



Standards for the education, training and preceptorship of reporting practitioners in adult chest X-ray

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1 Introduction

Clinical imaging services play a pivotal role in the diagnosis, treatment and monitoring of various disease processes and injuries. Patients are referred to imaging services for assistance in both diagnosis and deciding on the best subsequent management of a patient's condition. Imaging services are therefore vital for the delivery of effective health and social care. Chest radiographs are a high-volume test, with nearly 7 million performed annually in England. Patients who have a chest X-ray (CXR) performed require accurate and timely results.

The value and benefits of effective team working to deliver clinical imaging services are well known. The 2020 Diagnostics: Recovery and Renewal report¹ sets out the principles and arrangements for providing high-quality patient care within multiprofessional teams.

The current document defines the education and training required for all members of the multiprofessional team who report CXRs within a clinical imaging service. It is expected that other CXR reporters operating outside of a clinical imaging service should follow the same standards for education and training to ensure that they are trained to the same level of overall competence.

Any practitioner who is reporting an adult CXR formally should fulfil the criteria in this document.

Aims

- This document is aimed at reporting practitioners, their trainers and employers.
- The document is intended as a framework to structure learning, guide education and training provision and to support practitioners to deliver safe and sustainable clinical practice.

2 Learning outcomes

All programmes of education for adult CXR reporting should be based around the same overall aim: to produce competent, safe, and reflective reporting practitioners with the knowledge, understanding and ability to interpret and report CXR findings within their scope of practice.

The learning outcomes are separated into generic outcomes that apply to all healthcare professionals and those that are specific to CXR reporting.

A. Generic outcomes

By the end of the programme of training, learners should be able to:

1. Successfully function as part of the imaging department team under the supervision of a relevant specialist.
 2. Engage in evidence-based practice and evaluate research.
 3. Mentor, support and provide teaching within their scope of practice to other members of the imaging department.
 4. Communicate clearly, effectively and appropriately with patients, carers and other healthcare professionals.
 5. Recognise their limitations of practice and know when to consult other senior colleagues, including relevant specialist radiologists.
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6. Engage in critical reflection, clinical governance and quality improvement processes, including audit and self-audit.
7. Ensure that information governance processes are adhered to and safeguard data, including imaging data.
8. Undertake quality management relating to reporting equipment and new technology including artificial intelligence (AI).

B. CXR reporting outcomes

By the end of the programme of training, learners should be able to:

1. Critically appraise pathologies visible on chest radiographs enabling differentiation between normal and abnormal appearances.
2. Critically evaluate the clinical patterns of disease in chest radiographs and identify, if necessary, any further radiological investigation required, in accordance with locally agreed protocols.
3. Critically appraise the role of imaging in the diagnostic workup and treatment planning process, as well as its place in local or national diagnostic imaging pathways where appropriate. Understand the limitations of chest radiographs in certain clinical scenarios.
4. Provide timely, accurate and clinically useful reports of chest radiographs to answer the clinical question. Be able to distinguish between emergency, urgent and routine findings.²
5. Assess critically the implications of reporting errors in chest radiographs and the impact they may have on patient care, including the duty of candour required from clinicians in the event of an error.³ This includes knowledge of the legal and ethical considerations involved in reporting errors, as well as strategies for preventing errors and mitigating their impact.
6. Acknowledge professional limitations and the importance of seeking assistance from a consultant radiologist in complex cases, including how to communicate findings effectively to ensure proper patient care and where there is previous non-radiograph thoracic imaging for comparison.
7. Recommend follow-up imaging where appropriate, including discussion with a radiologist where any possible follow-up imaging falls outside of their scope of practice.
8. Demonstrate critical awareness of the importance of ongoing professional development and collaboration between healthcare professionals to optimise patient care.

3 Learning and teaching strategies

In 2022 a joint publication from The Royal College of Radiologists (RCR) and College of Radiographers (CoR) defined the recommended structure and design for education programmes that set the standards for reporting of musculoskeletal (MSK) radiographs.⁴ These recommendations should also be applied to the programmes for reporting chest radiographs to ensure that learners are able to demonstrate achievement of the required learning outcomes. Delivery of education and training for reporting practitioners working within a clinical imaging service should be undertaken by CoR-approved higher education institutions (HEIs), in collaboration with local or regional Advancing Practice faculties, or their equivalents in the devolved nations, and the clinical radiology training programmes

approved by the General Medical Council (GMC) and overseen by the postgraduate deans. Education and training for reporting practitioners working outside of clinical imaging services is the responsibility of the equivalent organisation for that profession.

All programmes should:

- Be supported with input from local imaging departments and imaging academies in the development of programmes, provision of resources and delivery of teaching.
- Utilise remote and online learning to ensure a wide range of educational resources are available to learners.
- Include theory-based and experiential learning within clinical workplace training.
- Be structured to enable learners to access the full range of educational and training opportunities available with robust quality assurance processes in place to ensure consistent implementation of the standards outlined in this document.
- Allow learners to progress in experience and responsibility and ensure that all learning outcomes are covered across the duration of the programme.
- Have a named workplace-based supervisor responsible for monitoring individual overall progress through the programme of training and into a period of preceptorship where relevant.

Supervisors are encouraged to identify learner-centred educational opportunities in the course of clinical work by helping to facilitate access to the wide variety of learning opportunities available in the clinical imaging workplace.

Learning methods will be varied and may include work-based experiential learning, remote and online learning, formal postgraduate teaching, independent self-directed learning, external study courses, learning with peers and simulation as appropriate to the individual programme and learner need.

4 Indicative assessment

A. Summative assessment

Appendix 1 provides a list of pathologies and variants which practitioners reporting on CXR should be able to identify. This list is not exhaustive

For the summative assessment, 100 cases are considered appropriate and should include abnormalities listed in Appendix 1. There should be an approximate 30 to 70 normal to abnormal ratio with variants included in the normal cases.

The pass mark is 90%.

The report should use appropriate terminology, as referenced in the Fleischner Society: Glossary of Terms for Thoracic Imaging.⁵

For abnormal cases, the report should indicate a definite diagnosis where appropriate and/or a differential if applicable. If appropriate, the report may also include recommendations for further imaging.

B. Workplace-based assessment

Training programmes should include a range of formative assessments to provide an overview of day-to-day practice. The formative assessments should be considered developmental and an opportunity for learning and two-way feedback. Formative assessments may also be referred to as workplace-based assessments (WPBAs) or supervised learning events (SLEs). For radiologists and other medical specialties that report chest plain radiographs, GMC-approved curricula define the range and requirements of WPBAs or SLEs. The RCR provides guidance on assessment that supplements GMC requirements (see www.rcr.ac.uk/clinical-radiology/specialty-training/curriculum/assessment).

Trainee reporting practitioners should be assigned a workplace-based mentor to provide tutorial support and guidance. This may be a consultant radiographer, experienced chest reporting radiographer, consultant radiologist or SAS doctor.* Tutorials should include consideration of patient pathways and onward patient management related to chest imaging. The tutorials should be seen as central elements to the training programme and structured with guidance from the relevant higher education institution.

Formative assessment for CoR-approved courses should follow the Quality Assurance Agency for Higher Education requirements for Masters level programmes (see www.qaa.ac.uk); WPBAs should include a record of practice CXR reports that have subsequently been compared with the definitive report. An appropriate percentage of these reports should be assessed by the workplace mentor.

To meet the requirements of the training programmes, practitioners should be allocated a minimum of two half days per week for reporting and other related workplace-based activities (for example, attendance at multidisciplinary team (MDT) meetings and mentored tutorials). This is in addition to private study and additional reporting time.

Other formative assignments may include a range of written and oral presentations, case studies, reflective assignment and image-based tests, albeit this list is not prescriptive or exhaustive.

All assessments, including those conducted in the workplace, should be mapped to the relevant learning outcomes described in this document.

Reflection and feedback are an integral component of all formative assessments, to enhance and drive learning. The assessments provide opportunities for trainees to identify strengths and areas for further development. For trainees to maximise benefit, reflection and feedback should take place as soon as possible after a formative assessment. Feedback should be of high quality and should include an action plan for future development.

The decision about the competency of a practitioner to provide clinical reports is informed by the summative assessments carried out at HEIs (MSc level module) including final image-based examination and other academic modules, followed by a period of preceptorship in clinical practice. Following confirmation of initial competency, regular peer review audit provides reassurance and identifies any areas of concern.

* Where we refer to SAS doctors in this document, we are referring to Specialty Doctors and Specialists, as well as doctors employed on what have previously been known as Staff and Associate Specialist grades.

C. Preceptorship

Preceptorship offers an additional supported opportunity for reporting practitioners to continue to develop skills and knowledge associated with clinical discussion and safe practice. Regular reporting sessions enable reporting practitioners to maintain competence and help build capacity and are likely to assist in increasing reporting output as experience is gained.

It is considered best practice that reporting practitioners have an up-to-date job plan in place. The job plan should include reporting and development time. Reporting practitioners may be employed in enhanced, advanced or consultant-level practitioner roles.⁶ According to the individual's level of practice, job plans should include time allocated for direct clinical care, supporting professional activities, additional NHS/trust responsibilities and relevant external duties.⁷

CXR reporting practitioners should:

- Be able to apply the notification and escalation of serious and unexpected findings²
- Participate in peer learning and radiology event and learning meetings (REALMs)⁸
- Have ongoing continuing professional development and annual appraisal.

All clinical reports for imaging investigations must be both diagnostic and actionable, regardless of the practitioner who provides the report. To streamline patient pathways, further imaging or referral to appropriate clinical services may be required, for example computed tomography (CT) chest for a chest radiograph suspicious of lung cancer, or emergency referral for acute traumatic pathology. Reporting practitioners should acknowledge professional limitations and the importance of seeking assistance from a consultant radiologist in complex cases. This may include communicating findings effectively to ensure proper patient care and review of previous non-radiograph thoracic imaging for comparison. Reporting practitioners should suggest follow-up imaging where appropriate, including discussion with a radiologist where any possible follow-up imaging falls outside of their scope of practice.

A preceptorship period should occur to assist in the transition to practice following each postgraduate qualification, new employment or return to practice from extended leave (a period of more than 12 months). A named clinical supervisor (either a consultant radiologist, SAS doctor or consultant reporting radiographer) should be provided to support the reporting practitioner and a period of double-reporting should be embedded. Optimal use of double-reporting is for one-to-one case-based discussion between preceptor and supervisor, but it is recognised that this is not always possible. The minimum expected hours for one-to-one mentorship with clinical supervision to review reports is 25 hours within a 12-month period. If there is a significant discrepancy between the provisional and final report, it is the responsibility of the supervisor to communicate with the reporting practitioner and the referring team.

The trust or health board should give time for the clinical supervisor to provide mentorship or supervision as detailed above and in the RCR job planning guidance.⁹ The reporting practitioner should be given time for the preceptorship and this needs to be included within job plans. A minimum of **400** consecutive reports, to include the spectrum of referral sources (primary care, emergency, inpatient, outpatient), should be double-reported by the newly qualified CXR reporting practitioner and a clinical supervisor. For qualified

reporting practitioners returning from extended leave,¹⁰ with a new employer or where a new referral source is added (for example primary care), **100** consecutive reports should be double-reported. If all the above has been reached then the preceptorship ends when the preceptor, named clinical mentor and leadership team agree that the reporting standards have been achieved.

Upon successful completion of the preceptorship period, there should be written evidence of completion and development into the full reporting practitioner role:

- True positive/true negative/false positive/false negative should be the outcome measure for reports reviewed within the preceptorship period.
- A 'good spot' flag should be included to reinforce a positive learning culture.
- The source of discrepancy (observational/interpretational/further recommendations and communication) should be recorded.
- Double reports should be recorded in a consistent template and included after self-reflection in annual appraisal.
- The minimum achievement required to complete preceptorship is 90% correct. Where that is not achieved then tailored learning sessions should be instigated with collaboration between preceptee and preceptor prior to reassessment.

Ongoing practice to maintain reporting quality

Evidence suggests a positive association between the annual volume of cases reported by practitioners and accuracy. In recognition of this, the Accelerate, Coordinate, Evaluate (ACE) Programme for lung cancer recommends a minimum weekly volume of two sessions of reporting of chest imaging for all practitioners.* The RCR's *Radiology reporting figures for service planning*¹¹ guidance can be used to inform job planning and resource allocation within trusts and health boards; particularly close attention should be paid to those reporting practitioners who have volumes of fewer than two sessions of weekly reporting. The number of cases reported by individual reporting practitioners will be collated on a rolling 12-month basis. Quarterly volumes will be used to estimate annual volume. Reporting practitioners who have an annual volume of fewer than two sessions per week should undergo a preceptorship of 100 consecutive cases double-reported in addition to routine peer review.

It is highly recommended that trusts and health boards adhere to the imaging reporting policy outlined in the guidelines, protocols, and clinical safety section of the *Quality Standard for Imaging*¹² document. It specifies that the reporting policy should cover certain indicative inputs which have been listed in Appendix 2.

* Allow 2,000 reports per year (we also suggested 2,000 MSK reports) – 50 per session × 2 per week × 40 weeks = 4,000 (2,000 CXR/MSK).

Disclaimer

This document is neither exhaustive nor immutable. Training and safe clinical practice should be tailored to individual and clinical needs, ensuring parity in outcome through a national standard.

This document cannot be expected to guarantee clinical competence or define scope of practice (which is defined by the employer). It must be supported by individual reflective practice, a period of preceptorship and ongoing clinical oversight. Ongoing feedback should be both radiological and clinical, including access to REALMs and supportive colleagues.

Appendix 1

The list provided is not exhaustive.

Lung

Variants

- Dextrocardia (with and without *Situs inversus*)
- Azygous lobe
- Right-sided arch
- Left superior vena cava
- Bifid ribs

Infection

- Tuberculosis including bronchopneumonia and military presentations
- Covid 19 pneumonitis
- Fungal infection including invasive pulmonary aspergillosis and aspergilloma
- Lobar pneumonia
- Atypical pneumonia
- Bronchopneumonia
- Aspiration pneumonia
- Septic emboli
- Opportunistic infection (eg pneumocystis jiroveci pneumonia)
- Abscess

Inflammation/autoimmune

- Vasculitis (granulomatosis with polyangitis), pulmonary eosinophilia, cryptogenic organising pneumonia, infarction from pulmonary embolism

Obstructive lung disease and airway abnormality

- Smoking-related emphysema, lower lobe emphysema (alpha 1 anti-trypsin deficiency)
- Cystic fibrosis
- Asthma and complications
- Bronchiectasis
- Bullae
- Unilateral lung hyperlucency (post-infectious obliterative bronchiolitis, bronchial atresia, aspirated foreign body)

Diffuse and interstitial lung disease

- Interstitial fibrosis
 - Cystic lung disease (eg lymphangiomyomatosis and pulmonary Langerhans cell histiocytosis)
 - Pneumoconiosis and progressive massive fibrosis, asbestos-related lung disease
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- Sarcoidosis including examples of intrathoracic adenopathy, parenchymal disease with nodules and/or lung fibrosis
- Hypersensitivity pneumonitis
- Vaping-related lung disease
- Diffuse alveolar damage

Cardiac and vascular

- Heart failure (subtle septal thickening to gross pulmonary oedema)
- Interstitial pulmonary oedema, alveolar pulmonary oedema, upper lobe blood diversion
- Cardiac chamber enlargement (eg left atrial dilatation)
- Pericardium; effusion, calcification, pneumopericardium
- Aortic dilatation and aortic aneurysm
- Cardiac shunt (eg atrial septal defect)
- Calcified left ventricular aneurysm
- Calcification of the mitral annulus
- Arterio-venous malformation

Devices and lines

- Vascular line placement-tip position and complications
- Cardiac devices – position and complications (acute as well as chronic complications such as lead migration and fracture):
 - Pacemakers, implantable cardioverter-defibrillators; according to local institutional protocol may also be involved in CXR assessment prior to magnetic resonance imaging (MRI) (eg ensure no lead migration or fracture prior to MRI)
 - Closure devices – atrial septal defect/patent foramen ovale, left atrial appendage occlusion device
 - Mechanical prosthetic valves including transcatheter aortic valve implantation
- Nasogastric tube correct and misplaced (never event)¹³
- Chest drains correct and misplaced
- Endotracheal tube

Hilar abnormality

- Dilatation of proximal pulmonary artery (differential diagnosis: hilar lymphadenopathy) to pick up pulmonary hypertension
- Bilateral adenopathy; sarcoidosis, tuberculosis, malignancy
- Unilateral adenopathy; malignancy
- Pulmonary arterial hypertension

Mediastinal abnormality

- Anterior, middle and posterior mass lesions
- Aortic aneurysm

Pleural abnormality

- Simple unilateral effusion on supine and erect X-ray
- Loculated/complex effusion
- Bilateral effusions
- Supine pleural effusion
- Subpulmonic effusion
- Smooth pleural thickening
- Nodular pleural thickening
- Asbestos-related pleural disease; pleural plaque and diffuse pleural disease
- Empyema
- Diffuse pleural calcification
- Pleural tumours

Trauma and emergency

- Pneumothorax; tension and non-tension
- Pneumothorax and pleural fluid on supine X-ray
- Pneumo-mediastinum, surgical emphysema
- Haemothorax
- Hydropneumothorax
- Diaphragmatic rupture
- Subphrenic gas
- Pneumopericardium
- Lung contusion
- Aspiration
- Aortic dissection/transection
- Oesophageal rupture
- Non-cardiogenic pulmonary oedema
- Musculoskeletal injury; ribs, spine, clavicles and shoulders
- Aspirated foreign body
- Acute respiratory distress syndrome

Lung malignancy and benign nodules

- Lung and lobar collapse
- Lung nodule/mass in a location commonly missed (eg behind heart, first rib, hilar region)
- Hilar, mediastinal adenopathy
- Adenocarcinoma presenting as consolidation
- Lymphangitis carcinomatosa
- Lung metastases

- Malignant pleural disease
- Benign lung nodules including hamartoma and calcified granuloma

Post-surgical or intervention

- Vats procedure
- Lobectomy – distinguish between lobar collapse and lobectomy
- Pneumonectomy
- Lung transplant
- Gastric pull-up (oesophagogastrectomy)
- Post-tuberculosis treatment (thoracoplasty, plombage)
- Radiotherapy
- Pleurodesis

Extrathoracic abnormalities

- Hiatus hernia
- Gastric obstruction
- Pectus excavatum
- Mastectomy
- Diaphragmatic eventration
- Diaphragmatic elevation
- Diaphragmatic hernia

Subphrenic abnormalities

- Obstructed or dilated bowel
- Pneumoperitoneum

MSK abnormalities

- Benign and malignant bone lesions; spine, ribs, shoulders, clavicles and humeri
- Bone injury (see trauma section)
- Scoliosis
- Osteoporosis
- Osteomalacia and vitamin D deficiency
- Renal bone disease
- Congenital bone anomalies

Appendix 2

- a. Roles, responsibilities and scope
- b. Agreed reporting KPIs
- c. Agreed reporting formats
- d. A system to assure quality, accuracy and verification of reports
- e. Preliminary clinical evaluation
- f. A system to ensure amendments are issued within specified timescales (when required)
- g. Further imaging, linking to REALMs
- h. Peer review of reporting
- i. Access to a second opinion
- j. Agreed communication of reports.

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