A multi-disciplinary team approach for AI implementation: a commentary for Medical Imaging and Radiotherapy key stakeholders

Abstract

Introduction

Artificial Intelligence (AI) algorithms are now being adopted and evaluated across a range of healthcare settings. Novel AI-based applications can reduce administrative workload of professionals, manage electronic health records, aid drug discovery, improve diagnostic services, and analyse complex and large amounts of data (Han et al., 2024; Al Kuwaiti et al., 2023; Wichmann et al., 2020). Medical Imaging and Radiotherapy (MIRT) are at the forefront of this digital transformation (Akudjedu et al., 2023). This trend is matched by the concurrent increase in MIRT-related AI products (van Leeuwen et al., 2024; Health Imaging, 2024; FDA, 2024). AI is acting as a catalyst for MIRT, and could, revolutionise image acquisition and analysis, redefine clinical workflows, improve diagnostic accuracy, provide automated organ segmentation, image registration and planning in radiotherapy, and customise patient care (Fu et al., 2022; Najjar, 2023; Landry et al., 2023). These recent AI advancements could translate into improved patient outcomes, personalised pathways and treatment plans, and, therefore, delivery of optimal health services adapted to each person (Pinto-Coelho, 2023; Brady et al., 2024).

Being at the front of this technological advancement comes with substantial costs; As AI applications emerge, are tested and are rigorously evaluated, MIRT professionals will have the responsibility of ensuring that the implementation of AI in clinical practice is optimised, monitored, and guided by robust governance principles, therefore following best practice. While each profession works to understand what AI implementation might has on clinical workflows, their future roles and careers, it is of paramount importance that each discipline also considers the challenges of AI implementation such as knowledge gaps, training, and the wider workforce (Walsh et al., 2023).

The importance of multidisciplinary work in AI integration

To ensure a smooth transition into the new AI era and successfully and safely implement AI in clinical practice, it is imperative to properly educate healthcare professionals (van de Venter et al., 2023; Malamateniou and McEntee, 2022; Topol, 2019), conduct AI research responsibly, promote effective leadership to drive AI integration into the complex healthcare systems, and support multidisciplinary teams navigating this transition, by involving all key stakeholders and users throughout the AI lifecycle (Stogiannos et al., 2023; Malamateniou et al., 2021). The importance of multidisciplinary work is further highlighted by recent studies showing that early involvement of key stakeholders is a vital aspect of AI implementation in healthcare (Chomutare et al., 2022); multidisciplinary representation should be employed when designing AI-enabled tools for healthcare services (Helman et al., 2023), during drug development (Gallego et al., 2021), and more importantly for AI adoption (Sezgin, 2023). This multidisciplinary collaboration should be active both in terms of theoretical AI principles and the practicalities of AI implementation (Walsh et al., 2023).

It has been proposed that multidisciplinary teams involved in AI implementation should at a minimum include knowledge experts, decision-makers, and users of AI tools (van de Sande et al., 2022). Representation is a key aspect of multidisciplinary collaboration,

since AI implementation teams should be diverse and optimally represent both the AI and the MIRT ecosystems. It is important to create multidisciplinary teams that represent the technical, clinical, and operational aspects of AI implementation early in the process (Smith et al., 2021; Trinkley et al., 2024). Diversity, equity, and inclusion should be drivers to ensure an equitable and diverse AI-enabled future in MIRT (Doo and McGinty, 2023; Vishwanatha et al., 2023; Hancock et al., 2024). Diverse teams have proved valuable enablers in healthcare transformation projects and these teams are more likely to recognise and address biases in AI tools, improve AI algorithms, and ensure fairness and trustworthiness of healthcare provision for marginalised populations (Shams et al., 2023).

Who makes up the AI ecosystem for medical imaging and radiotherapy?

The AI ecosystem in healthcare requires inclusion of physicians, allied health professionals, clinical scientists, researchers, educators, software developers, hospital administrators, professional associations, governmental regulatory bodies, and patients and public (Allen et al., 2019; Adus et al., 2023; Langmack, 2024). This means that the MIRT AI ecosystem typically should consist of radiologists, diagnostic and therapeutic radiographers, medical physicists, oncologists, computer scientists, engineers, technical physicians, management consultants, psychologists, nurses, health informatics experts, and other related stakeholders, including patients (Sogani et al., 2020). For medical physicists to be compliant with regulatory requirements, 'Medical Physics Experts' are legally required for AI implementation. According to the archetypes developed in work commissioned by National Health Service (NHS) England, all healthcare professions can be classified as shapers, drivers, creators, embedders, or users, depending on their role in the development, implementation, and use of AI technologies (NHS England, 2023). However, despite the distinct archetype definition, the scope is open as to which profession might develop into what role, and, although, it might seem natural that some professionals might gravitate easily towards specific archetypes, it will also depend on an individual's initiative and engagement with new technologies and on a robust team culture during AI integration. It is, therefore, expected that multiple professionals will fit the same archetype classification, which underpins the importance of working together through this transition to the routine use of AI, to make it as smooth as possible.

It is also vital to engage with implementation experts, across all disciplines, and harness the application of theories, frameworks, and concepts that implementation science has already established in the field (Nilsen et al., 2022). In addition, the inclusion of professional bodies in this ecosystem is paramount. Professional bodies, for example, the British Institute of Radiology (BIR) and the European Society of Medical Imaging Informatics (EuSoMII) are excellent examples of multidisciplinary societies in medical imaging, which attempt to integrate teams in complex clinical scenarios and bring multidisciplinary team collaboration in AI research projects. The creation of multidisciplinary teams should also include industry representatives, who will help organisations overcome key challenges associated with the complexity of MIRT, such as those arising from lack of interoperability or lack of transparency of MIRT equipment (Bizzo et al., 2023). The AI ecosystem should be interconnected, and a proposed relationship between its key stakeholders can be shown below (Fig.1).

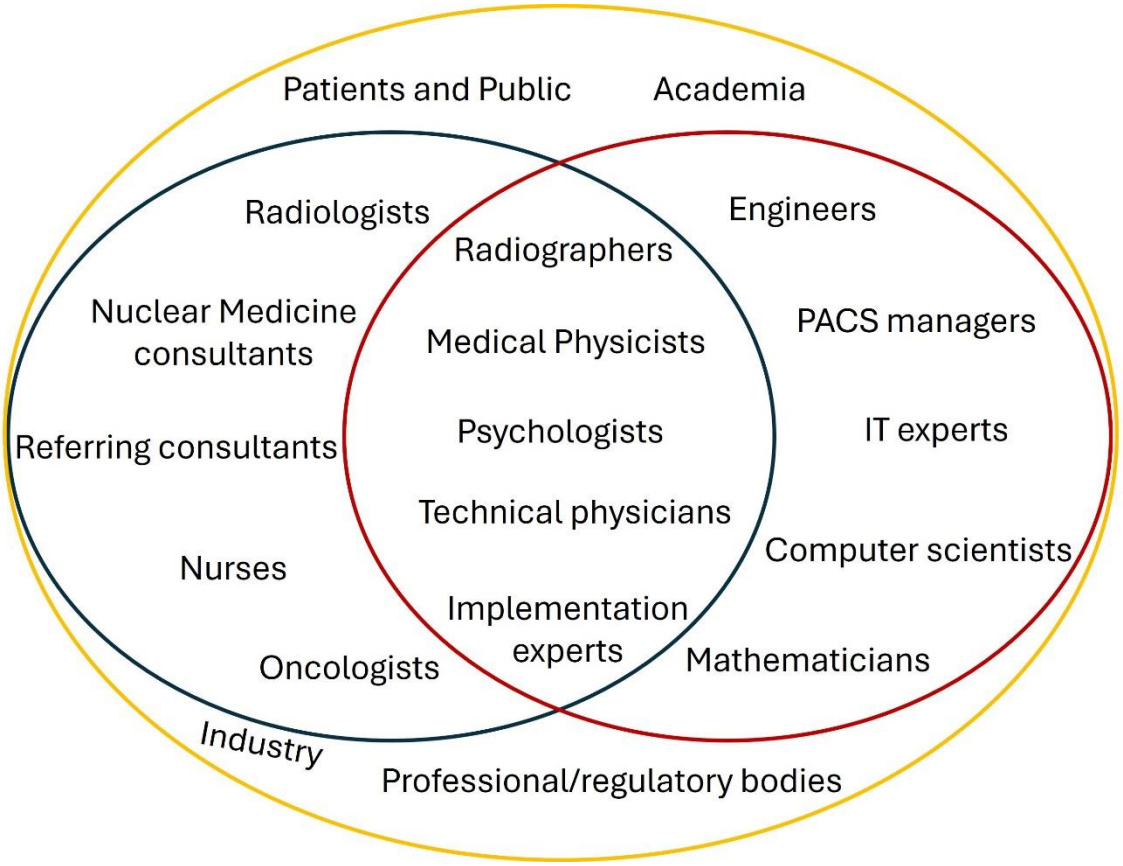

Figure 1. Venn diagram depicting a proposed AI ecosystem for medical imaging and radiotherapy including different professionals and agencies.

Patients and the public at the heart of AI innovation

Since the deployment of AI for quality improvement is centred on the patient experience and outcomes, it is vital to ensure that both patients, their caregivers, and the public are equal partners in AI improvement projects and that their involvement is authentic and occurs as early as possible. This will ensure services are not just user-friendly but also user-led. Early involvement of patient representation is a key asset that can save cost and time for any AI innovation and implementation project. Patient and public involvement (PPI) should be prioritised in all forms (whether advisory or co-production) when developing healthcare AI algorithms, as patients can act as experts with lived experiences and co-designers (Banerjee et al., 2022). Recent research has shown that patients generally have great expectations from AI, as it can improve the care they receive and enhance their overall experience, but they also have serious concerns and reservations, such as regarding potential loss of autonomy and data management, that must be addressed by the multidisciplinary teams (Katirai et al., 2023; Borondy Kits, 2023; Haan et al., 2019). PPI should not be tokenistic, but rather evolve into a true connection between patients and researchers, developers, and other team members. It should also be governed with specific and predefined terms of reference to ensure that patients feel valued and not manipulated. Equally, predefined outcomes, incentives, compensation and working patterns will ensure professionals can engage patients as co-researchers. This will enable the team to make decisions that reflect patients' priorities and avoid

assumptions when developing and implementing AI tools in healthcare (Baines et al., 2022). Patients can be valued innovators; it is, therefore, very important to include them in the development, testing, and deployment of AI in healthcare. Patients should be co-designers and active members of the multidisciplinary team, and not only invited participants for AI projects (Lysen and Wyatt, 2024). This is why the NHS has already implemented PPI groups and representatives in its organisations. Finally, patient groups that act as co-researchers in AI projects need to also be diverse in gender, ability, neurodiversity, experience, age, digital competency, to ensure opinions are inclusive and represent the wider patient population and not a very specific subgroup. Different countries have different schemes for compensation of patients and public that act as co-researchers and different governance frameworks. In the UK, the National Institute for Health and Care Research (NIHR) INVOLVE guidelines are followed (NIHR, 2019).

How can industry contribute: movers and shakers of AI

We could say that industry is responsible for the fast pace that AI has assumed. Around 80% of the AI applications to the Food and Drug Administration (FDA) were from radiology companies at the end of 2023 (Kinahan, 2023). There is great commercial interest, and the stakes are high in the established medical imaging and radiotherapy manufacturers, but also in the new AI start-ups and small and medium-sized enterprises (SME). The enthusiasm, and know-how when it comes to the diffusion of innovation, the resources and agility that industry bring could be useful enablers to drive AI forward. However, reliance on private companies to provide AI products for use cases that may be publicly beneficial but not commercially profitable would clearly not be prudent. Industry-Academic-Clinical partnerships could converge efforts to ensure AI is properly governed, thoroughly tested and expertly deployed for a meaningful purpose to solve real clinical problems. Healthcare regulators are vital in the above procedures.

Reshuffling the cards in the new AI era

For AI implementation to be safe and successful, there is need to work collaboratively to be adequately trained and operationally prepared to assume new responsibilities and roles. New opportunities will be created in AI education, research, governance, and quality assurance. Recent research has highlighted the need for new professional roles, and radiographers have already advocated for clearer guidance and leadership opportunities to engage in these new roles (Stogiannos et al., 2024a). Similarly, medical physicists and radiologists strongly believe that AI will change their roles and professional practice, and they are eagerly anticipating playing a central role in the AI future in medical imaging and radiotherapy (Huisman et al., 2021; Andersson et al., 2021; IAEA, 2023). Recent research has highlighted that radiologists, radiographers, and medical physicists have different priorities and different needs regarding AI implementation in clinical practice (Stogiannos et al., 2024b). However, all medical imaging and radiotherapy professionals underline the need to work closely together with patients, the public, academia, industry, professional bodies, to maximise the positive impact of AI and minimise its potential risks for patients and professionals. In the framework of a multidisciplinary team, the presence of a “local champion,” namely an individual with a

strong personal interest in AI applications may be beneficial for AI implementation within an organisation. This person often promotes initiatives and plays an active role in AI integration, serving therefore as a critical facilitator in the optimal adoption of these technologies (Strohm et al., 2020).

What does involving the whole ecosystem look like?
With the overarching goal of successfully implementing AI in MIRT, while improving patient outcomes and experience to effectively involve the whole MIRT ecosystem, the approach of the team should be:

- ✓ **Multidisciplinarity** requires the team to bring together professionals from different fields of specialisation (Taberna et al., 2020), but staying within their boundaries.

- ✓ **Transdisciplinarity**, on the contrary, overcomes the boundaries of the disciplines involved, and it is beneficial because it aims to integrate all perspectives (Choi and Pak, 2006).

- ✓ **Cross-disciplinarity** involves engaging in practices related with subjects outside the scope of a discipline, but without any integration from other disciplines. It has proved particularly beneficial for knowledge exchange in areas where medical science and social sciences meet (Albert et al., 2022).

- ✓ **Interdisciplinarity** requires professionals to synthesise approaches taken from different disciplines to integrate knowledge.

- ✓ **Multiagency** approaches should be also employed for AI implementation; these require professionals from several organisations to work together. For instance, industry, professional bodies, patients and public as well as academia are proven to be valuable agencies to support the work of the clinical practitioners.

To summarise, teams should be comprised of professionals from different fields; work beyond boundaries to integrate multiple perspectives, synthesise, and apply that knowledge to engage with subjects traditionally regarded as beyond the professions' remit; organisations must work together to facilitate open cultures of supportive teamwork.

It is important to acknowledge that professionals working in a multidisciplinary team are required to show respect for their collaborators' opinions, while any task undertaken within the team should be transparent to all members. This results to be essential to foster an environment built on open dialogue, enabling therefore the team to explore innovative AI solutions effectively. With all these people involved in the implementation of AI, efficient, knowledgeable management is going to be paramount.

Although the benefits of working in multidisciplinary teams are numerous, the following areas of interest will be briefly discussed:

Clinical practice and AI: Teamwork in clinical practice is intrinsic. This is particularly visible in acute settings, where decisions can often be time-critical. The positive impact that effective, multidisciplinary teamwork has on patient care and outcomes has been widely documented in the literature (Weller et al., 2024; Rosen et al., 2018). AI tools can even be used to facilitate better communication and collaboration among the multidisciplinary team by providing shared platforms for image analysis, interpretation, and improved workflow. This leads to enhanced patient care, greater efficiency, and better health outcomes (Vos et al., 2020).

Education for AI: Another great benefit of multidisciplinarity is the opportunity to develop a shared understanding and professional respect for each other's roles. Interprofessional education has proved to be highly effective and beneficial in various healthcare disciplines (Guraya and Barr, 2018). For this reason, medical imaging academies and radiotherapy networks have already been established for interprofessional education. All members of the AI ecosystem should cultivate their teamwork and collaboration competencies to be able to engage in interprofessional learning. There is a need to bridge the gap between AI and users, building tools like conversational agents and data visualisation techniques that would allow the users to enquire AI and provide useful input accordingly.

Research for AI: In the realm of AI, research-related challenges are complex, mainly due to ethical issues, the need for large amounts of high-quality data, algorithmic biases, and many more. Hence, it is time for AI researchers to reenact the environment, test all possible solutions, and suggest improvements with everyone's contributions. Not including a professional group or patients early on can result in challenges with AI implementation, require more funding to explore that view too, and create delays. An excellent example comes from the NIHR, that has recently awarded almost 42 million pounds to establish 14 centres that will drive life-changing research into health technologies (NIHR, 2024).

Policy for AI: Creating policies for AI in healthcare remains a largely underdeveloped field. Research has confirmed that international coordination and collaboration between professionals, bodies, governments, and initiatives will help policy makers to shape the future of AI in healthcare (Morley et al., 2022). This was strengthened by research in the MIRT discipline, where different professionals collaborated to create AI governance guidance (Stogiannos et al., 2024b). Therefore, a collective effort is needed, and inclusion and respect of others' perspectives will enable policy and decision makers to draw the most reliable conclusions that will benefit everyone, including the patients.

Reflexivity Statement

We present the synthesis of the team that co-authored this article, in an attempt to provide transparency regarding the team's thoughts. This team consists of radiologists (n=15), radiographers (n=18), computer scientists (n=3), engineers (n=2), medical physicists (n=4), psychologists (n=2), one technical physician, one operational management expert, and patients (n=3). There are 27 men and 19 women of diverse ethnicity. Representatives from 5 professional bodies, 8 companies, 20 different Universities and 12 different

countries around the world have participated in this work. We firmly believe this shows a diverse representation of the MIRT AI ecosystem.

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