Artificial Intelligence: Guidance for clinical imaging and therapeutic radiography professionals, a summary by the Society of Radiographers AI working group.

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Abstract

Introduction Artificial intelligence (AI) has increasingly being adopted in medical imaging and radiotherapy clinical practice, however research, education and partnerships with key stakeholders to facilitate a safe and effective transition have not kept pace. The aim of the document is to provide baseline guidance for radiographers using AI in clinical

practice, education and training, research, and to highlight the key stakeholder partnerships needed to advance this agenda for radiography. The guideline is intended for use not only by the multi-professional clinical imaging and radiotherapy teams, but also volunteers, students and learners.

Methods The format mirrors similar publications from other SCoR working groups in the past. The recommendations have been subject to a rapid period of peer, professional and patient assessment and review. Feedback was sought from a range of SoR members and advisory groups, as well as from the SoR director of professional policy, as well as from external experts. Amendments were then made in line with feedback received and a final consensus was reached.

Results AI is an innovative tool radiographers will need to engage with to ensure a safe and efficient clinical service in imaging and radiotherapy. Higher education institutions will need to adjust their curricula to offer the necessary knowledge, skills and competences for diagnostic and therapeutic radiographers, to enable them to navigate a future where AI will be central to patient diagnosis and treatment pathways. Radiography-led research in AI should address key clinical challenges and enable radiographers to co-design, implement and validate AI solutions. Partnerships are key in ensuring the contribution of radiographers is integrated into healthcare AI ecosystems for the benefit of the patients and service users.

Conclusion Radiography is starting to work towards future AI-enabled healthcare. This guidance document offers recommendations for various areas of radiography practice. Optimisation of our clinical practice will require us to update educational curricula, rethink our research priorities and forge new strong clinical-academic-industry partnerships. These recommendations serve as baseline guidance for UK radiographers and it is expected they will impact on and shape future policy and practice in Radiography in the UK and beyond.

Background

Artificial Intelligence (AI), including its subsets of Machine Learning (ML) and Deep Learning (DL), have the potential to make a profound impact on clinical practice and patient care. It is important to consider how the clinical imaging and radiotherapy workforces will use AI and technology to provide better quality services, whilst meeting the needs of service users[1]. The development of AI is important for radiography because it has the potential to further support clinical decision making, enhance radiography education, extend the scope of radiography-led research and provide more time for practitioners to personalise care for patients in clinical imaging and radiotherapy services [2].

A growing number of national and international policies and plans consider the use of AI in healthcare. The World Health Organisation (WHO) made a commitment to address the ethics, governance and regulation of AI for health in 2019, establishing an expert group who aim to develop a global framework for ethics and governance in AI[2]. The joint International Society of Radiographers and Radiological Technologists (ISRRT) and European Federation of Radiographer Societies (EFRS) statement for AI, published in 2020, considers radiographers essential in elevating patient care with AI[4].

In line with these developments, in January 2020 the Society and College of Radiographers (SCoR) issued a policy statement with regards to AI[4]. This short strategy statement focused upon AI, including ML and DL. It outlined that the professional body would continue to support radiography professionals to champion person-centred care and quality services in diagnostic and radiotherapy services when considering AI, with all its subsets.

A Society of Radiographers (SoR) working group (WG) was established following the publication of the AI guidance statement. All co-authors of this paper were members of this working group, coming from different areas of radiography including academia, clinical practice, research and industry within both diagnostic and therapeutic radiography. Dr Tracy O'Regan was the assigned SCoR liaison person, Mrs Jackie Matthew the Vice-chair and Dr Christina Malamateniou the Chair. The working group was initially convened in September 2020 with a 6-month horizon. Its broad purpose was to represent the voices of the radiographic workforce in the development, implementation and evaluation of AI technology, with aims to strengthen and support care for patients in clinical imaging and radiotherapy.

A working recommendations document was deemed as an appropriate vehicle to convey the voice of the radiography workforce on AI in the UK. The recommendations, provided in shortened format in this paper, are focused on the different areas of radiographic practice within both clinical imaging and therapeutic services: a) Clinical Practice, b) Education, c) Research and d) Stakeholder partnerships.

Scope and purpose

The aim of the document is to provide baseline guidance for education, research, clinical practice and stakeholder partnerships, which will require regular updating given the rapidly evolving nature and evidence of AI. The guideline is intended for use by the multi-professional clinical imaging and radiotherapy teams, including all staff, volunteers, students and learners. This includes clinical and non-clinical, registered and other practitioners, service managers, educators, and researchers. In addition to staff members, the guidance covers family, parents/carers or supporters who may accompany patients in a clinical imaging or radiotherapy services.

It is hoped that these guidelines will be of value to people who are developing, testing, validating and implementing AI for radiography in clinical practice, patients and carers, individual practitioners, service managers and academic institutions.

Methods

The group members submitted a short note of their specific interests to the chair and were then divided onto appropriate subgroups (led by a subgroup leader): i) education (led by Dr England), research (led by Dr McFadden), clinical practice (led by Dr Woznitza), and stakeholder partnerships (led by Ms McQuinlan). The subgroups worked toward completion of the draft guidance.

The recommendations were compiled using evidence from research literature and healthcare professional policy and practice (see supplementary material for some of the sources used). The working party identified, reviewed and synthesised the available evidence from research and expert opinion, including service users, and subjected that evidence to peer professional discussion and debate within the subgroups.

The recommendations' document format mirrored similar publications from other SCoR working groups in the past. The content has been compiled after a period of peer, professional and patient assessment and review. Feedback was sought from a range of SoR members and advisory groups, including the SoR Informatics group, the College of Radiographers (CoR) Patient Advisory Group, the SoR Research Advisory Group, and the CoR Education and Career Framework (ECF) working group. Input was also sought internally from Mrs Charlotte Beardmore, Director of Professional Policy at Society of Radiographers and College of Radiographers and externally from Professor Geraint Rees, Pro-Vice-Provost on AI and Dean of the Faculty of Life Sciences at University College London. Amendments were then made in line with feedback received and a final consensus was reached.

To enable this work, the working party met regularly online via video-conferencing and collaborated asynchronously on the Synapse group platform hosted by the SoR website and using an open google document functionality to collect live feedback and peer review. Smaller meetings were organised between the Chair, Vice-chair and SCoR professional officer to consolidate the group's discussions and regular email communications ensured feedback from all working party members.

Recommendations and priorities

The following tables and text summarise the recommendations and priorities for clinical practice, education, research and key partnerships to advance the AI agenda for

diagnostic and therapeutic radiography as discussed and agreed by the SCoR AI working group.

a. Recommendations and Priorities for Clinical Practice

AI is being rapidly integrated into imaging equipment with often little consideration as to how it influences radiography practice and frontline services. Current regulatory frameworks stipulate that all AI systems which are deployed clinically require human oversight of their implementation[6]. This task is adding to the radiographer's role and increasing the need for a high level of digital literacy among radiography staff as they must learn to evaluate, interact and oversee the actions of AI driven tools within their workflow. Healthcare professionals need to be involved in the co-construction and development of AI[7] to ensure the suitability and clinical relevance of AI solutions. Many AI tools have already been developed but the challenge is for them to be fully internally validated (do methods work?) and externally validated (do they work on unseen data?) to be able to implement these solutions in clinical practice. Furthermore, standardisation of regulations and the creation of universally agreed auditable standards for AI healthcare solutions are vital for the safe integration of AI in clinical imaging and therapeutic radiography services[8]. Table 1 below summarises priorities for radiography clinical practice in relation to AI integration.

Table 1 Clinical Practice Priorities

Order number	**Strategic Priorities for research** **(vision)**	**Recommendations for practice** **(actions)**	**Responsibility for implementation** **(people or groups)**	**Status***:
1.	Engagement of clinical professionals in research to develop solutions in	Perform clinically-relevant AI research that addresses real life challenges with the input of	Researchers, clinicians, academics. Patient, public, professional and	**Pending** Examples include: NHSx, NHS Digital and NHSx AI

	areas of clinical need (Use cases).	all key stakeholders: clinicians, academics, researchers and service users. This could be facilitated through strong clinical academic partnerships and patient and public involvement (PPI) initiatives.	industry partners. SoR, CoR, healthcare professional bodies.	Skunkworks initiatives
2.	Validation of AI tools	Clinicians need to be included in the clinical validation processes of AI tools to be assured of the safety and efficacy of algorithm decision support prior to deployment as part of routine clinical practice. The Medicines and Healthcare products Regulatory Agency (MHRA), CE marking (and its successor scheme) and software	Researchers, clinicians, academics. Industry.	**Ongoing** Eg. SoR ongoing work with regards to: Development of NHSx / NHS AI Lab, SRTP, NIAW national imaging resources. NHS AI lab 'NHS Ethics Initiative' research project: empowering staff to make the most of AI - Skills and Capabilities

		standards committees need to be consulted, as well, given their expertise.		Framework for AI.
3.	Ensure equitable and fair use of AI in clinical practice.	AI users highlight the limitations and biases in the performance of AI tools and promote equitable use of AI software and hardware. This will enable clinician awareness of inequities in the AI technology of concern. This is vital so that AI implementation will not exacerbate health inequalities (e.g.	Clinicians, researchers, academics, Industry partners.	**Emerging** Eg: Pending publication of AHP framework: Reducing health inequalities; Joint work from Public Health England/Kings Fund/ SoR and AHP Professional bodies.

		appointment prioritisation, case triage, image interpretation).		HEE AHP digital inclusion agenda.
4.	Ensure AI tools are being audited, validated & evaluated over time (QA/QC).	Clinical practitioners ensure there are robust post-implementation auditing and QA/QC frameworks in place to ensure consistent and reliable algorithm performance, following national/internatio nal regulatory frameworks for post-marketing surveillance of medical devices,	Industry, Healthcare organisations, clinical professionals and industry partners.	**Emerging** The British Standards Institute (BSI) AI auditable standards for healthcare. NHSx, NICE, CQC, HEE,NHS Digital, MDA collaboration with host organisation; Ada Lovelace Institute: AI Ethics Initiative.

5.	CPD and ongoing training	Clinical imaging and radiotherapy professionals to seek out appropriate education in the use of algorithmic implementation, safety, clinical decision support and effective communication of decisions to patients and other health professionals.	Clinical imaging and radiotherapy professionals, academics, HEIs, computer science experts, industry partners, CoR, SoR.	**Pending**
6.	Patient, Public, Professional Partnerships and co-production of clinical AI tools.	Clinicians engage patients as partners in the development of algorithms, their privacy is maintained and appropriate informed consent is obtained.	Clinicians, researchers, patients, industry, CoR, SoR.	**Pending**

***** Pending – work not commenced, Emerging – work commenced but not established, Ongoing – work established and continuing

b. Recommendations and priorities for Education

Radiography is one of the most technology enabled professions in healthcare. The Topol Review outlined the urgency for healthcare practitioner training to facilitate a safe and efficient digitalised healthcare system and enable improved patient outcomes and personalised care[9]. Opinion statements and white papers for radiologists and other medical specialities have outlined the need for an update in educational curricula to include more AI training, such as terminology, statistics, AI applications, patient-centred care, ethics and validation techniques [4,10-15].

In the UK this priority is supported in the Topol Review, recommending that HEIs develop an NHS Digital Education Strategy to improve digital literacy at undergraduate and postgraduate level. Organisations employing and retaining staff should ensure that clinical staff are supported to maintain an appropriate level of digital literacy[9,16-17]. HEE technology enhanced e-learning platform for clinical imaging and for radiotherapy, supported by CoR, delivers learning in a virtual environment; ongoing addition of new content should include learning about AI. To further support the educational and workforce training goals of this AI guidance, programmes should be developed in collaboration with the CoR, SoR, HEI leadership (Heads of Radiography Education (HRE), Programme Directors and Heads of Departments), practice educators and industry representatives.

To meet the increasing demand there are currently an increasing number of "Data Science" or "Healthcare Informatics" postgraduate courses in most UK Universities. Furthermore, Health Education England (HEE) in collaboration with University of Manchester have developed a free e-learning course AI for Healthcare: Equipping the Workforce for Digital Transformation Also City, University of London has developed a 30 UK credit postgraduate module on "Introduction to AI for radiographers".

The radiography community and educators need to consider the abovementioned curriculum design examples, the required curriculum updates and changes in light of new technological developments and accordingly update the pre-registration and post registration/post graduate educational curricula to enable the radiography workforce to safely and efficiently navigate into the digital future. The CoR Education and Career Framework (ECF), currently under review, should also embrace these changing practice requirements. Table 2 below summarises priorities for radiography education in relation to AI integration.

Table 2 Education Priorities

Order number	**Strategic Priorities for research**	**Recommendations for practice**	**Responsibility for**	**Status***

	(vision)	**(actions)**	**implementation** **(people or groups)**	
7.	Promote collaborative learning between educators, clinical practitioners, researchers, SoR, CoR and industry.	Create opportunities for co-development of AI educational tools and of the AI curriculum by facilitating synergies between these partners. Highlight these priorities in the CoR Education and Career Framework (ECF).	HEIs, academics, practice educators, industry partners, CoR, SoR, SCoR ECF working group.	**Pending**
8.	Engage with appropriate stakeholders including professional bodies, patient and service user groups and regulators to ensure academic curricula are person and patient centred.	Create undergraduate and postgraduate and CPD educational provisions on patient and person-centred care in medical imaging and radiotherapy.	HEIs, academics, CoR ECF working group, professional bodies, patient public involvement groups and appropriate charities.	**Ongoing** CoR Patient Public Professional Partnerships document. CoR ECF.

9.	Ensure training on AI, progressive technology, data science and healthcare informatics in education programmes is aligned to scope of practice of professionals.	Liaise with practice educators and practitioners to ensure education delivers what practice needs.	HEIs, practice educators.	**Pending**
10.	Create training opportunities related to clinical audit, service evaluation and validation of AI systems integrated within clinical imaging and radiotherapy practices.	Liaise with practice educators and practitioners to devise optimal clinical audit/service evaluation and validation pathways with evidence-based standards.	Radiography professionals, industry partners, HEIs, academics.	**Pending** The British Standards Institute (BSI) AI auditable standards for healthcare.
11.	Promote continuity of education in AI, progressive technology, data science and healthcare informatics from	Bring pre-registration and postgraduate academics together, Harmonise AI training standards in	HEIs, practice educators, CoR ECF working group, national healthcare Systems' e-learning	**Emerging** AI is included in CoR Research Strategy 2021-2026.

	pre-registration to postgraduate education, lifelong learning and CPD.	CoR ECF document.	management, CPD platforms, for example CoR CPD Now.	A standard for AI to be included in the revised CoR/RCR Quality Standard for Imaging AI to be included in CoR ECF.

12.	Consider appropriate inclusion of AI within pre-registration and postgraduate training curricula. AI topics to include the following: • Overview of AI and its potential roles within clinical imaging / radiotherapy. • Basic knowledge of terminology and of development processes of AI algorithms. • Testing, validation, standardisation and governance arrangements.	Organise a task force of radiographer academics and clinical practitioners/educators.	Academics, HEIs, industry partners, AIWG, patient public / service user groups.	**Pending**

	• AI implementation techniques • Patient-centered and person-centred care in the context of AI. • Critical appraisal of research literature related to emerging technologies. • Ethics of AI, accountability in the AI ecosystem and principles of innovation and entrepreneurship. • Regulatory and approval processes of new technology			

13.	Incorporate learning for all practitioners and operators on risk management of AI use in clinical practice including; patient safety, justification, interpretation and communication of using AI/algorithms to contribute to clinical management, diagnosis and/or staging and radiotherapy treatment.	Organise short courses, develop CPD resources and signposting toward further information in these areas.	HEIs, industry partners, academics, practice educators.	**Pending**
14.	Evaluate the correct clinical usage of AI systems within clinical competency assessment tools	Review pre-registration and postgraduate clinical competency assessment tools and methods.	HEIs, academics, clinical professionals.	**Pending**
15.	Facilitate educational research activities to evaluate and	Organise educational research projects and initiatives in	HEIs, academics,	**Emerging** Evaluation of AI

	monitor the introduction of modules in AI, progressive technology, data science and healthcare informatics and best practices for education and learning.	relation to AI curriculum design, delivery and evaluation.	radiography students	postgraduate module at City University of London is underway.
16.	Enable involvement of educators/students of suitable academic/clinical expertise to develop AI within clinical imaging, radiotherapy and radiographic education.	Organise student-academic focus groups to brainstorm and discuss the proposed changes in the curriculum, so pre-registration and postgraduate students are actively involved in their learning.	HEIs, academics, radiography pre-registration and postgraduate students.	**Pending**
17.	Teach not just about AI principles but with AI-enabled educational tools.	Ensure that appropriate focus is given to developing/co-constructing AI solutions with an educational focus for delivery of the academic curriculum within clinical	HEIs, academics, industry partners.	**Ongoing**

		imaging and radiotherapy .		
18.	Provide opportunities for scoping events and networking around prospective developments.	Organise educational conferences and other educational activities around AI, its use and future work.	HEIs, academics, industry partners, pre-registration and postgraduate students.	Ongoing: UK Imaging and Oncology (UKIO) congress. EFRS and ISRRT congress European Society of Radiology (ESR) European Congress of Radiology (ECR). European Society for Radiotherapy and Oncology (ESTRO) congress. Achieving excellence in radiography education conference Focused international AI

				conferences, for example, AI conference by City University of London, July 2020. SoR online Synapse workspaces.

***** Pending – work not commenced, Emerging – work commenced but not established, Ongoing – work established and continuing

c. Recommendations and Priorities for Research

As highlighted by Hardy and Harvey[11] there is a lack of information on the impact of AI on the radiographers role and service delivery. As healthcare professionals, radiographers are accustomed to the development of evidence-based practice with increasing technological advances[5,16]. It is recommended that research is required to investigate the impact of AI on the quality of services; patient care; radiographers' roles and their working practices. There is also a need for prospective high quality 'real world' clinical validation of AI interventions, the reporting of which should adhere to the appropriate guidelines (e.g. SPIRIT-AI and CONSORT-AI guidelines[18-19]). Table 3 below summarises priorities for radiography research in relation to AI integration.

Research Priorities Summary Table

Order number	**Strategic Priorities for research** **(vision)**	**Recommendations for practice** **(actions)**	**Responsibility for implementation** **(people or groups)**	**Status***

19.	Explore and map out radiography baseline theoretical knowledge, clinical practice, technical skills and perceptions/expectations on the use of AI	Conduct research on the current knowledge, technical skills/competences and attitudes and expectations of radiographers towards AI. This could take the form of surveys or other type of mixed methods research	Society of Radiographers Artificial Intelligence Working Part (AIWG), Education Institutes (HEIs), College of Radiographers (CoR), academics.	**Ongoing** For example: AIWG UK-wide AI survey with similar surveys running in Africa, Ireland, Saudi Arabia, Greece. EFRS and ISRRT running pilot studies 2021. HEE AHP digital skills project.
20.	Investigate the impact of emerging AI technologies on the patient experience, patient safety and quality of care.	Undergraduate and postgraduate/doctoral and postdoctoral research in this area	AIWG, HEIs, SoR, Radiography service managers, academics.	**Emerging**

21.	Investigate how the radiographers' role, career opportunities, role extension and career progression will develop and change with the increased use of AI.	Baseline search but also ongoing research required.	AIWG, HEIs, SoR, Research active professionals, academics, Radiography service managers, consultant practitioners, advanced practitioners, team leaders.	**Pending**
22.	Develop transparent AI working practices and protocols. Strive for explainable AI that practitioners and patients will be able to trust but also query and assess its quality.	Creation of auditable standards. Cross-disciplinary, multi-site research projects needed.	SoR, Industry, HEIs, Academics, clinical practitioners, British Standards institute	**Ongoing.** SoR sit on NHSx AI Lab AI Imaging Board. Further work ongoing at NHS digital, NHSx & NHS AI labs in England, Scottish Radiology Transformation Project (SRTP), National Imaging Academy Wales (NIAW).

23.	Identify what AI metrics/interface influence clinical decision making.	Research projects e.g. by clinical imaging and therapeutic radiography professionals, doctoral students, post-doctoral researchers.	AIWG, HEIs, SoR, research active professionals, academics, colleagues from industry.	**Ongoing** For example: Ultrasound scan and surgical innovations in pregnancy services.
24.	Highlight the work and impact of radiographer researchers, who work in AI. Make radiographers visible to editors, publishers, funding bodies as autonomous researchers who can add value within multidisciplinary teams.	Organise conferences, arrange sessions in conferences, webinars, seminars etc on radiography and AI. Invite multi-professional key-stakeholders in order to increase visibility and understanding of capability and impact of clinical imaging and therapeutic radiography professionals.	AIWG, HEIs, SoR, research active professionals, academics.	**Emerging.** Promote existing papers and further publication of articles in Radiography journal. Publish case studies on AI research led by radiographers on Synergy news
25.	Support, fund and advocate for AI research in radiographic practice and education.	Highlight funding routes that are available within devolved nation research programmes.	SoR professionals, Industry professional partners, AIWG, research	**Emerging** Explore the possibility of CoRIPS themed calls for AI research.

		Explore the development of industry funded grants and partnerships. Approach research funders to advocate for the role of radiography research in AI implementation and healthcare practice.	funders (NIHR, MRC, ESRC)	
26.	Forge partnerships between AI researchers and clinical practitioners to support collaboration on areas of mutual interest.	Create multidisciplinary teams.	AIWG, HEIs, SoR, research active professionals, academics.	**Emerging** For example, a range of sites where AI is being used in collaborations between NHS sites/NHSx/Academic partnerships. Accelerating Access Collaborative (AAC) awards e.g. MIRADA Medical. Futures NHS Platform resources: NHSx AI Hub.

				National Consortium of Intelligent Medical Imaging (NCIMI). The East Midlands Radiology Consortium (EMRAD).

***** Pending – work not commenced, Emerging – work commenced but not established, Ongoing – work established and continuing

d. Recommendations and Priorities for Stakeholder Partnerships

Due to the complexity of healthcare systems, the development, testing, validation, implementation and auditing of AI tools needs to involve multidisciplinary teams [20-26]. The teams must include key stakeholders from all areas of practice: healthcare practitioners, scientists, engineers, researchers, educators, patients, trainees and industry; just a few of the different key groups that need to work in partnership to deliver AI solutions. These partnerships, vitally, must extend to and include the full context and scope of practice of the radiography workforce. Key partners must ensure radiography practitioners are included in decision making, both from clinical imaging and radiotherapy, radiography researchers are supported and able to apply for funding, radiography students and trainees get the education they need to safely navigate a digital future[26-30]. It is therefore essential that industry partners and key collaborators recognise the whole range of professionals involved in the medical and clinical imaging workflows; the distinct bodies of knowledge who can work with them to develop solutions. In this process it is also essential that patients hold a central place in highlighting clinical necessities and personalisation and humanisation priorities. Table 4 below summarises priorities for key stakeholder partnerships in relation to AI integration in Radiography.

Table 4 Stakeholder Partnership Priorities

Order number	**Strategic Priorities for research** **(vision)**	**Recommendations for practice** **(actions)**	**Responsibility for implementation** **(people or groups)**	**Status***:
27.	Collaboration between industry, researchers and the whole range of professionals working in clinical sites.	Partnership between industry, radiography researchers and early adopter clinical sites to establish AI health transformation pathways and develop validation documentation for AI healthcare adoption. Also establish early accountability pathways for AI products.	Academics, Industry, clinical practitioners, UK regulatory bodies and professional bodies including SoR, IPEM, RCR professionals. NHS Trust leadership,	**Ongoing** For example the NHSs AI in Health and Care Awards for conceptualisation, development, testing and validation of AI technologies in the NHS. For example AI for Value Based Healthcare. Collaboration between NHS Trusts, SMEs and Kings College to develop, validate and implement AI technologies

				for the benefit of the NHS**.**
28.	Collaboration between industry and educators/ academics.	Partnerships between industry and educators/academics and practice educators is important to ensure radiography pre-registration and postgraduate training is up-to date with current technologies and clinical needs. Forge partnerships to run joint conferences/ webinars on AI in radiography.	Academics/educators, industry, CoR. Professional bodies.	**Ongoing** For example, AI symposium City University of London. Association of Healthcare Technology Providers (AXREM): Imaging Trade Association AI Manifesto. For example, Radiography 2020 conference; ESTRO and ASTRO conference.

29.	Development of AI Health Lead Radiographers/ Clinical Imaging and Therapeutic radiography professional ambassadors to facilitate clinical digital transformation.	Ensure radiographers, clinical imaging and therapeutic service professionals participate/apply for the NHS Topol fellowship scheme and other AI leadership positions with the NHS, HEIs and industry.	SoR members, HEIs, professional bodies, AIWG.	**Ongoing**
30.	Advocate and work with industry to establish a common language in AI terminology for consistency.	Ensure a common AI language is understood between industry, academia, clinical practice.	Industry, academic, clinical.	**Pending**
31.	Co-ordinate a seamless multidisciplinary framework of AI implementation, where every team member is valued and their input is heard.	Collaboration between clinical practitioners, academics, researchers, professional bodies, regulatory bodies, service user groups.	ALL	**Pending**

***** Pending – work not commenced, Emerging – work commenced but not established, Ongoing – work established and continuing

Opportunities for Partnerships

The partners listed in Table 5 below represent some of the available opportunities for partnership working within AI (this list is not exhaustive and will continue to expand.)

Table 5 Available opportunities for partnership working within AI

Opportunity	Description	Status
CRUK RadNet	CRUK RadNet is a radiotherapy research network with seven centres, each driving their own research priorities. CRUK RadNet Oxford is leading the charge with clinical and research opportunities for AI and machine learning in radiotherapy. https://www.cancerresearchuk.org/funding-for-researchers/our-research-infrastructure/radnet-our-radiation-research-network	**Ongoing**
CTRads	CTRads is a NCRI Clinical and Translational Radiotherapy Research Working Group created to focus on clinical and translational issues related to radiotherapy. CTRads has four workstreams, including one dedicated to new technology, physics and quality assurance. CTRads recently held an open call for research proposals. https://www.ncri.org.uk/how-we-work/ctrad/workstreams/	**Ongoing**
London Medical Imaging & Artificial Intelligence Centre for Value-Based Healthcare	The London Medical Imaging & Artificial Intelligence Centre for Value-Based Healthcare is a consortium of academic, NHS and industry partners led by King's College London and based at St Thomas's Hospital. It aims to bring together clinical, research and industry minds to develop innovative technologies using NHS medical images and data. Work is also being done to develop a platform for validation of these technologies.	**Emerging**

	https://www.aicentre.co.uk/our-partners	
NCIMI (National Consortium of Intelligent Medical Imaging)	NCIMI is a network of NHS hospitals, clinical leaders, industry experts in the fields of AI and medical imaging, world-leading academic researchers plus patient groups and charities. NCIMI's mission is to computer vision with artificial intelligence and apply it to clinical problems within imaging and diagnostics through research. www.medsci.ox.ac.uk/research/networks/national-consortium-of-intelligent-medical-imaging	**Ongoing**
NHSx	NHSx partnering with Accelerated Access Collaborative (AAC) and NIHR to award funding for evaluation and validation of progressive technologies in the clinic. First winners were announced 8th September 2020. Work is being done to match the award winners with clinical sites and to ensure the right evidence is collected for validation of new technologies. https://www.england.nhs.uk/aac/	**Emerging**
Topol Programme for Digital Fellowships in Healthcare.	A range of clinical candidates, including those with an Allied Health background have been admitted. If you have an idea or clinical problem you would like to solve, you can apply for a fellowship. NHS candidates and banding restrictions apply. www.topol.hee.nhs.uk/digital-fellowships/	**Emerging**
Vendor or Professional Body Meetings and Conferences.	Vendor or Professional Body organised user meetings and conferences provide many opportunities. There is the activation of a product feedback loop when industry and clinic engage. Networking between academia, clinic and industry can encourage research collaborations for the betterment of clinical practice. The establishment of an AI Emerging Technology (AIET) conference track at established conferences such as	**Ongoing**

	UKIO, BIR, ECR/EFRS congress and ESTRO may further the publication of AIET research.	

Limitations of the guidance

The evidence base around the development and use of AI in diagnostic and therapeutic radiography, clinical imaging and therapeutic services, is still early in development. The Equator Network have provided guidance with regards to the conduct and reporting of AI research for clinical protocols and for randomised controlled trials[18,19], which will be useful in the future.

Although there is minimal evidence of AI-specific research that is viewed under a diagnostic radiography interpretative lens, there are numerous papers with respect to the development of AI-enabled radiology / clinical reporting[3,11,12,17]. Therapeutic radiography AI-based research is concentrated upon radiotherapy treatment planning, therapeutic pathways and optimisation of workflows[28-30]. Therapeutic radiography papers remain largely opinion or review based. Despite this gap, a strength of the recommendations contained within this guidance was the perceived strong level of agreement between all working group members, all experts in different aspects of AI, with respect to the priorities for the development of AI in healthcare across clinical practice, education and research.

Members of the working party were conscious of the complexity and diversity of AI within medical imaging. This includes the different rates at which AI has been implemented in different imaging modalities, the varied experiences of practitioners depending on the clinical, education or research setting they are based at, the changing experiences and needs of the people present within clinical imaging and radiotherapy departments and the rapid rate of change as part of the digitalisation of healthcare. The working party members remained cognisant of these wider issues while the main focus of the work was to examine the developing evidence-base and to develop recommendations for radiographers[27,31].

It was recognised that work around AI will require SoR members' long-term cooperation with a range of organisations to promote and facilitate the implementation of AI and health technologies where appropriate. It was recommended that, beyond the duration of the working party, an AI advisory group should be established to lead further work and update this guidance as required.

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