From "Nice-to-Have" to "Must-Have:" AI's Inevitable Progression?

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Despite its enthusiastic acceptance by early adopters, artificial Intelligence (AI) has yet to reach the critical mass necessary to achieve the widespread utilization in radiology that one might expect for such a powerful technology.

Indeed, the AI chasm has not yet been crossed,[1,2] and it makes me wonder: Are AI-powered technologies destined to remain solely "nice-to-have" tools in our field, or do they have the potential to achieve "must-have" status?

I believe AI is headed toward the latter. Technology is at the core of radiology; X-ray machines, computed tomography (CT) and magnetic resonance imaging (MRI) scanners, and other imaging tools are just a few of the technologies that are essential to our work as radiologists.

Similarly, it is unthinkable nowadays to consider operating a radiology department without PACS, image viewers, and radiology information and speech recognition systems. Today's imaging data, workloads, and expected service and productivity are no longer those of 50 years ago. Without these technologies radiologists would simply not be able to run their practices and meet the demands of today's healthcare world.

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Indeed, they illustrate just how the evolution of medical needs over time have led to the development of solutions that were once considered nonessential but have now become must-have tools in radiology—and all of medical care, for that matter.

There is no reason to think AI will not follow a similar path. I remember a discussion I had with a colleague a few years ago. I told him that software had been created to detect bone fractures on plain X-rays with a level of accuracy close to that of radiologists.[3] He candidly replied that he did not need such software, as he was able to detect these injuries on his own. He suggested that such a tool would become, at most, a nice-to-have gimmick.

Since then, several AI-enabled tools are gradually providing imaging practices with growing levels of support. Even if AI software to support the detection of a fracture or a stroke continues to be perceived by many radiologists as a nice-to-have option, I believe that it can improve our overall performance, confidence, and experience.[4-7]

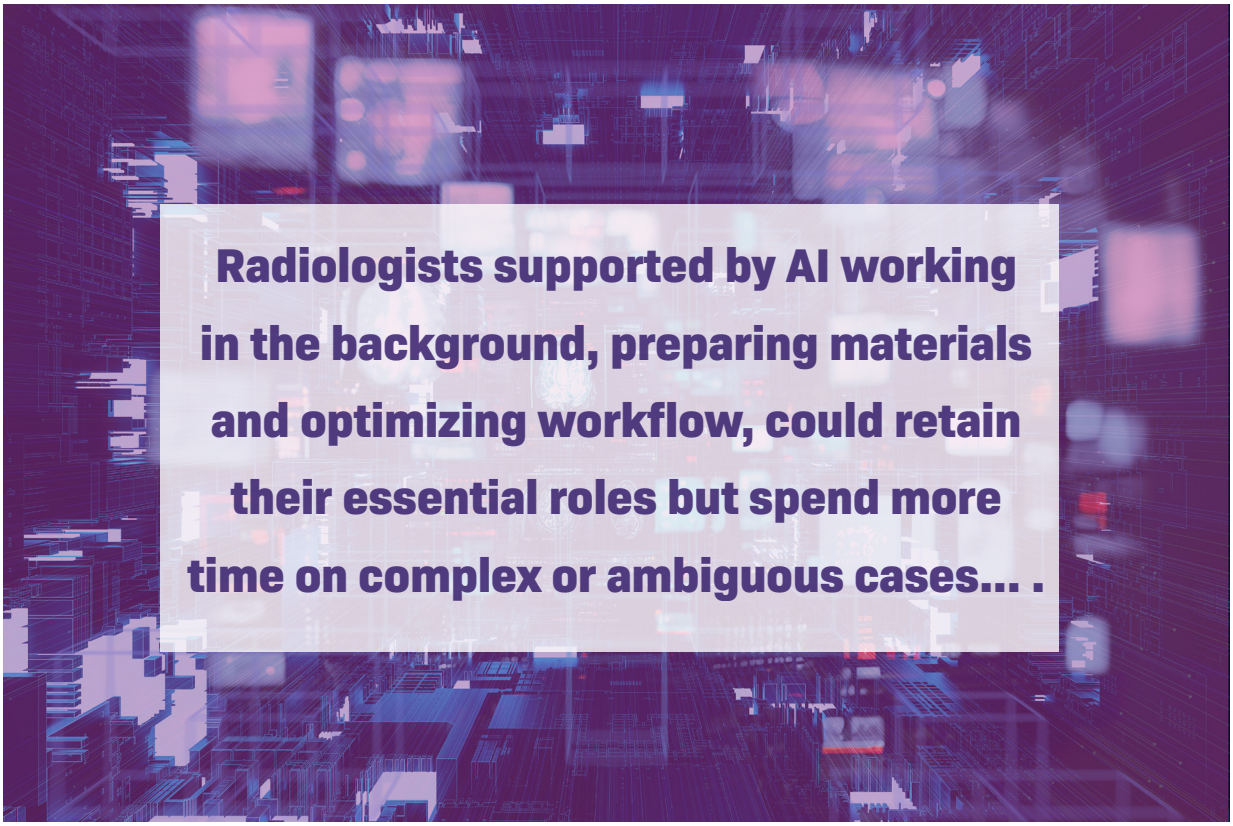
Artificial intelligence-powered software serves as a second pair of eyes, consistently and continuously working alongside us anytime and anywhere. It may help us avoid missing subtle abnormalities and can reinforce our confidence when determining exams are normal. It gives extra help during a long and strenuous day of work.

Obviously, AI has its shortcomings—it still generates its share of false-positives and false-negatives. But this does not discount its value when used reasonably with limitations in mind. Its benefits largely compensate for its use despite the limitations, and I believe its performance will undoubtedly improve with time.

In addition, AI has the ability to supercharge our equipment and quality can enable us to do more with less and improve our performance without compromising quality. For example, AI-based image reconstruction technology can significantly reduce image acquisition time, increase throughput, and reduce patient discomfort. [8,9] It is becoming increasingly clear that the next growth spurt in productivity and quality will be fueled by AI, strengthening its conversion from an accessory to an essential tool.

Consider, for example, AI has already started to gradually pervade our professional environment, and the more we integrate it, the more necessary it becomes.

AI-driven tools are currently mostly used to support radiologists in their visual interpretation-enabled automation of imaging findings. AI has the potential to do much more; it can facilitate the radiologists' daily workflow and become even more essential. Imagine a not-too-distant future where AI automates image protocoling and acquisition,



optimizing its value. In addition, AI software could even “read” every case and prefill a preliminary report, complete with highlighted findings, for delivery to the radiologist.

The radiologist’s role would be to validate the report, much like it is done in systematic peer reviewing of residents’ preliminary reports. This workflow could increase productivity and give radiologists more time to spend on complex matters and less time on simple and repetitive tasks.

It’s like the autopilot system on an aircraft. Piloting an airplane is complex and requires completion of many checks and activities, some of which are simple but tedious . The autopilot takes over some of those duties so that under the pilot’s supervision, the system controls almost every part of the flight, freeing the pilot to devote their work time on more essential and critical work, cross-checks, and verifications.

Similarly, radiologists supported by AI working in the background, preparing materials and optimizing workflow, could retain their essential roles but spend more time on complex or ambiguous cases while continuing to deliver high-quality reports to referring physicians.

Studies have shown that radiologists have a day-to-day average error rate of 3 to 5%.[10] This rate is rising with the growing volume of work,[11] increasingly difficult working conditions, and high burnout rate faced by today’s radiologists.

Peer review at the image and report levels can minimize error rates; however, the reality is that not enough radiologists are available to peer review every case and ensure optimal quality. Artificial intelligence has the potential not only to significantly improve the performance of reporting,[7] but also to work 24/7 to achieve the goal of zero errors in radiology.

I wouldn’t be surprised if the use of qualified AI software becomes a requirement for reimbursement, as is already the case with respect to validation of the appropriateness of advanced imaging requests by qualified electronic clinical decision support system under the Protecting Access to Medicare Act (PAMA) of 2014 in the USA.[12] Considering current research and investment, these scenarios are more likely than ever.[13-15]

It is also worth noting that key healthcare players outside of radiology can find significant value in AI for imaging interpretation, particularly at the point of care.[16] Equipping these caregivers with AI-generated reports can pave the way to new workflows and more efficient patient care pathways and has the potential to become essential to care provided outside of radiology.

Indeed, portable ultrasound and MRI devices can extend the capabilities of front-line healthcare professionals only so long as the clinicians are able to understand their results. Artificial intelligence-powered

software can provide them with the necessary guidance and information right where they are required.[17-20] Imaging at the point of care extends AI-based radiology's market value far beyond our field and will certainly strengthen its status as a must-have in the healthcare ecosystem.

Medicine is rapidly moving toward early multimodal diagnosis and personalized care,[21] aiming at better outcomes by delivering the right therapy to the right patient at the right time. Medical imaging is a key pillar in this new era,[22] and AI is arguably its most important catalyst.

Ultimately, I believe that by systematically extracting insights from images that are impossible to detect by human eyes and combining them with other data, AI has the potential to become a must-have weapon in the growing arsenal of healthcare technology.

References

1) European Society of Radiology (ESR). Current practical experience with artificial intelligence in clinical radiology: a survey of the European Society of Radiology. *Insights Imaging*. 2022; 13:107.

2) Bibb A, et al. 2020 ACR Data Science Institute Artificial Intelligence Survey. *Am Coll Radiol*. 2021;18(8):1153-1159.

3) Kuo RYL, et al. Artificial intelligence in fracture detection: a systematic review and meta-analysis. *Radiology*. 2022;304(1):50-62.

4) Leibig, C, et al. Combining the strengths of radiologists and AI for breast cancer screening: a retrospective analysis. *Lancet Digit Health*. 2022;4(7):e507-e519.

5) Patel, B.N., Rosenberg, L., Willcox, G. et al. Human–machine partnership with artificial intelligence for chest radiograph diagnosis. *npj Digit. Med*. 2019; 111. https://doi.org/10.1038/s41746-019-0189-7

6) David K Eng et al. Artificial intelligence algorithm improves radiologist performance in skeletal age assessment: a prospective multicenter randomized controlled trial. *Radiology* . 2021;301(3):692-699.

7) Nguyen T et al. Assessment of an artificial intelligence aid for the detection of appendicular skeletal fractures in children and young adults by senior and junior radiologists. *Pediatr Radiol*. 2022; 52, 2215–2226.

8) Bash S et al. Deep learning enables 60% accelerated volumetric brain MRI while preserving quantitative performance: a prospective, multicenter, multireader trial. *AJNR Am J Neuroradiol*. 2021; 42(12):2130-2137.

9) Bash S, et al. Deep learning image processing enables 40% faster spinal MR scans which match or exceed quality of standard of care : a prospective multicenter multireader study. *Clin Neuroradiol*. 2022;32(1):197-203.

10) Brady AP. Error and discrepancy in radiology: inevitable or avoidable? *Insights Imaging*. 2017;8(1):171-182.

11) Lee CS et al. Cognitive and system factors contributing to diagnostic errors in radiology. *AJR Am J Roentgenol*. 2013;201: 611-617.

12) Appropriate Use Criteria Program. https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/appropriate-use-criteria-program. Accessed January 12, 2023.

13) Pesapane F, Codari M, Sardanelli F. Artificial intelligence in medical imaging: threat or opportunity? Radiologists again at the forefront of innovation in medicine. Eur Radiol Exp. 2018 Oct 24;2(1):35. doi: 10.1186/s41747-018-0061-6. PMID: 30353365; PMCID: PMC6199205..

14) Xuli Tang et al. The pace of artificial intelligence innovations: speed, talent, and trial-and-errror. https://doi.org/10.1016/j.joi.2020.101094

15) Parekh S. VC funding for medical imaging AI companies totals almost $3.5 billion since 2015. *Signify Research*. https://www.signifyresearch.net/medical-imaging/vc-funding-for-medical-imaging-ai-companies-totals-almost 3-5-billion-since-2015/

16) Cheema BS, et al. Artificial intelligence-enabled POCUS in the COVID-19 ICU: a new spin on cardiac ultrasound. *JACC Case Rep*. 2021;3(2):258-263.

17) Kainz B, Heinrich MP, Makropoulos A, et al. Non-invasive diagnosis of deep vein thrombosis from ultrasound imaging with machine learning. NPJ Digit Med. 2021 Sep 15;4(1):137. doi: 10.1038/s41746-021-00503-7. PMID: 34526639; PMCID: PMC8443708

18) Kundu P, Sadegh S, Salehi M, et al. Point-of-Care MRI with Artificial Intelligence to Measure Midline Shift in Acute Stroke Follow-Up. medRxiv 2022.01.22.22269697; doi: https://doi.org/10.1101/2022.01.22.22269697

19) Pokaprakarn et al. AI estimation of gestational age from blind ultrasound sweeps in low-resource settings. Published March 28, 2022 NEJM Evid 2022; 1 (5) DOI:https://doi.org/10.1056/EVIDoa2100058.

20) Acosta J, et al. Multimodal biomedical AI. *Nat Med* 2022; 28:1773–1784.

21) European Society of Radiology (ESR). Medical imaging in personalised medicine: a white paper of the research committee of the European Society of Radiology (ESR). *Insights Imaging*. 2015;6(2):141-55. doi: 10.1007/s13244-015-0394-0. Epub 2015 Mar 13. PMID: 25763994; PMCID: PMC4376812.