
Symbiotic intelligence in health care

OPINIONS

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The author has completed the ICMJE form and declares the following conflict of interest: he has invested in global index funds whose portfolios include AI companies.

The combination of human and artificial intelligence does not automatically yield better results than the sum of its parts.

At a time when artificial intelligence (AI) is revolutionising an increasing number of fields, there is an expectation that combining human expertise with machine precision will automatically lead to better outcomes. In medicine, where ethical and legal considerations require that human doctors remain central to clinical decision-making, the idea of *symbiotic intelligence* is highly appealing. Intuitively, we expect that combining human and machine capabilities will yield better diagnostics, fewer errors and a higher level of patient safety than either could achieve alone. However, research shows that this does not happen automatically. Without proper design and implementation, AI support may even reduce performance compared with the doctor or AI on their own.

Several reasons

A recent meta-analysis examined when it is useful to combine human intelligence with AI [\(1\)](#). Following a systematic review of 106 experimental studies, the authors concluded that human–AI systems perform worse on average than either humans or AI on their own. This is particularly true for tasks where AI performs better than humans. However, synergies were observed where humans initially outperformed machines.

There may be several reasons why combining humans and AI does not always produce better results. Doctors may either trust AI too much and overlook obvious errors, or not trust it enough and ignore useful suggestions. AI tools that are not seamlessly integrated into clinical practice may disrupt workflow and distract clinicians rather than assist them. AI is often better than humans at routine and structured tasks, such as image recognition and systematic categorisation, whereas humans are better at contextual assessment and communication. When humans and machines try to outperform each other, conflicts may arise, preventing effective collaboration. Consequently, their combined performance may be worse than, for example, AI on its own .

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Synergies are not a given [\(1\)](#); they require clearly defined, complementary roles for AI and humans, and tools that are adapted to everyday clinical practice.

One study shows that synergy is possible [\(2\)](#). A network of primary care clinics in Nairobi used a clinical decision support tool that served as a 'safety net' for doctors. The tool identifies potential documentation errors and clinical decision-making errors but is only activated when necessary. It is thus intended to support, rather than replace, the doctor's expertise.

The results are promising. There were 16 % fewer diagnostic errors and 13 % fewer treatment errors among doctors who used the tool compared with those who did not have access to it. In absolute terms, the tool could have averted diagnostic errors in 22,000 consultations and treatment errors in 29,000 consultations annually at these clinics alone. All doctors reported that the tool improved the quality of care, and 75 % described the effect as 'substantial'.

The Nairobi study was different because AI was evaluated under real, dynamic clinical conditions. Furthermore, the tool was not an 'extra layer' but an integral part of the electronic health record. It provided suggestions for the doctor, who always had ultimate responsibility. Any usability issues were addressed on an ongoing basis by the programmers.

What is required to succeed?

To succeed, optimal task allocation is necessary, where AI and doctors are assigned the tasks they are best suited for. For AI, this includes routine analyses, pattern recognition and data collection, while for doctors it encompasses contextual assessment, patient communication and ethical considerations. For example, AI can analyse histological images for cancer assessment and propose differential diagnoses, whereas the doctor is best suited to evaluating the patient's history, symptoms and preferences.

Software must be seamlessly integrated into the workflow. AI tools must be invisible when not needed, and available when required. They should not interrupt the doctor with warnings unless these are directly relevant to the task at hand.

«AI tools must be invisible when not needed, and available when required»

Humans should retain autonomy over the tasks they are best suited to. AI should support clinical judgement, and doctors must be able to override AI suggestions. It is also important that doctors understand how the system works and why it generates specific suggestions. This can help reduce automation bias.

AI systems must learn from doctors' feedback and adapt to local conditions. There must be ongoing evaluation of how the technology is used and its impact. It could even be argued that we need clinical informaticians, similar to today's clinical pharmacologists (3).

Doctors need ongoing training in the critical use of AI. In Nairobi, this was achieved by having proficient users of the AI tool train their colleagues (2).

Efficiency is often cited as an argument for implementing AI support. In Kenya, the AI group spent longer on their consultations (2) but made fewer errors. The focus should be on making consultations safer and more accurate rather than faster, which may save resources later in the patient pathway.

Success depends on more than technology. Dedicated roles (e.g. AI coordinators) are needed to assess which tools are appropriate for which tasks and how they should be implemented. Very few quantitative studies have evaluated the practical implementation of AI in different healthcare systems.

Symbiotic intelligence is possible

Symbiotic intelligence in health care requires deliberate design, effective integration and continuous evaluation. AI alone will not revolutionise medicine, and doctors alone cannot exploit AI's full potential. We must invest in educating future doctors and invite reflection on the symbiotic collaboration between humans and AI. All doctors must learn to determine when and how AI can be used, and when to rely on their own judgement.

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