Information Management and Technology: further advice and guidance on curriculum

The Society and College of Radiographers is pleased it publish this advice and guidance document which has been prepared by members of the Information Management and Technology (IM&T) Group to provide additional information on the knowledge and understanding needed by the radiography workforce in order to meet the demands of working in an environment where technology and information management systems are ever more complex.

This document builds on the information given in the   Learning and Development Framework for Clinical Imaging and Oncology, (SCoR September 2007) the relevant section of which is reproduced in Appendix A.

The IM&T group has expanded and developed the information given in the Learning and Development Framework and has provided a body of knowledge pertinent to IM&T issues. This is intended to   fulfill three functions:

1. to support education providers in delivering both pre-and post –registration courses.
2. to meet the proficiency requirements set by the Health Professions Council (HPC)
3. to provide further information on the information technology (IT) skills and knowledge needed by the radiography workforce.

Whilst SCoR would not wish to be prescriptive as to the curricular content of pre- and post-registration courses, we would consider the additional information contained within Appendices B and C to be a useful and practical aid to education providers.

Whilst clearly there is scope for differing levels of detail to be taught to different staff groups, there has been no distinction drawn in this document between radiographers at any level or assistant practitioners. This is partly because of the brevity of this document and partly a reflection of how levels of information technology skills may not be linked to levels of practice. Hence, it is possible, in some circumstances, to have a higher requirement of knowledge and understanding of an assistant practitioner, for example, compared to an advanced practitioner.

Appendix B addresses 'generic' IT skills and knowledge which are applicable to both diagnostic and therapeutic radiographers. Additionally there is consideration of the changes in imaging (projection radiography) used currently in both radiotherapy and diagnostic imaging departments and this is described in Appendix C.

Finally, in such a fast moving environment there needs to be a cautionary note: the illustrative content given in Appendices B and C will need constant updating and adjustment to meet the needs of future developments and whilst every attempt has been made to be up to date, education providers will wish to adjust to further changes as and when they emerge.

Bibliography & References

College of Radiographers The Learning and Development Framework for Clinical Imaging and Oncology (SCoR September 2007)

International Commission on Radiological Protection (2004) Managing Patient Dose in Digital Radiology: Publication 93, Annals of the ICRP 34 (1) pp1-20 [Online]
http://www.icrp.org/docs/ICRP_93_digital_educational_version_20April04.pdf

College of Radiographers Information Management and Technology: Implications for the Radiography Workforce (College of Radiographers, London. January 2006)

Quality Assurance Agency, (2001) Radiography benchmark statements, Quality Assurance Agency [Online] http://www.qaa.ac.uk/academicinfrastructure/benchmark/default.asp

Health Professions Council, (2007) Standards of proficiency: radiographers, Health Professions Council, London [Online] http://www.hpc-uk.org/assets/documents/10000DBDStandards_of_Proficiency_Radiographers.pdf
(Extract – Appendix 1)

A Handbook of Ethics for Health Informatics Professionals
(http://www.bcs.org/upload/pdf/handbookethics.pdf)

Essential IT Skills NHS Health (covering NHS Elite and NHS Health Programmes)
http://www.connectingforhealth.nhs.uk/systemsandservices/etd/eits

RCR SCoR IPEM Treatment Verification Guidelines (awaiting publication)

INFORMATION MANAGEMENT AND TECHNOLOGY

FROM Learning and Development Framework for Clinical Imaging and Oncology, SCoR September 2007

Illustrative content
- Computer technology and keyboard skills
- Electronic patient records
- Legal requirements relating to record keeping (data protection legislation)
- Information management and retrieval systems
- Data manipulation
- Data interpretation
- Security of data
- Health informatics
- Recognise, capture, evaluate and apply information
- Presentation skills
- Complete relevant mandatory local and/or national training e.g., European Computer Driving Licence (ECDL)

Levels of knowledge and understanding
Should be sufficient to enable the:
Assistant practitioner to record and retrieve data that has been personally generated in line with protocol and legal requirements.
Practitioner to take responsibility for data processing and storage related to own scope of practice within an ethical and legal framework.
Advanced practitioner, within the area of individual practice/expertise, to generate information from stored data and to manipulate data in different formats for use across professional and/or organisational boundaries in line with relevant ethical and legal frameworks and contributing to the integration of health and social care systems.
Consultant practitioner, within the area of individual practice/expertise, to be accountable for the design and development of information technology systems to meet service, ethical and legal specifications and to meet the needs of the integrated health and social care economy.

IM&T CURRICULUM REQUIREMENTS FOR DIAGNOSTIC AND THERAPEUTIC RADIOGRAPHY

The vast majority of the skills listed 1-7 below are contained within the European Computer Driving Licence (ECDL) – a widely available generic IT qualification. It is also well covered by the Essential IT Skills NHS Elite Manual which recently replaced ECDL as the recommended qualification for NHS Staff.

Skills numbered 8 &9 are also contained within the Essential IT Skills NHS Health Manual

	SKILL	• ILLUSTRATIVE CONTENT	KNOWLEDGE AND UNDERSTANDING	HPC Proficiency
1	Basic Concepts of IT	• Hardware & software components of a PC that are suitable for general applications (e.g. word processing, internet access) • Purpose of the following hardware items; hard drive, RAM, keyboard, mouse, USB port etc • Health and safety issues relating to the safe and efficient use of a PC • Mechanisms by which a PC can be protected from viruses	Will be able to: • Confidently use a Windows environment • For common plug & play hardware, set up components such that the PC works correctly • Install and use anti-virus and spyware software.	
2	Using the computer & managing files	• Purpose of a folder and sub-folder structure • Common file types, identifiers eg.doc, .ppt , .jpg & naming conventions	Will be able to: • Save files into a logical sub-folder structure • Manage saved files, including deletion and un-deletion.	
3	Word	• Purposes for which word processing software	Will be able to:	

	Processing	can be used.	• Use a word processor competently and confidently for construction of documents e.g. patient letters, departmental protocols, essays	
4	Spreadsheets	• Purposes for which spreadsheets can be used. • Data verification – during and after entry	Will be able to: • Create a simple spreadsheet • Enter data into spreadsheets • Create simple charts using spreadsheet data.	
5	Databases	• Purposes for which a database might be used • Reasons why databases are used in healthcare • Clinical data entry points and technologies e.g. bar codes.	Will be able to: • Create a simple database • Enter data into a database • Enter & retrieve data in commonly used clinical databases	
6	Presentation	• Purposes for which presentation packages might be used in healthcare	Will be able to • Create a simple presentation using MS PowerPoint • Use a simple PowerPoint presentation with a small audience	1B3
7	Information and Communication/ Internet	• Uses and limitations of email and internet technologies in healthcare. • Usage of internet and intranets within healthcare • Data protection measures applicable to network transmission • Internet sources of healthcare information e.g. Departments of Health, Medline	Will be able to: • Competently and confidently use an email package to transmit and receive information • Competently and confidently use a common internet search engine to access health information in support of continuing professional development.	1B3, 1A8
8	Professional Responsibilities	• Exercising professional judgement with respect to data quality and record keeping, confidentiality, access and security • Contributing to a multi-disciplinary team – e.g. reporting equipment failure, correcting data	Will be able to: • Demonstrate safe, auditable use of clinical systems in support of patient care	1B2, 2B5

		inaccuracies		
9	Data Concepts	• Concepts of data quality, including completeness, accuracy, source and timeliness • Concepts and common mechanisms associated with data integrity and security • Secondary uses of clinical data principles of archival and retrieval as used in common healthcare systems • Common mechanisms for transfer of data – their risks and benefits	Will be able to: • Demonstrate safe, auditable use of clinical information systems in support of patient care	1, 2B5
10	Clinical Information Systems	• Overview of common clinical information systems, logical architecture & interactions, including but not limited to; patient administration systems (PAS), patient master index (PMI), scheduling and information systems, electronic requesting, results reporting, choose & book • Principles of information handling during system failure and downtime events	Will be able to: • Demonstrate safe use of clinical information systems. • Understand the need for accurate, complete and timely information • Undertake safe practice in cases of system failure and restoration	
11	Radiology/ radiotherapy Information Systems (RIS)	• Explain role of information systems in supporting departmental functions such as scheduling, storage of exam or treatment information, storage of patient information, provision of management information, Principles of links to systems PAS/PMI, Order communications, results reporting & PACS	Will be able to: • Show safe use of clinical information systems.	

| 12 | Picture Archiving and Communications Systems (PACS) & teleradiology systems | • Principles of digital image storage, distribution & viewing
• Responsible use of equipment & resources
• Overview of PACS components – monitors, networks, storage, database, interfaces and modality links.
• Common types of image display devices monitors, projectors. Give an overview of Royal College of Radiologists (RCR) monitor specification guidelines, Quality assurance of monitors.
• Explain why it may be necessary to manipulate image data and the risks associated with it.
• List common examples of image manipulation, their use, and the modalities they are associated with – hanging protocols, contrast, brightness, sharpening, video inversion generation of 'new' images from original datasets, maximum intensity projection, multi planar reformatting, colour scale manipulation | Will be able to:
• Demonstrate safe and confident use of PACS and teleradiology to store and distribute images to appropriate clinicians.
• Basic system troubleshooting and business continuity in case of system failure | 1A7 |
| 13 | Imaging Workstations | • Understanding of role of specialist image handling workstation, relationships to modalities and PACS systems.
• List advantages and disadvantages of their use | Will be able to:
• Demonstrate safe and confident use of specialist imaging workstations with respect to production, reporting, storage and distribution of common radiological images. Within radiotherapy to demonstrate safe and confident use of specialist imaging workstations for Image Guided Radiotherapy (IGRT). | |

IM&T CURRICULUM REQUIREMENTS FOR PROJECTION RADIOGRAPHY

Over the last 3 years PACS and digital acquisition technologies for projection radiography have become commonplace in both radiotherapy and diagnostic imaging departments across the UK. Although the NHS in England has probably seen the most rapid progress, there has also been considerable progress across the whole of the UK. The private sector also is investing heavily, to bring their systems up to date. The majority of radiographers are now using these technologies in filmless working environments, and it can safely be assumed that this situation will extend until those using conventional film based techniques form a very small minority.

This statement is not yet true of Mammography but Full Digital Dimension Measurement (FDDM) technology is maturing rapidly, and this situation can be expected to change over the next 5-10 years

The Learning and Development Framework for Clinical Imaging and Oncology (SCoR September 2007) states the outcomes to be achieved for imaging within the section on physical science and technology. Given the change in technologies described above, it would seem appropriate to move towards a focus on digital acquisition technologies and filmless working.

	SUBJECT AREA	ILLUSTRATIVE CONTENT	KNOWLEDGE & UNDERSTANDING	HPC Proficiency
1	Image characteristics	• Noise, contrast, sharpness, resolution, and the radiographic & technological factors affecting them.	Will be able to: • Undertake competent objective assessment of images produced and their fitness for purpose • Identify adjustments of radiographic technique for optimum image quality	

2	Radiation Field incident on the detector	• Subject contrast, beam geometry, scatter	Will be able to: • Undertake competent objective assessment of clinical images produced and their fitness for purpose • Identify adjustments of radiographic technique for optimum image quality	
3	Perception & interpretation of images	• Physiology of the human imaging system • Psychology of vision • The moving image	Will be able to: • Undertake objective assessment of clinical images produced and their fitness for purpose	
4	Analogue to digital conversion	• Aspect ratios, matrix and bit depth and their effect on image appearance, file size and grey scale. Histogram analysis, look-up tables	Will be able to: • Identify limitations of specific imaging devices to ensure fitness for clinical purpose	
5	Receptors	• Latent image formation in projection radiography and fluoroscopy • Sensitometry – exposure-response relationships, detective quantum efficiency (DQE), cassette construction & care • Receptor construction & care	Will be able to: • Identify limitations of specific imaging devices to ensure fitness for clinical purpose • Use imaging equipment safely to ensure fitness for clinical purpose, reduction of wear & tear and avoidance of damage	
6	Image plate (IP) readers	• IP transport, flying spot reader configurations, scanline configurations, IP erasure	Will be able to: • Safely use imaging equipment to ensure fitness for clinical purpose, reduction of wear & tear and avoidance of damage	

7	Presentation & viewing of radiographs	• Monitor specification and calibration, software toolset and environmental conditions e.g. lighting, and their effect on viewers' ability to assess and interpret images. • Importance of viewing images with optimal spatial & contrast resolution. • Archival of an image that represents a true record of initial diagnosis • Data to be recorded with image, annotations, hanging protocols, image display devices e.g. monitors, projectors, RCR monitor specification guidelines, QA of monitors. • Workflow and placement of devices within exam rooms and viewing areas, lighting and noise	Will be able to: • Safely use imaging equipment to ensure fitness for clinical purpose, • Identify limitations of specific imaging devices to ensure fitness for clinical purpose	3A1
8	Factors affecting the radiographic image	• Factors governing exposure factor selection (FSS, kV, SID etc) • Appearance and sources of common image distortions & artifacts • Scatter reduction	Will be able to: • Safely use imaging equipment to ensure fitness for clinical purpose, • Identify limitations of specific imaging devices to ensure fitness for clinical purpose	3A1

9	Exposure & Dose	• Radiation dosimetry and its relationship to exposure indices	Will be able to: • Understand the significance and action thresholds associated with exposure indices. • Act in accordance with local procedures with respect to adverse incidents.	3A1
10	QA & Audit	• Roles of personnel and tasks associated with IPEM 91 • Fault reporting • Reject analysis programme for projection radiographs • Continuous dose audit	Will be able to: • Ensure all imaging equipment is maintained fit for purpose.	2C2

APPENDIX D

The following is an extract from the recent Health Professions Council (HPC) Proficiencies (2007) documentation. Although many aspects of the professional practice of radiographers require knowledge, skill or appreciation of Information Management and Technology (IM&T) the HPC has directly highlighted these proficiencies which are directly based on IM&T (Table 1)

Proficiency
1a.3 Understand the importance of and be able to maintain confidentiality
2a.1 Be able to gather appropriate information
2b.2.1 Demonstrate a level of skill in the use of information technology appropriate to their profession
2b.4 be able to conduct appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely and skillfully
2b.4.6 Be able to operate radiotherapy or diagnostic imaging equipment safely and accurately
2b.4.7 Be able to check that equipment is functioning accurately and within the specifications, and to take appropriate action in the case of faulty functioning and operation
2b.4.15 Be able to manipulate exposure and image recording parameters to optimal effect
2b.4.16 Be able to use to best effect the processing and related technology supporting film-based and computer-based imaging systems
2b.5 be able to maintain records appropriately
2b.5.1 Be able to keep accurate, legible records and recognise the need to handle these records and all other information in accordance with applicable legislation, protocols and guidelines
2c.2 Be able to audit, reflect on and review practice
2c.2.3 Be able to maintain an effective audit trail and work towards continual improvement
2c.2.4 Participate in quality assurance programmes, where appropriate
3a.1 know and understand the key concepts of the bodies of knowledge which are relevant to their profession-specific practice
3a.1.5 Know the physical principles of radiation generation, interaction, modification and protection underpinning the use of radiation for diagnosis or treatment
3a.1.9 Understand the capability, applications and range of technological equipment used in diagnostic imaging or radiotherapy
3a.1.15 be aware of the current developments and trends in the science and practice of radiography
3a.1.22 Know the physical and scientific principles on which image formation using ionising and non-ionising radiation is based

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