



# The Opportunities and Risks of Artificial Intelligence in Medicine and Healthcare

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Artificial Intelligence (AI) is increasingly being applied in healthcare and medicine, with the greatest impact being achieved thus far in medical imaging. These are technologies that are capable of performing a task that usually requires human perception and judgement, which can make them controversial in a healthcare setting. In this article we will explore some of the opportunities and risks in using AI in healthcare, as well as policy recommendations for improving their use and acceptance.

## Opportunities

New AI technologies can identify subtle signs of disease in medical images faster and more accurately than humans. One example is the deep learning algorithm developed by Enlitic, Picture Archiving and Communications (PAC), which detects signs of disease in medical imaging modalities including MRI, CT scans, ultrasound and x-rays. PAC contextualizes the imaging data by comparing it to large datasets of past images, and by analysing ancillary clinical data, including clinical reports and laboratory studies. As a result, Enlitic claims doctors may be able to achieve 50–70% more accurate results with PAC compared to human radiologists working alone, and at 50,000 times faster speed.

Another key area of medicine where AI is impacting is in clinical decision-making, in particular disease diagnosis. These AI technologies can ingest, analyse and report

on large volumes of data, across different modalities, to detect disease and guide clinical decisions. For example, Lumiata's graph-based analytics and risk prediction system has reportedly "ingested more than 160 million data points from textbooks, journal articles, public data sets and other places in order to build graph representations of how illnesses and patients are connected."<sup>2</sup> This new knowledge can help in understanding the multifactorial basis of disease and guide the development of new treatments.

Big data also has a role to play. Complementary technologies such as 'smart wearables' have the potential to increase the power of medical AI through the provision of large volumes of diverse health-relevant data, collected directly from the user. The combined impact of these technologies will help us to move closer towards achieving 'precision medicine', an emerging approach to disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle.

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Hospitals, doctors and nurses are overworked and cost and time efficiencies are always being sought. Automating elements of medical practice means

clinicians will increasingly have more time to spend with the patient on those tasks where human-delivered care is key. Focus will transition to working on more complex cases, clinical interpretation, and patient communication. These areas can also benefit from AI input, and together should help the medical and technology community to address a greater number of medical needs and overall improve the delivery of healthcare.

## Risks

While we can look forward to the benefits of AI to improve healthcare, the adoption of these technologies is not without considerable potential risks. The clinical setting, healthcare provision and patient data necessitate the highest level of accuracy, reliability, security and privacy.

Consistent accuracy is important to preserve trust in the technology, but AI is still in its infancy. Whilst AI systems may have been trained on comprehensive datasets, in the clinical setting they may encounter data and scenarios that they have not been trained on, potentially making them less accurate and reliable and therefore putting at risk patient safety. As aforementioned, medical AI systems may work with consumer-facing smart wearables, and use the data they generate. A recent study showed that the heart rate readings provided by one of the most popular smart wearables, the Fitbit PurePulse Trackers, “do not provide a valid measure of the users’ heart rate and cannot be used to provide a meaningful estimate of a user’s heart rate”, and in fact differed from ECG readings by an average of 20 bpm.<sup>5</sup>

The data collected by these devices is also sensitive and needs to be safeguarded with the highest security standards. A study<sup>6</sup> showed that 20 out of the 43 fitness apps

analysed included high-risk data, such as address, financial information, full name, health information, location and date of birth. If we work from the premise that all personal data can be identifiable, then it is critical that all data used in a medical setting is safeguarded. Given that there is an important distinction between clinical and non-clinical use, and the fact that data from non-clinical smart wearables may feed into clinical AI systems, it will be necessary to identify where clinical-level accuracy and reliability needs to be implemented.

Both accuracy and security are required to foster trust in these new technologies. A lack of trust in AI systems may significantly impinge adoption of technologies that may otherwise offer significant improvements in patient outcomes. Trust can be gained through greater transparency in how results are achieved. For instance, how the AI system came to a recommendation that the patient should have a mastectomy. Currently this is a technological issue that the technical community is addressing, and so solutions should come henceforth.

Addressing the risks posed by medical AI is important as technological development and implementation ramp up growth. Industry estimates predict that by 2018, 50 percent of the more than 3.4 billion smartphone and tablet users will have downloaded mobile health apps<sup>7</sup>.

## Encouraging the Rapid, Ethical, and Responsible Growth of Medical AI

The accuracy, reliability, security and clinical use of medical AI technologies would need to be ensured through a combination of standards and regulation. Existing regulatory frameworks would need to develop to address medical AI technologies, which have their own ethical problems to

contend with. Artificial intelligence programs may be able to learn and alter their recommendations in ways not intended or foreseen by their creators. That, and the diversity of development approaches across the planet,<sup>8</sup> poses challenges for current regulatory frameworks that would therefore need to evolve to define guidelines and best practice.

The development of standards for data collection and testing of medical AI technologies should be a community-driven effort, led by clinicians, industry, academia and stakeholders. Dedicated research and open-source development addressing the key issues would facilitate the growth of medical AI. A comparable undertaking can be found in the related field of genomic medicine. The Global Alliance for Genomics and Health brings together over 375 leading institutions working in healthcare, research, disease advocacy, life science, and information technology, to provide recommendations and solutions to mitigate the risks associated with the accumulation of large datasets of medical and genetic information.

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This is very feasible. A ‘Global Alliance for Artificial Intelligence in Health’ could collaborate with the planned NHS ‘test bed’ sites, real world sites for ‘combinatorial’ innovations that integrate new technologies, new staffing models and payment-for-outcomes<sup>9</sup>. The NHS ‘test beds’, which are planned over the next 5 years, would facilitate the implementation of AI

technologies within clinical settings. Furthermore, putting in place a mechanism to inform the relevant national and international public bodies about the results and outcomes is also important.

Medical education would also need to expand to better include new technology. Today’s educational curriculum encompasses minimal teaching of technologies that medical practitioners will use, or come into contact with in their profession. For AI systems to be fully appreciated and implemented as they are intended within clinical practice, there would need to be dedicated training in understanding and working with these new technologies, which will even take on certain clinical tasks with complete autonomy, such as diagnosis and surgery. Furthermore, as the role of the clinician will evolve, medical education will need to focus more on complex disease scenarios, and developing skillsets to navigate, understand and communicate the myriad of data that may be called upon for a given medical scenario. In order to equip medical students to meet these demands, medical education will need to be more holistic to incorporate understanding of the technologies and the results they generate.

Finally, healthcare IT systems today can be fragmented and cumbersome to work with, presenting challenges for implementation of new technologies. Interoperability and IT procurement would need to evolve to meet the growing need for advanced technologies in clinical practice, and would need to ensure that the data and outcomes are integrated seamlessly into an end-to-end care pathway.

## Conclusion

If policymakers, hospitals and universities consider these policy issues, we would be in a better place to take advantages of AI’s

opportunities for healthcare. Without them, the risks of poor accuracy, security and understanding may cause untold problems. With such a controversial technology such as artificial intelligence, it is imperative that policymakers make decisions while the technology is still young, before they are forced to make policy reactively.

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## About the Author



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