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Editorial

What Is the Value of Artificial Intelligence in Radiology?

Mashael Alrujaib,[1] Dana Bakheet[1,2]

[1]College of Medicine, Alfaisal University, Riyadh, Saudi Arabia
[2]Department of Biobanking, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

Address correspondence to Mashael Alrujaib (rujaibmk@gmail.com).

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The promise of artificial intelligence in medicine is to provide composite, panoramic views of individuals' medical data; to improve decision making; to avoid errors such as misdiagnosis and unnecessary procedures; to help in the ordering and interpretation of appropriate tests; and to recommend treatment.

Eric Topol[1]

The increasing reliance on data in the field of radiology has grown tremendously over the past two decades. This role has aligned better with the global transformation toward improving quality and outcome while providing more patient-centered care. Artificial intelligence (AI) has emerged as a continuation of prior advancements in information technology to allow more accurate predictions and better decision making. From computer-aided tomography to texture analysis, all the way to convolutional neural networks and machine learning (ML) or deep learning, AI stands today as a promising innovative technology toward achieving patient-centered care and better outcomes.[1] With an accelerated development and evolution of predictive and modeling algorithms, AI allowed identification of abnormal chest X-rays and prioritizing them on reporting lists. AI as such helped radiologists provide maximum value in a timely way by reporting those likely to be abnormal earlier. It also helped to make better use of limited resources for reporting radiology results from those examinations that were likely to affect patient management and outcome.[2] Mammograms were prioritized using AI: normal mammograms or those likely having benign findings were given lower priority, whereas mammograms with more suspicious breast lesions were prioritized. The impact of AI on mammography workflow has allowed improved efficiency and effectiveness while reducing diagnosis to therapy time for patients suspected of having breast cancer.[3] During the coronavirus disease 2019 (COVID-19) pandemic, AI allowed for earlier detection of COVID-19 in patients who were awaiting test results. In addition, AI helped stratify patients with a likelihood of worse outcome, directing a physician's decisions regarding choice and timing of critical care use.[4,5]

The role of AI is not limited to diagnostic radiology in improving accuracy and efficiency of image interpretation but has extended to the field of interventional radiology (IR). AI allowed radiologists to identify the most suspicious lung nodules to be biopsied while avoiding lung nodules that were likely benign and or those that were unlikely to affect patient outcome. AI improved the accuracy and efficiency of image segmentation for the brain and the liver before and after endovascular and surgical interventions. Therefore, targeted therapy is more effective today with more personalized data on patients' risks, likelihood of response to therapy, and overall prognosis. This improvement has made IR for oncology patients even more efficient and effective.[6] It also sheds more light on the additional advantages of robotics in improving the safety of patients and healthcare workers regarding radiation protection with more controlled and targeted radiation exposure.[7,8]

Despite these advantages, one cannot overlook some challenges and risks that might arise when adopting AI. The reliance on big data may limit the use of AI for new procedures and technologies for which ML might be difficult to achieve early. In addition, the quality of data is no less important than its volume: increasing the demand for human resources to ensure accurate data labeling would compete with the available limited human resources. The high level of automation and dependence on machines might also represent a threat to radiologists who might fear being replaced by robots after decades of a rewarding professional legacy. In addition, legal implications of AI remain unclear; there is no consensus on who is accountable in the event of a medico legal case.[9] These issues in particular add to the ethical and technical difficulties of using AI in clinical trials. Ultimately, in addition to the need for significant

investments in establishing big datasets from patients, there is a need for reliable measures and regulations to ensure data security and protection of a patient's confidentiality.

Although these arguments might seem somewhat legitimate, they are unlikely to limit future developments or accelerated adoption of AI. The need for big data is becoming the trend rather than an exception as healthcare providers realize the added value of digitization to achieve more efficient and effective patient-centered care.[2,3,5] Although the need for supervised ML and accurate labeling will continue, it would likely benefit from more advancement in the field, where radiology and other medical trainees become the new generation to adopt and cultivate AI use. As the values of AI, such as improved effectiveness and cost efficiency are proven, the need for accurate labeling to improve data quality may also gain support. The return on investment in robots will help diagnostic and interventional radiologists improve efficiency and accuracy, allowing better future use of valuable human capital.

Although overall AI is expected to reduce a doctor's workload, save time, and improve workflow while providing more patient-centered care, the misperception of AI becoming a threat to radiologists might make radiology as a future career less appealing to medical students. A good way to mitigate the problem is to increase the awareness and improve the knowledge of medical students regarding the promising role AI is expected to play in improving patient care. AI will need to be included in medical curricula, to ensure that scientists and radiology trainees embrace AI, thereby ensuring that radiology will stay at the forefront of technology adoption.[10]

In summary, the role of AI is likely to stay in healthcare for many decades to come. AI has shown a promising role in diagnostic radiology, and this role will likely extend to IR. AI is expected to transform the way we deliver care by identifying alternative therapies and modes of treatment, or even by helping to avoid unnecessary diagnostic imaging and interventional procedures when no added benefit is expected or when outcomes appear less favorable. Radiologists and other healthcare providers are highly encouraged to support and embrace AI because it has proven its added value in the field of radiology and in patient care.

References

1. Topol E. *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. Hachette; 2019.
2. Binczyk F, Prazuch W, Bozek P, Polanska J. Radiomics and artificial intelligence in lung cancer screening. *Transl Lung Cancer Res*. 2021;10:1186–1199.
3. Morgan MB, Mates JL. Applications of artificial intelligence in breast imaging. *Radiol Clin North Am*. 2021;59:139–148.
4. Bouchareb Y, Moradi Khaniabadi P, Al Kindi F, et al. Artificial intelligence-driven assessment of radiological images for COVID-19. *Comput Biol Med*. 2021;136:104665.
5. Abdulaal A, Patel A, Al-Hindawi A, et al. Clinical utility and functionality of an artificial intelligence-based app to predict mortality in COVID-19: mixed methods analysis. *JMIR Form Res*. 2021;5:e27992.
6. Iezzi R, Goldberg SN, Merlino B, et al. Artificial intelligence in interventional radiology: a literature review and future perspectives. *J Oncol*. 2019;2019:6153041.
7. Seah J, Brady Z, Ewert K, Law M. Artificial intelligence in medical imaging: implications for patient radiation safety. *Br J Radiol*. 2021;94:20210406.
8. Bang JY, Hough M, Hawes RH, Varadarajulu S. Use of artificial intelligence to reduce radiation exposure at fluoroscopy-guided endoscopic procedures. *Am J Gastroenterol*. 2020;115:555–561.
9. Pesapane F, Volonté C, Codari M, Sardanelli F. Artificial intelligence as a medical device in radiology: ethical and regulatory issues in Europe and the United States. *Insights Imaging*. 2018;9:745–753.
10. Paranjape K, Schinkel M, Nannan Panday R, et al. Introducing artificial intelligence training in medical education. *JMIR Med Educ*. 2019;5:e16048.