT, MRI, US/CT guided biopsy
All systems	Incidental findings Post-operative appearances and complications Iatrogenic conditions Post mortem imaging appearances		Experience: PET CT, post-mortem CT

Radionuclide radiology comprises those diagnostic-imaging techniques, which use radio-labelled tracers for diagnosis, while molecular imaging provides images of metabolic and physiological processes at the molecular and cellular level. Techniques utilised in these areas of radiology can be applied to all of the body systems in Table 1, as well as being used to study physiological and metabolic processes at a cellular level. Although access to these procedures may not be available for all trainees, they should demonstrate a basic knowledge of the spectrum of techniques utilised in these areas of radiology and the biological processes in disease that can be probed using these methods. Examples of clinical use of radionuclide imaging, along with an outline of imaging and therapy approaches and the biological processes that can be interrogated using molecular imaging are given in Table 2.

Table 2: Examples of clinical use of radionuclide and molecular imaging

Examples of clinical use of radionuclide imaging	
Staging and response assessment of malignant disease	
Differentiating neurodegenerative disorders	
Parathyroid imaging	
Thyroid imaging and adrenal imaging	
Neuroendocrine tumour imaging	
Sentinel node localisation	
Imaging and therapy approaches	**Biological Processes**
Pharmacokinetics, pharmacodynamics and imaging	Tumour formation
Theranostics	Metabolism
Gene therapy and viral vectors	Cell death
In vitro imaging	Ischaemia
In vivo preclinical imaging	Hypoxia
Receptor imaging	Thrombosis
	Degeneration
	Tissue repair

2.4 Practical procedures

In addition to advising on imaging strategy, there are a number of practical techniques and procedures in which competence should be developed. The extent to which a trainee engages in these procedures will be stage-dependent and range from an awareness of the procedure to independent performance (see Table 8). Table 3 outlines key procedures that trainees are expected to have experience of, however, as with the previous table, these procedures are described at a high level and the table is not intended to provide an exhaustive list of procedures that trainees will encounter.

Table 3: Practical procedures for clinical radiology

Perform the following imaging procedures
Image guided biopsy
Image guided drainage
Image guided vascular access and basic catheter/wire manipulation
Contrast studies of lines and tubes
Contrast studies of the adult and paediatric GI and GU tract

2.5 Breadth of training

2.5.1 Interventional Radiology

Exposure to interventional radiology in general clinical radiology training is vital to enable continued provision of basic image-guided diagnostic and therapeutic intervention where a formal IR service is not available, or to support a formal IR service. Knowledge of IR techniques, including common indications for their use, is also important to allow appropriate informed clinical discussion in a reporting or MDT setting. Some CR trainees may decide to focus on specific IR techniques to supplement their area of special interest. Although this would not lead to an IR specific completion of training, it should be encouraged and supported.

2.5.2 Emerging technologies

Trainees are expected to keep up to date and to embrace and evaluate emerging technologies such as Artificial Intelligence (AI), Machine Learning, Deep Learning and Radiomics, where these act as an adjunct to imaging analysis and interpretation. AI tools are being developed to assist with diagnostic assessments and trainees should be prepared to adapt these tools into clinical practice once validated. This will require consideration of the following:

- basic statistics needed to empower radiologists to be able to design and/or interpret a clinical trial in the workplace, involving the testing of AI software or a scientific hypothesis so as to draw meaningful conclusions
- to be aware of the concepts related to data curation, confidentiality and anonymisation, and regulations concerning use of patient data
- appreciate the role of image annotation, and how annotated images can be harnessed as data for research and clinical care
- understand the basic concepts of radiomics
- understand the meaning, requirements of, and pitfalls inherent in training data, validation data and testing data in developing AI software
- appreciate AI and machine learning terms including: convolutional neural network, random forest, dice index, use case

2.5.3 Emerging imaging techniques

Trainees should be aware of emerging imaging techniques and to undertake training in these techniques where these become available according to their specialist interest. Examples of this include hybrid imaging and CT post mortem scanning. Hybrid imaging in the form of PET/CT is well established in clinical practice and all trainees are expected to have experience of this, but other newer forms of hybrid imaging may evolve into clinical routine. CT post mortem imaging is being performed more frequently and there is likely to be increasing demand for radiologists' skills in interpreting these examinations in future. While core radiology skills can be applied to image analysis in these emerging techniques, trainees should understand that this is not sufficient alone and that specific training in the emerging technique will be required.

2.5.4 Academic training

All trainees are required to demonstrate an understanding of research methodology and critical appraisal linked to clinical practice. There are various ways in which this can be demonstrated. Trainees are required to contribute to a research project during training to gain experience of undertaking research. Alternatively, trainees could, with their educational supervisors, develop a research question and a protocol as a theoretical exercise. All trainees

should develop their critical appraisal skills and regularly appraise and discuss current research papers – for example as part of regular journal clubs.

Trainees may choose to undertake a combined clinical and academic training programme and some trainees may opt to do research leading to a higher degree without being appointed to a formal academic programme. The four nations have different arrangements for academic training and doctors in training should consult their training programme director (TPD) or registrar office for further guidance.

3 Teaching and learning methods

Progression through the programme will be determined by the annual review of competence progression (ARCP) process (see section 4.6) and the training requirements for each indicative year of training are summarised in the progression grids for the generic CiPs, specialty-specific CiPs and critical progression points (see sections 4.3 and 4.4). The successful completion of clinical radiology training 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. Training will normally take place in a range of district general hospitals and teaching hospitals.

The sequence of training should ensure appropriate progression in experience and responsibility. The training to be provided at each training site is defined to ensure that, during the programme, the entire syllabus is covered and also that unnecessary duplication and educationally unrewarding experiences are avoided.

The curriculum will be delivered through a variety of learning experiences and will allow trainees to achieve the capabilities described through a variety of learning methods. There will be a balance of different modes of learning from formal teaching programmes to experiential learning 'on the job'. The proportion of time allocated to different learning methods may vary depending on the nature of the attachment within a rotation. 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 clinical radiological workplace. Rotations should be constructed to enable trainees 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.

3.1 Work-based experimental learning

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

- radiological attachments with gradual reduction in supervision according to increasing competence as judged by trainers (apprenticeship model): Trainees will spend a large proportion of their time involved in supervised radiological practice in a hospital setting. Learning will involve the trainee undertaking an increasing number of radiological tasks in all areas of the imaging department and in other areas where imaging services are provided (e.g. bedside ultrasound).
- multidisciplinary team meetings: These inter-disciplinary meetings provide excellent learning opportunities.

The degree of responsibility taken by the trainee will increase as competency increases. There should be appropriate levels of supervision throughout training with increasing independence and responsibility as learning outcomes are achieved.

3.1.1 Optional work-based experiential learning

Time spent within clinical teams related to a special interest area (e.g. with respiratory physicians to support the trainee's learning of chest radiology) to more fully understand clinical aspects of their work either as a clinical attachment or paired with an appropriate trainee clinician to engage in co-learning, as agreed with clinical supervisors is encouraged.

3.2 Formal postgraduate teaching

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

- a programme of structured, regular teaching sessions to cohorts of trainees
- 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
- attendance at training courses organised on a school or regional basis, which are designed to cover aspects of the training programme outlined in this curriculum

3.3 Independent self-directed learning

Time will be provided during training for personal study, including longer periods offered as part of study leave. Trainees will use this time in a variety of ways depending upon their stage of learning. Suggested activities include:

- preparation for assessment and examinations
- reading, including journals and web-based material
- maintenance of personal portfolio (self-assessment, reflective learning, personal development plan)
- audit, quality improvement and research projects
- achieving personal learning goals beyond normal expectation

3.4 External study courses

Time to be made available for external courses is encouraged, subject to local conditions of service. Examples include management courses and communication courses.

3.5 Learning with peers

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

3.6 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 radiology where simulation can play a useful role in supporting delivery of this curriculum and each training centre is encouraged to incorporate these techniques into the training programme wherever possible.

4 Programme of assessment

4.1 Purpose of assessment

The programme of assessment refers to the integrated framework of exams, 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 at critical progression points, 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 trainees 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 trainees and motivating them to ensure they receive suitable training and experience
- ensure that trainees possess the essential underlying knowledge required for clinical radiology
- assess trainees' actual performance in the workplace
- demonstrate trainees have acquired the GPCs and meet the requirements of GMP
- provide robust, summative evidence that trainees are meeting the curriculum standards during the training programme
- inform the ARCP, identifying any requirements for targeted or additional training where necessary and facilitating decisions regarding progression through the training programme
- identify trainees who may benefit from careers counselling
- recognise and acknowledge the potential for excellence and where trainees are performing over and above expectations for their stage of training

Accountable, professional judgment is central to ensuring that trainees 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.

4.2 Programme of assessment

The programme of assessment is comprised of several different individual types of assessment, covering both summative and formative assessment. Assessment will take place throughout the training programme to allow trainees to continually gather evidence of learning and to provide the formative feedback essential to improving clinical practice. Continuous review and assessment is a fundamental part of clinical radiology training. Radiology trainees are expected to demonstrate improvement and progression during each attachment. It is important that they arrange and undertake assessments in a timely and educationally appropriate manner spread throughout the training year. All assessments, including those conducted in the workplace, 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 many 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, training. The TPD will

ensure that there is a local faculty of trainers capable of building a balanced judgement of a trainee's performance supported by workplace based assessments. Such an approach will prevent any individual having undue influence regarding a trainee's progression.

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

4.3 Assessment of CiPs

Assessment of the CiPs involves looking across a range of key skills and evidence of progress to make an overall judgement about a trainee'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 assessment, supervisors' reports, summative assessment and the trainee's own self assessment via the MSF and reflections entered into the e-portfolio. Assessment of the CiPs, or aspects of the CiPs, should take place throughout training and include formative feedback to the trainee on their performance.

Different scales will be used to assess generic and specialty-specific CiPs, reflecting the need for supervisors to make entrustment decisions about the ability of trainees to take on the particular responsibilities or tasks described in the specialty-specific CiPs, and the level of supervision that they require, as appropriate to their stage of training.

Table 4 shows the scale and descriptors used to assess the generic CiPs and Table 5 shows the scale and descriptors used to asses the specialty specific CiPs.

Table 4: Level descriptors for generic CiPs

Level	Descriptors	
1	**Novice**	requires support and guidance throughout
2	**Developing**	working towards competency, with some support and guidance needed
3	**Capable**	possesses adequate skills to act independently and seeks support and guidance if required
4	**Expert**	highly skilled and able to lead and support others

Table 5: Level descriptors for specialty-specific CiPs

Level	Descriptors	
1	**Entrusted to observe only**	No provision of direct clinical care
2	**Entrusted to act with direct supervision**	The supervising doctor is physically within the hospital or other site of patient care and is immediately available to provide direct supervision. For IR procedures the supervising doctor is present in the operating theatre.
3	**Entrusted to act with indirect/minimal supervision**	The supervising doctor is not physically present within the hospital or other site of patient care, but is immediately available by means of telephone and/or electronic media, to provide advice and can attend physically if required to provide direct supervision. For IR procedures the supervising doctor is on hand in the department.
4	**Entrusted to act unsupervised**	The trainee is working independently and at a level equivalent to a day 1 consultant

The expectations of progress against the CiPs for each stage of training are outlined in the progression grids that make up Table 6 and Table 7. These show the minimum expectation for the end of the named stage of training. Trainees may show progress beyond the level shown for some CiPs and exceptional trainees may show progress beyond the level shown in a number of CiPs. Exceptional performance can be recorded in the clinical and educational supervisors' reports.

Table 6: Progression grid for generic CiPs, showing minimum expected progress at the end of each stage of training

Generic CiP	ST1	ST2	ST3		ST4	ST5	CCT
1. Demonstrate the professional values and behaviours expected of all doctors as outlined in Good medical practice.	4	4	4	Critical progression point	4	4	Critical progression point
2. Successfully function within the health service and healthcare systems in Pakistan.	2	2	2		3	4	
3. Engage in reflection, clinical governance and quality improvement processes to ensure good practice.	2	3	3		3	4	
4. Engage in evidence-based practice and safeguard data, including imaging data.	3	3	3		4	4	
5. Act as a clinical teacher and supervisor.	2	2	3		3	4	
6. Work well within a variety of different teams, communicating effectively with colleagues and demonstrating the skills required to lead a team.	2	3	3		3	4	

Table 7: Progression grid for specialty-specific CiPs, showing minimum expected progress at the end of each stage of training

Specialty Specific CiP	ST1	ST2	ST3		ST4	ST5	CCT
7. Appropriately select and tailor imaging to patient context and the clinical question(s).	2	2	3	Critical progression point	4	4	Critical progression point
8. Provide timely, accurate and clinically useful reports on imaging studies.	2	2	3		3	4	
9. Appropriately manage imaging examination lists/procedures according to clinical need and professional expertise.	2	2	3		3	4	
10. Evaluate image quality and utilise the knowledge of imaging sciences to optimise image quality.	2	2	3		4	4	
11. Safely manage the imaging and image-guided intervention needed to support emergency care.	2	2	2		3	4	
12. Effectively contribute a clinical/imaging opinion to a multidisciplinary team (MDT) meeting.	1	1	2		3	4	

4.4 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 clinical radiology training. Table 8 outlines the key milestones that trainees should accomplish in order to pass these critical progression points, in addition to achievement of the generic and specialty specific CiPs as appropriate for their stage of training (see Table 6 and Table 7).

The first critical progression point will be where trainees transition to special interest training at the end of ST3. Trainees are expected to have met the required levels for the milestones and procedures outlined in Table 8 by the end of ST3 as a minimum; however individual trainees may achieve the required level for some milestones and procedures at an earlier point in training. Ensuring that trainees have met these requirements by the end of ST3 will allow them to progress to special interest or interventional radiology sub-specialty training with appropriate time to develop their specialist skills while maintaining and further developing their general radiology capabilities.

The second critical progression point marks the end of clinical radiology training. Trainees are required to reach level 4 in all generic and specialty-specific CiPs by completion of training.

4.5 Evidence of progress

Radiological practice will be assessed using an integrated package of formative workplace based assessments (WPBAs) and summative examination of knowledge and radiological skills, which will sample across the curriculum. The assessments are supported by structured feedback and are fit for purpose, having undergone evaluation in terms of their feasibility, reliability, validity and reproducibility.

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 for the generic CiPs, specialty-specific CiPs and critical progression points (see sections 4.3 and 4.4). Evidence of progress may also be gathered from other sources and trainees are encouraged to demonstrate their progress against the CiPs in a variety of different ways,

Table 8: Progression grid for critical progression points in clinical radiology training, showing minimum expected progress at the end of each stage of training

Milestones and procedures	ST1	ST2	ST3		ST4	ST5	CCT
Image guided biopsy	1	2	2	Critical progression point	3	4	Critical progression point
Image guided drainage	1	2	2		3	4	
Image guided vascular access and basic catheter/wire manipulation	1	2	2		3	3	
Contrast studies of lines and tubes	2	3	3		4	4	
Contrast studies of the adult and paediatric GI and GU tract	1	2	3		3	4	
Protocol and prioritise imaging referals	1	2	3		4	4	
Independently report emergency dept plain films	2	3	3		4	4	
Manage an ultrasound list to support the acute unselected intake	2	3	3		4	4	
Report CT examinations with remote access to a consultant to support the acute unselected intake	1	2	3		3	4	
Report MRI examinations with remote access to a consultant to support the acute unselected intake	1	2	3		3	4	
MTA			X				
Final MD examination					X		

reflecting their strengths, areas of interest and the resources available to them. The trainee will collect evidence to support their self-assessment, and the educational supervisor will use it to reach a global assessment.

4.5.1 E-portfolio

On enrolling with the MD trainees will be given access to the MD e-portfolio. This is a record of a trainee's development and progress towards achieving the CiPs. All appraisal meetings, personal development plans and WPBAs should be recorded in the e-portfolio. Trainees 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 to work in a range of clinical settings and of satisfactory performance. It will contribute to the educational supervisor's report and ARCP. Successful completion of the curriculum requires evidence, recorded in the e-portfolio, that the trainee has met all of the generic and specialty-specific CiPs.

It is the trainee'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 curriculum. 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 trainee's record of progress through the curriculum, write end-of-attachment appraisals and supervisor's reports.

The university may use the e-portfolio to monitor the progress of trainees for whom they are responsible.

4.5.2 Summative Assessment

There are a number of components to summative assessment in clinical radiology training, which together qualify trainees for the award MD degree of Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU). The MTA examination consists of two modules: Scientific Basis of Imaging and Anatomy. The second examination is divided into written and practical assessment. The Mid-term assessment (Scientific Basis of Imaging module) and Final written Examination test knowledge through multiple choice and single best answer (SBA) questions. The MTA (Anatomy module) tests knowledge by requiring the identification of normal anatomical structures on images. The Final MD practical Examination assesses clinical competence (interpretative, analytical and communication skills).

Those assessment tools which are not identified individually as summative will contribute to summative judgements about a trainee's progress as part of the programme of assessment. A suitable number and range of these will ensure reliable assessment of progress and achieve coverage of the curriculum.

4.5.3 Formative Assessment

Workplace based assessment (WPBA) is the cornerstone of assessment for day-to-day practice. Reflection and feedback is an integral component to all WBPAs 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. Activities to be assessed should be agreed in advance and it is the responsibility of the trainee to arrange this.

In order for trainees 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 trainee 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. Minimum numbers of each type WPBA are given, although it is anticipated that trainees may/ will undertake many more, as the WPBAs are the vehicles by which the trainee will guarantee one-to-one teaching and ensure appropriate curriculum coverage during their clinical attachments.

Multisource 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 trainee, derived from a number of colleagues. For each assessment, the trainee should nominate at least 15 raters. 'Raters' are individuals with whom the trainee works, including supervising consultants, doctors in training more senior than the trainee under assessment and experienced radiographic, nursing or allied health professional colleagues. Raters should be agreed with the educational supervisor at the start of the training year. A minimum of 12 raters must respond to complete the MSF.

The recommended mix of raters/assessors is:

- 2–4 senior doctors
- 2–4 doctors in training
- 2–4 radiographers
- 2–4 nurses/allied health professionals
- 2–4 other team members including clerks, secretaries and auxiliary staff

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

MSF should usually take place once a year (or at appropriate intervals for LTFT trainees), 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, including at least one of consultant level per four month placement. Trainees should agree the timing, problem and assessor, although assessors may also carry out unscheduled assessments. Trainees should receive immediate feedback to aid learning.

Trainees should complete a minimum of six mini-IPXs in each year of training (or equivalent for LTFT trainees). These should be spaced out appropriately, ideally with at least two mini-IPX completed in each post. Mini-IPXs should sample across different clinical radiological problems as summarised in Table 1.

Radiology-direct observation of procedural skills (Rad-DOPS)

A Rad-DOPs is a structured checklist for assessing the interaction of a radiology trainee with the patient when performing a practical procedure. Assessors must be trained both in the procedure and feedback methodology and could include consultants, more senior doctors in training, advanced practitioner radiographers, qualified nurses or allied health professionals. Different assessors should be used for each encounter wherever possible. Trainees should agree the timing, procedure and assessor, although assessors may also carry out unscheduled assessments. Trainees should receive immediate feedback to identify strengths and areas for development.

Trainees should complete a minimum of six Rad-DOPS in each year of training (or equivalent for LTFT trainees), sampling a wide range of different procedures/skills as summarised in Table 3. These should be spaced out appropriately, ideally with at least two Rad-DOPS completed in each post. Rad-DOPS can be undertaken as many times as the trainee and their supervisor feel is necessary and may be used to inform decisions about when a trainee can be regarded as competent to perform a procedure independently.

Teaching observation

The Teaching Observation form is designed to provide structured, formative feedback to trainees on their competence at teaching. It evaluates the competence of a trainee to deliver a teaching episode in a wide variety of settings. Trainees should complete a minimum of two Teaching Observations in each year of training (or equivalent for LTFT trainees), based on any instance of formalised teaching by the trainee, which has been observed by the assessor. The process should be trainee-led (identifying appropriate teaching sessions and assessors).

Quality improvement project and audit assessment tool (QIPAT)

The QIPAT is designed to assess a trainee's competence in completing an audit or quality improvement project. The assessment can be based on review of audit or quality improvement

documentation or on a presentation at a meeting. If possible, the trainee should be assessed on the same audit or quality improvement project by more than one assessor.

All trainees are expected to complete an audit or quality improvement project for each year within the training programme (or equivalent for LTFT trainees). Trainees should show how they have instigated, collated and presented a piece of work, as well as reflected upon any changes in clinical management as a result of work completed.

MDT Assessment (MDTA)

The MDT Assessment Tool is designed to provide feedback on a trainee'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 trainee and providing feedback.

MDTAs are optional for trainees in ST1-ST3; however a minimum of two MDTAs per year is expected in ST4 and ST5.

Reflection and log books

The e-portfolio contains a number of documents to support reflection, including blank reflection forms and templates that provide prompts for different types of reflection. Trainees may set any reflections recorded in the e-portfolio to private so that they can only be viewed by the trainee or make them available to their supervisors on their timeline.

Trainees are also encouraged to keep log books of practical procedures to document the skills and experience attained and to facilitate reflective learning.

Educational supervisor's report

The educational supervisor will periodically (at least annually) draw together the results of a trainee's educational activities to give an overview of their progress in a formal structured educational supervisor's report. The overall judgment of a trainee 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.

4.6 Decisions on progress (ARCP)

Individual progress will be monitored by an annual review, the ARCP. This process should be used to integrate and systematically review evidence about a doctor's performance and progress in a holistic way to facilitate decisions regarding progression through training, as well as identifying any requirements for targetedor additional training where necessary.

The evidence to be reviewed by ARCP panels should be collected in the trainee's e-portfolio. We strongly recommend that trainees have an informal e-portfolio review prior to ARCP, either with their educational supervisor or arranged by their TPD. These provide opportunities for early detection of trainees who are failing to gather the required evidence for ARCP.

In order to guide trainees, supervisors and the ARCP panel has produced an ARCP decision aid which sets out the requirements for a satisfactory ARCP outcome at the end ofeach indicative training year.

Satisfactory progression across all domains within the decision aid will lead to progress into the next year of training (Outcome 1). Unsatisfactory progression will be informed bysome or all of the following (the decision being undertaken by the ARCP panel): lack of curriculum coverage; inadequate or poor outcomes in workplace based assessments and/ or examinations; and areas of concern within the educational supervisor's report. This will result in one of two outcomes:

- conditional progress into the next year of training (Outcome 2): A specific action plan will be formulated with the trainee to redress deficiencies in performance. Progress will be re-assessed as appropriate within the next year of training.
- directed training without progression (Outcome 3): If the trainee is so far short of the objectives for their stage of training such as to prevent them continuing into the next stage of training, directed training is recommended to achieve those objectives. The MD program recommends that repetition of the entire indicative year should only be recommended for exceptional reasons.

4.7 Assessment blueprints

Table 9 shows the possible methods of assessment for each CiP. It is not expected that every method will be used for each competency and additional evidence may be used to help make a judgement on capability.

Table 9: Blueprint of WPBAs and examinations to the generic and specialty-specific CiPs

	MSF	Mini-IPX	Rad-DOPS	Teaching observation	QIPAT	MDTA	Mid term Assessment (scientific basis of imaging module)	Mid Term Assesment (anatomy module)	Final MD written examination	Final MD practical (viva &TOACS) examination
Generic CiPs										
1. Demonstrate the professional values and behaviours expected of all doctors as outlined in Good medical practice.	X	X	X			X				
2. Successfully function within the health service and healthcare systems in Pakistan.	X				X					
3. Engage in reflection, clinical governance and quality improvement processes to ensure good practice.	X				X					
4. Engage in evidence-based practice and safeguard data, including imaging data.	X				X					
5. Act as a clinical teacher and supervisor.	X			X						
6. Work well within a variety of different teams, communicating effectively with colleagues and demonstrating the skills required to lead a team.	X	X	X	X		X				
Specialty Specific CiPs										
7. Appropriately select and tailor imaging to patient context and the clinical question(s).		X	X			X	X	X	X	X
8. Provide timely, accurate and clinically useful reports on imaging studies.		X	X			X		X		X
9. Appropriately manage imaging examination lists/procedures according to clinical need and professional expertise.	X		X						X	X
10. Evaluate image quality and utilise the knowledge of imaging sciences to optimise image quality.		X	X				X		X	X
11. Safely manage the imaging and image-guided intervention needed to support emergency care.	X	X	X						X	X
12. Effectively contribute a clinical/imaging opinion to a multidisciplinary team (MDT) meeting.	X					X				X

5 Supervision and feedback

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

5.1 Feedback

Access to high quality, supportive, timely and constructive feedback is essential for the professional development of the trainee. Trainee 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 trainees are undergoing workplace-based assessments, in the workplace setting, and through discussions with supervisors, trainers, assessors and those within the team. Trainees must develop the ability to seek and respond to feedback on clinical practice from a range of individuals.

Trainers should be supported to deliver valuable and high quality feedback. This can be by providing face to face training to trainers. Trainees would also benefit from such training as they frequently act as assessors to junior doctors, and all involved could also be shown how best to carry out and record reflection.

5.2 Supervision

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

Organisations must make sure that each doctor in training has access to a named clinical supervisor and a named educational supervisor. It is preferred that a trainee has a single named educational supervisor for the duration of training. The clinical supervisor will change for each post and will usually be the consultant to whom a radiology trainee is directly responsible for that post.

The supervisor needs to be formally recognised by the PMC and SZABMU to carry out their roles. It is essential that training in assessment is provided for trainers and trainees inorder 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 clinical radiology can be a difficult transition for trainees. TPDs and trainers are encouraged to offer advice, a mentor system and a counseling service during the year. The following milestones should be acknowledged:

- The trainee should meet with their clinical supervisor, educational supervisor and their TPD at the start of their appointment, and again with their clinical and educational supervisors after three-four months. Some individuals may undertake more than one of these roles simultaneously.
- The trainee's practice must be closely supervised and patient safety is of paramount importance. Such aspects are monitored by the clinical supervisor for each individual post and documented in the e-portfolio. Formal mechanisms for feeding back any concerns raised by the clinical supervisor, to the trainee, and the educational supervisor and TPD, should be in place. There should be a formal mechanism for counselling trainees who are unsuccessful in the First MD Examination.
- All training in postgraduate radiology should be conducted in SZABMU approved locations with appropriate standards of clinical governance and that meet relevant Health and Safety standards for clinical areas.
- Trainees 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 trainee's educational supervisor and the designated clinical governance lead. In keeping with the principles of Good Medical Practice, trainees should know that they must limit their clinical practice to within their level of clinical competence and seek help and support without hesitation.

5.2.1 Clinical supervisor

A clinical supervisor will usually be the consultant to whom a radiology trainee 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 trainee's practice throughout a post and will provide constructive feedback, as well as contributing to the educational supervisor's report.

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 radiology trainees 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 radiology department
- meeting with the radiology trainee at the beginning of each post to discuss what is expected in the post, learning opportunities available and the trainee's learning 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 trainee is appropriate and properly supervised
- ensuring that all training opportunities meet the requirements of equality and diversity legislation
- monitoring, supporting and assessing the radiology trainee's day-to-day clinical and professional work
- providing regular feedback on the trainee's performance
- undertaking and facilitating WPBA

- allowing the trainee to give feedback on the experience, quality of training and supervision provided
- discussing serious concerns with the educational supervisor about a trainee's performance, health or conduct
- meeting with the radiology trainee to assess whether they have met the necessary outcomes and completing an end of post review form for each post

5.2.2 Trainees

Trainees should make the safety of patients their first priority. Furthermore, trainees should not be practising in clinical scenarios which are beyond their experiences and competences without supervision. Trainees should actively devise individual learning goals in discussion with their trainers and should subsequently identify the appropriate opportunities to achieve said learning goals. Trainees would need to plan their WPBAs accordingly to enable their WPBAs to collectively provide a picture of their development during a training period. Trainees should actively seek guidance from their trainers in order to identify the appropriate learning opportunities and plan the appropriate frequencies and types of WPBAs according to their individual learning needs. It is the responsibility of trainees to seek feedback following learning opportunities and WPBAs. Trainees should self-reflect and self-evaluate regularly with the aid of feedback. Furthermore, trainees should formulate action plans with further learning goals in discussion with their trainers.

5.3 Appraisal

A formal process of appraisals and reviews underpins training. This process ensures adequate supervision during training, provides continuity between posts and different supervisors, and is one of the main ways of providing feedback to trainees. Arranging a review is primarily the responsibility of the trainee. All appraisals should be recorded in the e-portfolio.

Annual induction appraisal

When radiology trainees start in a new training year, 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 trainee.

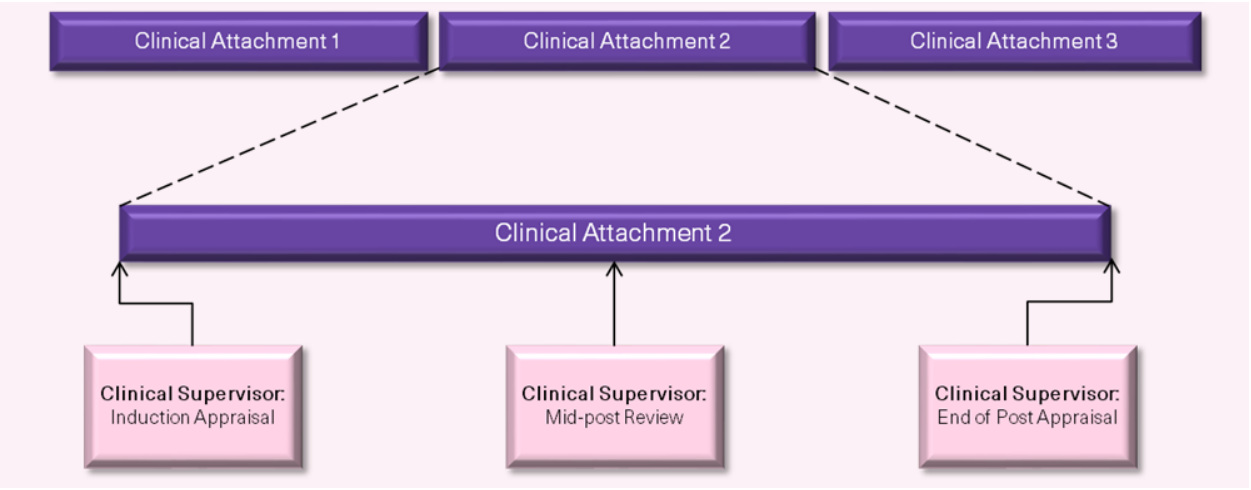
Clinical supervisor: induction appraisal

When radiology trainees start a new post, 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 clinical attachment and be used to inform the (PDP).

Clinical supervisor: mid-post appraisal

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

Figure 3: Appraisal meetings during a single training year



Clinical supervisor: end of post appraisal

Towards the end of a placement, the trainee 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 placement. This process will involve review of comments from colleagues who have observed the doctor's performance in practice and/or in individual assessments. It should detail any outstanding issues that still need to be addressed.

End of training year appraisal

The results of educational activities for an academic year will be drawn together and included in a formal structured educational supervisor's report. This will cover the overall performance of the trainee in each post. The overall judgment of a trainee 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 trainee and the supervisor and recorded in the structured supervisor's report in the e-portfolio.

6 Appendices

6.1 Curriculum development, implementation and review

This curriculum was developed by the HOD Radiology and Curriculum Committee.

6.1.1 Implementation

This curriculum will be implemented in January 2022. All trainees inducted before January 2022, will be continued with the previous pattern.

6.1.2 Intended use

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

6.1.3 Review

The Radiology department is responsible for review of the curriculum. Clinical radiology, as a technology supported specialty, is rapidly changing and evolving and as a result the curriculum is kept under constant review to ensure that radiology training and education reflect modernpractice.

6.2 Quality management

The Registrar office of the University have established appropriate programmes for postgraduate radiological training in centers under its affiliation.

Local evaluation is essential for monitoring the quality of teaching, learning and supervision and developing local implementation. It is the responsibility of individual training programmes to carry out this necessary work, which will provide evidence for training programme development, as well as material with which to respond to the findings of the annual PMC survey.

The Training Program Director (TPD) will typically co-ordinate the evaluation process with administrative support, however anyone involved in the programme will have a contribution to make to its evaluation. Evaluation should be embedded in the training programme as an annual process. The various strands of evidence will need to be summarised, analysed and formulated in time for response to the PMC survey, Registrar office report and recommendations for programme development.

6.3 Equality and diversity

We believe that equality of opportunity is fundamental to all radiological practice and to the many and varied ways in which individuals become involved with the radiological societies, either as membersof staff and Officers; as advisers from the medical profession or in a lay capacity; as members of the professional bodies or as radiologists in training and examination candidates.

The registrar office quality assurance will ensure that each training programme complies with the equality and diversity standards in postgraduate medical training as set by PMC.

Compliance with anti-discriminatory practice will be assured through:

- ensuring trainees have an appropriate, confidential and supportive route to report examples of inappropriate behaviour of a discriminatory nature. The Registrar office must also ensure contingency mechanisms are in place if trainees feel unhappy with the response or uncomfortable with the contact individual.
- monitoring of MD examinations;
- ensuring all assessments discriminate on objective and appropriate criteria and do not unfairly disadvantage trainees. 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 as a radiologist) through reasonable adjustments.