How AI could revolutionise NHS healthcare

*In the run up to the Imperial-LSE symposium on [Generative AI and The Knowledge Economy](), **Miqdad Asaria** argues that AI could lead to a paradigm-shift in healthcare systems likes the NHS. AI could help personalise medical treatments, enhance research and development of new drugs and help with the administrative burden currently undermining the productivity and efficiency of healthcare providers.*

Generative AI has the potential to radically transform both how patients interact with the NHS when consuming healthcare as well as how the NHS produces healthcare. If the numerous challenges to adopting AI can be overcome this could lead to leaps in both population health and health system productivity, relieving some of the pressures of ever rising healthcare costs and hospital waiting lists. However, to achieve these benefits in severely budget constrained systems like the NHS we will require significant investment in the digital health infrastructure underpinning AI.

Personalised medicine

Perhaps the single most exciting impact of AI is in the potential it has to change the way we interact with the [health system](). AI will increasingly be able to interface with our growing range of [wearable devices]() and apps, combine the data from these with our health records and cross reference with the latest [knowledge base]() from preventive healthcare and clinical medicine to produce a set of objectives for our health. It will then be able to combine these with what it has learnt about our [personalities]() and perhaps our consumption habits to translate these objectives into an easily digestible set of recommendations in a style and medium that is individually tailored to be most likely to work for us. For some this might take the form of gamification using [augmented reality](), for others animations appealing to our scientific curiosity or [interactive conversations]() with a simulated version of our favourite celebrity. This approach may help engage us in preventive behaviours whilst well and quickly pick up on any developing serious health condition and guide us towards appropriate treatment, simultaneously preparing the

treatment provider with the information they need to understand and address our condition. Early adoption of this approach is already being trialled in the context of social care in the NHS where people are being discharged from hospital and remotely monitored using wearable devices and AI algorithms in virtual wards in their own homes.

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In order to unlock these paradigm-shifting health benefits we will need to overcome a number of challenges before we are comfortable entrusting our health to the machines. Many of these challenges have been extensively discussed elsewhere and include the problem of model hallucination where the AI invents answers when questioned outside of its knowledge base, the requirement for these probabilistic algorithms to deliver reproducible results, and the legal issues around who is accountable when something goes wrong. Tackling biases encoded in model training data and algorithms and staying on top of model drift are also often highlighted as crucial challenges facing AI models. Additionally, we will need to think carefully and creatively about the digital divide, how to prevent new technology further exacerbating health inequalities and how to retain and even enhance the humanity in our healthcare systems. These are all challenges that health systems like the NHS are aware of and actively grappling with.

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AI and drug discovery

The second area where AI is already making a huge impact is in the drug discovery and development process. AI is speeding up many of the key steps required to develop new drugs by orders of magnitude and consequently dramatically reducing the research and development costs of bringing new drugs to market. It is also greatly streamlining post market surveillance processes by enabling the efficient collection and analysis of real-world data to identify adverse drug reactions and other safety concerns. Traditionally, outsized research, development and surveillance costs have driven the pharmaceutical industry to focus on producing treatments targeted to only the most profitable diseases

and underpinned arguments for patent protections which have driven up the costs of medicines making them unaffordable to patients in many parts of the world and resulting in escalating healthcare budgets even in those parts of the world such as in the UK where medicines are affordable. AI has the potential to upend this business model with progress already being made in tackling previously unprofitable neglected diseases and throwing the pharmaceutical patent system into turmoil both by undermining the business case for patents and the legal definition of what is patentable.

> In order to unlock the significant improvements in productivity and associated cost savings – the already depleted budgets of health systems such as the NHS will need to be augmented to undertake the substantial investment in digital technologies required to underpin the AI transformation.

AI and productivity

With the promise of better access to healthcare, faster diagnosis of conditions, and new drugs to treat wider ranges of conditions comes the concern that AI will generate yet more demand in the already overstretched healthcare system. There is hope that here too AI may come to the rescue by picking up much of the administrative burden and associated costs around healthcare, freeing up clinicians time for face to face interactions thereby tackling a major cause of burnout in health systems such as the NHS.

Furthermore, AI promises to accelerate task shifting initiatives where it can act as a co-pilot helping both patients manage their own care and non-specialist clinical staff tackle more specialised tasks than they would typically be comfortable managing on their own. However, in order to unlock the significant improvements in productivity and associated cost savings – the already depleted budgets of health systems such as the NHS will need to be augmented to undertake the substantial investment in digital technologies required to underpin the AI transformation. This investment is required to: upgrade the poor state of digital infrastructure within the NHS; overcome the challenges posed by interoperability across the plethora of NHS data silos; upskill the NHS workforce with dedicated AI specialist career pathways; and develop and implement responsible AI governance frameworks to carefully manage the risks and ethical challenges that AI poses to the NHS.

The NHS is starting to acknowledge the scale of this challenge and has made promising early progress on all of these fronts as well as recently announced the allocation of a further £3.4 billion of its budget to NHS technology and transformation. As AI starts to be rolled out within the NHS, healthcare payment and reimbursement mechanisms will need to be carefully thought through to ensure that the correct incentives are in place to encourage the adoption of the cost saving and productivity enhancing opportunities that AI offers. The NHS has again been a pioneer on this front by explicitly introducing incentives to reward the use of AI.

The potential benefits of AI are huge but there are significant challenges that will need to be overcome in order to realise these benefits – challenges that the NHS is actively engaging with setting it up to be a leader in the health AI revolution.

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