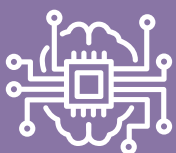
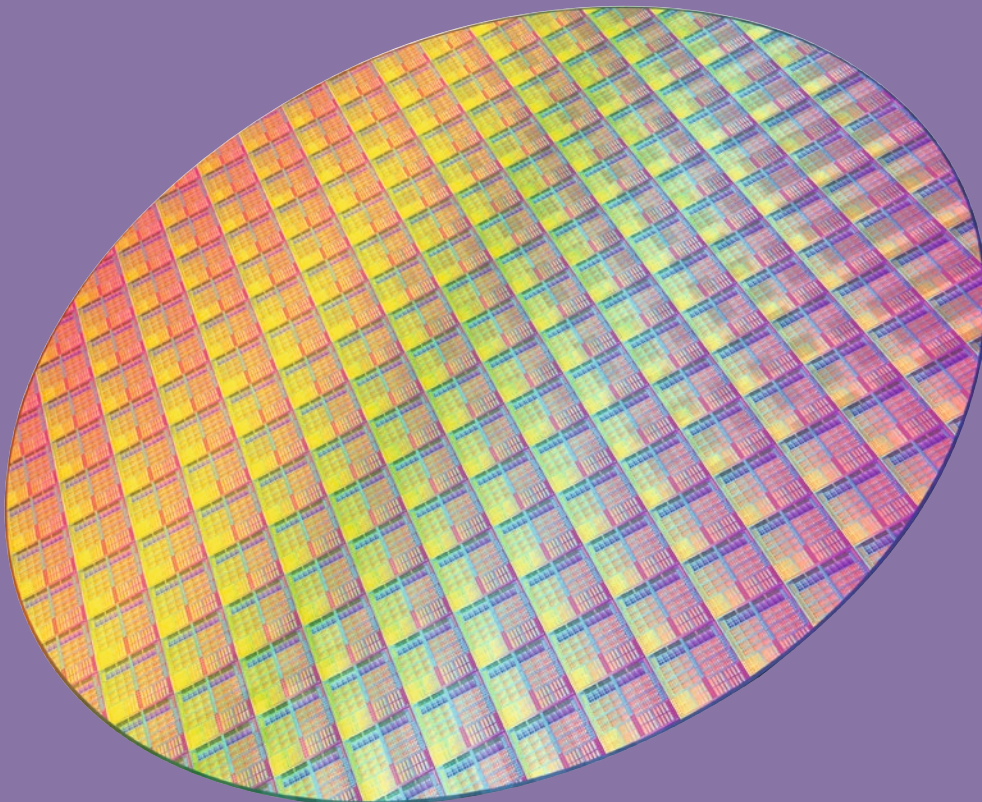


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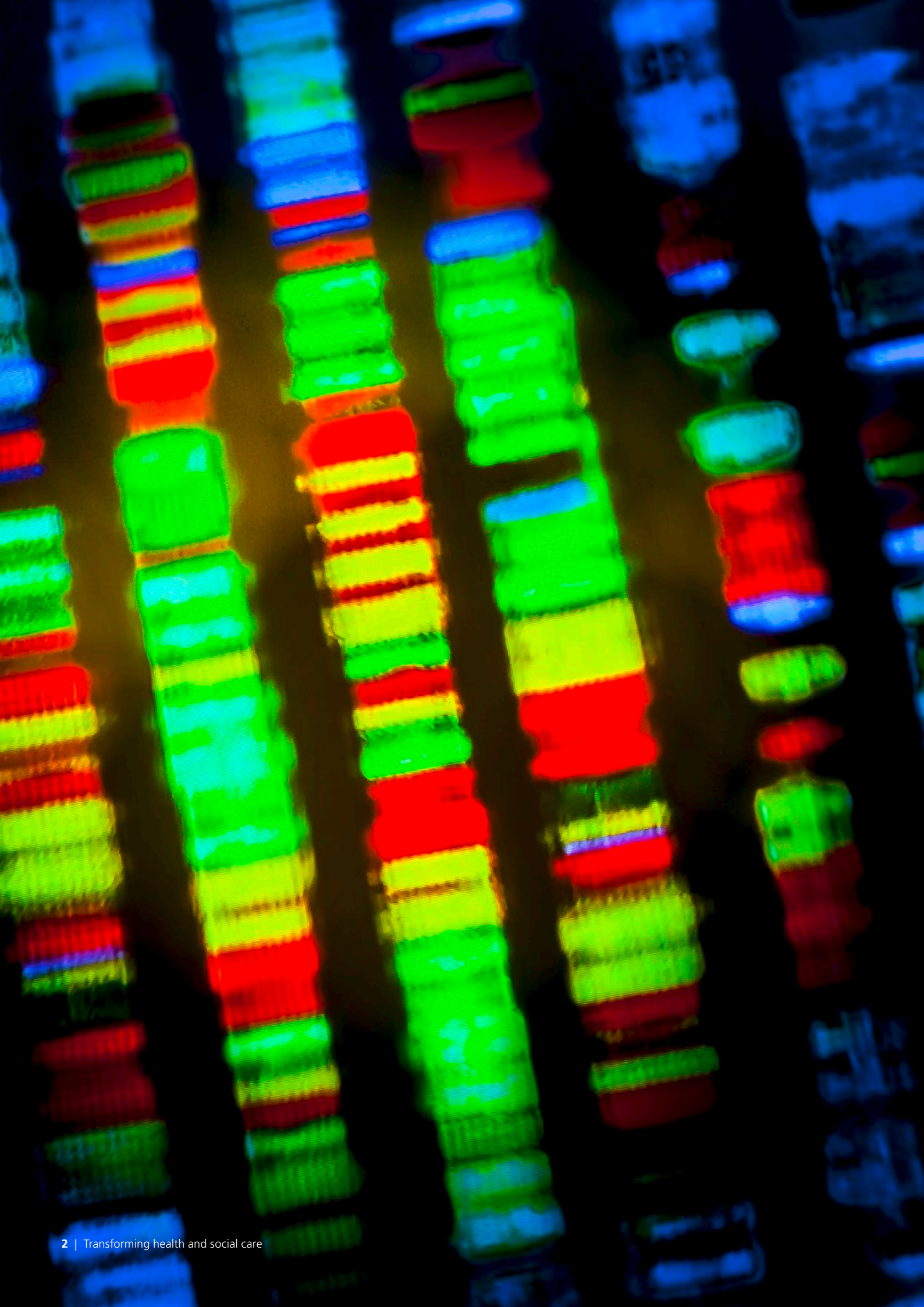
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Transforming health and social care

Industry perspectives on the opportunities and challenges of AI



Artificial
Intelligence



At a roundtable event in London in September 2018, CMS assembled a selection of healthcare operators, industry experts, healthtech companies and CMS Partners to discuss the potential impact of artificial intelligence (AI) and other related technologies on the UK health and social care sector. In this report, we capture the future direction of technology in the industry and how it might overcome the inherent hurdles preventing much-needed modernisation.

With the UK already being at the forefront of AI innovation and the UK government putting the creation of an 'AI and Data Economy' sector at the heart of its overarching industrial strategy, health and social care should be a major participant in and beneficiary of the drive to develop and adopt this rapidly growing technology.

The opportunity to change the way we deliver health and social care is huge and the potential time and cost savings and service quality improvements that can be delivered are there to be taken. In a separate report by CMS, "Vital Signs, a digital dynamic promises growth for UK life sciences", survey responders cited healthcare records management, remote health monitoring, back office processes and pathology and imaging being among the greatest commercial opportunities for digital technologies such as AI.

Historically, the sector has been a relatively slow adopter of innovation due in part to poor data quality, the lack of integration between health and social care delivery and the long term, deep rooted behaviours of health and social care providers and their patients and service users. There are other hurdles to get over, such as privacy and data security concerns, healthcare professionals' apparent reluctance to embrace new technologies, the NHS's approach to innovation and the need for the legal and regulatory environment to catch up with the rapidly changing technological environment. We believe with, among other things, a political will to intervene in the sector, the deployment of additional capital in the NHS, greater investment in the development of AI technologies and improved sector leadership and co-ordination, these obstacles can and will be overcome and will provide great benefits to the sector.

We hope you find this report of interest.



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The basis for transformation

There are compelling arguments for the use of AI in healthcare, but a full-scale revolution of day-to-day internal processes and patient care is likely to be slow. Redundancy fears, resistance to change, budget constraints, regulatory obstacles and liability concerns are hindering these technologies' proliferation across the sector.

In an age when trolleys full of paper-based medical records are still being wheeled around UK hospitals, it would be logical to dismiss the healthcare sector as a barren land for AI implementation, but the arguments for AI and deep learning technology are logical and compelling. Enhanced efficiencies, faster and more accurate diagnoses, more successful treatments and surgeries, and better workplace satisfaction are just a few reasons for its rollout. Yet budget constraints, inertia and fear that jobs will be put in jeopardy are serious obstacles to AI take-up.

A February 2018 Deloitte study entitled *Time to Care: Securing a future for the hospital workforce in the UK* says that only 49% of survey respondents felt that their organisation was 'adequately prepared to implement new technologies in patient care.'

Healthcare institutions, most notably the National Health Service (NHS), often suffer from a lack of nimbleness and internal alignment on procurement. While one department may recognise the transformational effect of AI or deep learning adoption, the next may be content with the status quo. Moreover, a return on investment (ROI) may be blatant, but institutions find it hard to access capital due to strictly defined budget allocations and public policy decisions. Innovative or forward-thinking individuals will often find it hard to make their voices heard, especially when their opinions are not in parallel with institutional or public policy.

Add in the fact that AI has only really entered the healthcare lexicon in the last two or three years, it simply hasn't had enough time to gain a foothold. Karen Taylor, Research Director of the Centre for Health Solutions at Deloitte UK, says her team's research back in 2014 found that references to AI in healthcare were relatively rare, nor was it seen as a priority for most healthcare institutions. Yet it is now very much part of key strategic discussions.

"There will be a significant shift in the next three years," says Kishan Pattni, Lead Data Scientist in Deloitte's AI unit. "With what we can now do in image recognition and natural language processing, this is paving the way towards so much more in healthcare that is increasingly artificially human and intelligent. This is being enabled by huge advances in deep learning and artificial neural networks."

The power of the consumer will play a powerful role in the future. Take the recent phenomenon of medical tourism, says Simon Hooper, co-founder and CEO of RemindMecare.

"Consumers typically drive change," he remarks. The younger generation is increasingly looking to technology, such as fitness trackers, to help improve their health and health insurance companies are already leveraging this data to offer customers more competitive premiums. "AI can be used to help people stay healthy," says a CMS report entitled *Digitisation in Healthcare: From utopia to reality – artificial intelligence, its legal risks and side effects*. "The goal is to give consumers better control of their health and wellbeing," the report states.

Detection, diagnosis and treatment

Despite resistance to change, there are a number of key areas where AI is expected to make a key difference, such as preventing non-essential hospital admissions, which will then create momentum for further transformation.

There are clear easy wins for AI in the healthcare sector. AI can be used to analyse patient waiting lists, to identify where patients may have fallen off the radar or out of the system all together. AI can be used to quickly identify abnormalities and ailments, and recognise the most effective treatments.

It is already having early successes, particularly in distinguishing whether a patient needs immediate care or treatment. The NHS has employed Babylon Health to triage 111 helpline enquiries and ensure that patients access the most appropriate level of care more quickly. The app provides an 'alternative mechanism of accessing integrated urgent care and connecting patients to clinicians', according to an NHS statement, which says the technology will 'tell people where to go and who to see, as close to their home as possible, so they can make the right choices.'

Dr Martyn Diaper, CEO at IMH Group, a network of primary care sites across the UK that serves to help the NHS deliver its five-year plan, says: "If AI can do anything it should reduce hospital admissions. That is where it will gain traction in the NHS."

The same rationale is being used by Virgin Care, which adopted TotalMobile, the mobile working

solution, in 2014, enabling nurses to access vital patient information during home visits. Karen Millen, Virgin Care's General Counsel and Company Secretary, says that the initiative has significantly improved efficiency with initial estimates suggesting that nurses were able to visit up to two extra patients a day and reduce the time spent on paperwork. She says that this is crucial in Virgin Care's focus on preventative medicine and in reducing hospital admissions – allowing clinical colleagues to spend more time doing what they do best – spending time face to face with people, making a difference.

Of course, AI is gaining recognition far and wide. A collaboration between Moorfields Eye Hospital NHS Foundation Trust, DeepMind Technologies and University College London (UCL) has created a new AI system that identifies eye abnormalities from scans and recommends appropriate referrals. It claims to make the right referral recommendations more than 94% of the time.

Niall McAlister, a Corporate Partner at CMS says that this initiative has proven to be more accurate than diagnoses by many clinicians and is completed "in a fraction of the time". He believes that AI's future prospects will depend on the "quick change and momentum" that is created by these innovations.

Obstructing AI's momentum

Despite the compelling arguments for its use, there are numerous reasons why AI is failing to gain a toehold, not least the fear that it will make certain roles redundant and highlight where professionals are not meeting the required standards.

While the NHS has a huge budget, it simply doesn't have the cash reserves to make significant investments in AI and other technologies. Public policy also determines to a large extent where funds are channelled.

Poor IT infrastructure with little consistency of systems across the health and social care sector adds another layer of complexity for AI and deep learning systems to overcome. As one participant at the roundtable dinner states: 'For the NHS to adopt AI is like turning around a super tanker.'

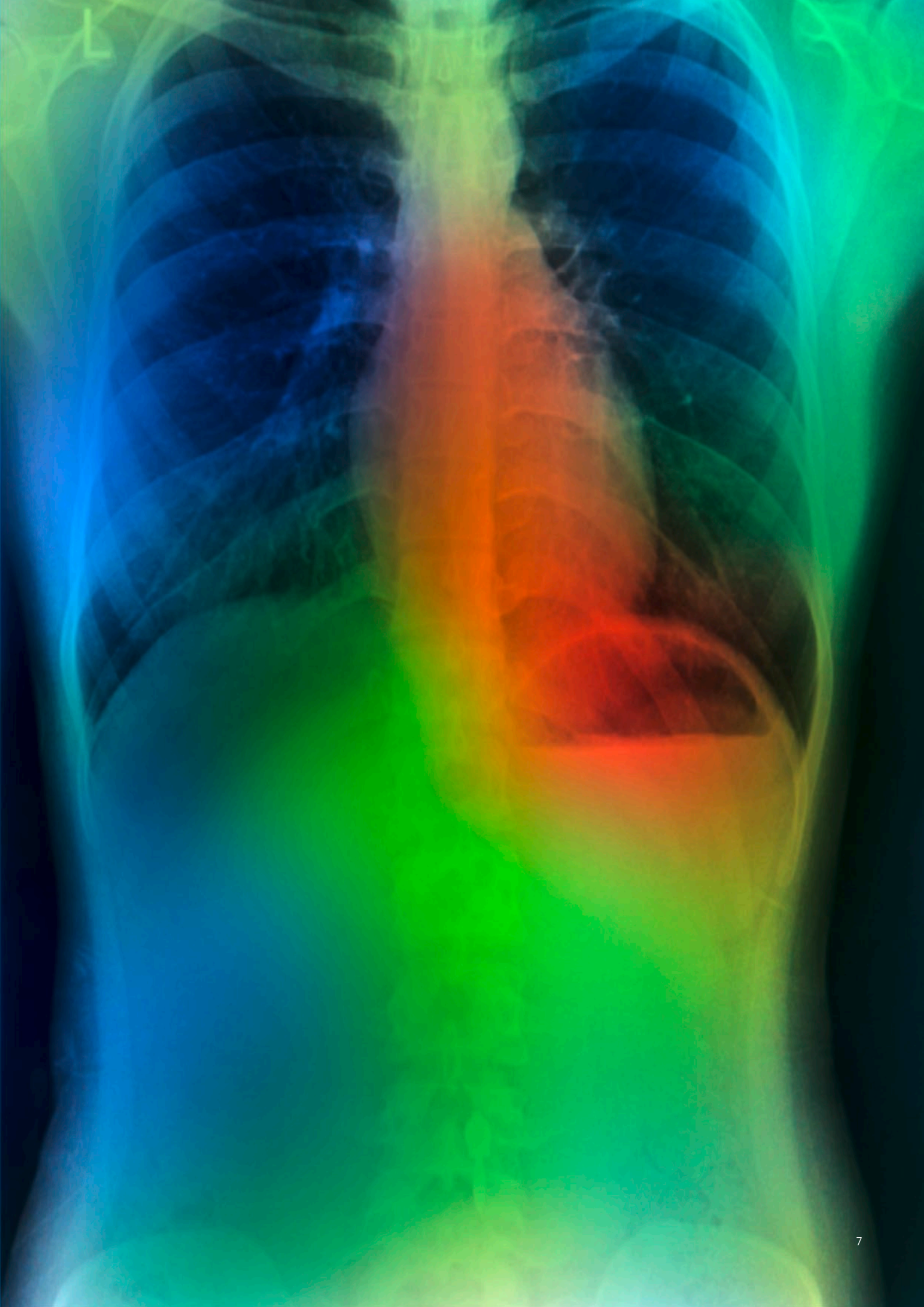
Super tanker or not, healthcare is still ripe for change. Karen Taylor (Deloitte) remarks: 'There are great minds in the NHS, but the barrier to wider scale adoption of technologies including AI are significant, including a lack of evidence of impact and difficulties obtaining the requisite funding to invest in the technology. Moreover, even when one ward in a hospital is using a particular technology, staff in a neighbouring ward may be resistant to change. The NHS has a huge amount of money but it is not always spent wisely. While between 60 and 70 per cent of hospital operating costs are spent on clinical staff, an increasing amount of their time is spent on administrative tasks when automating administrative and repetitive tasks could free up time to spend on direct patient care.'

Dr Martyn Diaper (IMH) believes that the sector needs to create greater transparency so that AI and other technologies can really make an impact. "There is not enough visibility into the quality of care," he says. "We need to give more transparency to doctors and patients."

Fear of change remains a common factor in why technologies continue to be undervalued. Worries about marginalisation are also crucial, especially for professionals that are anxious about whether they are performing to expected standards. Dr Diaper believes that healthcare professionals are likely to be particularly resistant to AI if the technology effectively highlights their own failings. These cultural obstacles must be overcome if AI technologies are to gain real traction.

Moreover, concerns have been raised about AI developers and their commercial priorities and responsibilities. DeepMind Technologies, for example, collaborates with Moorfields Eye Hospital and UCL, and is owned by Alphabet, the parent company of Google. Will patients or consumers feel incentivised to sell their data to a 'corporate giant'? Carina Healy, a Technology Partner at CMS, believes that the healthcare sector will have to work hard to earn the trust of patients, so that they will be more willing to share their health data.

Resistance to AI is also driven by the concern that it will drive up demand for immediate treatment, through greater efficiencies and quicker and more accurate diagnoses. For example, thousands of people are thought to be living with yet undiagnosed diabetes – they could become an immediate and additional burden to healthcare services. However, quicker diagnoses could alleviate pressure on the healthcare sector because ailments can be addressed before they become more serious.



The role of AI in decision making

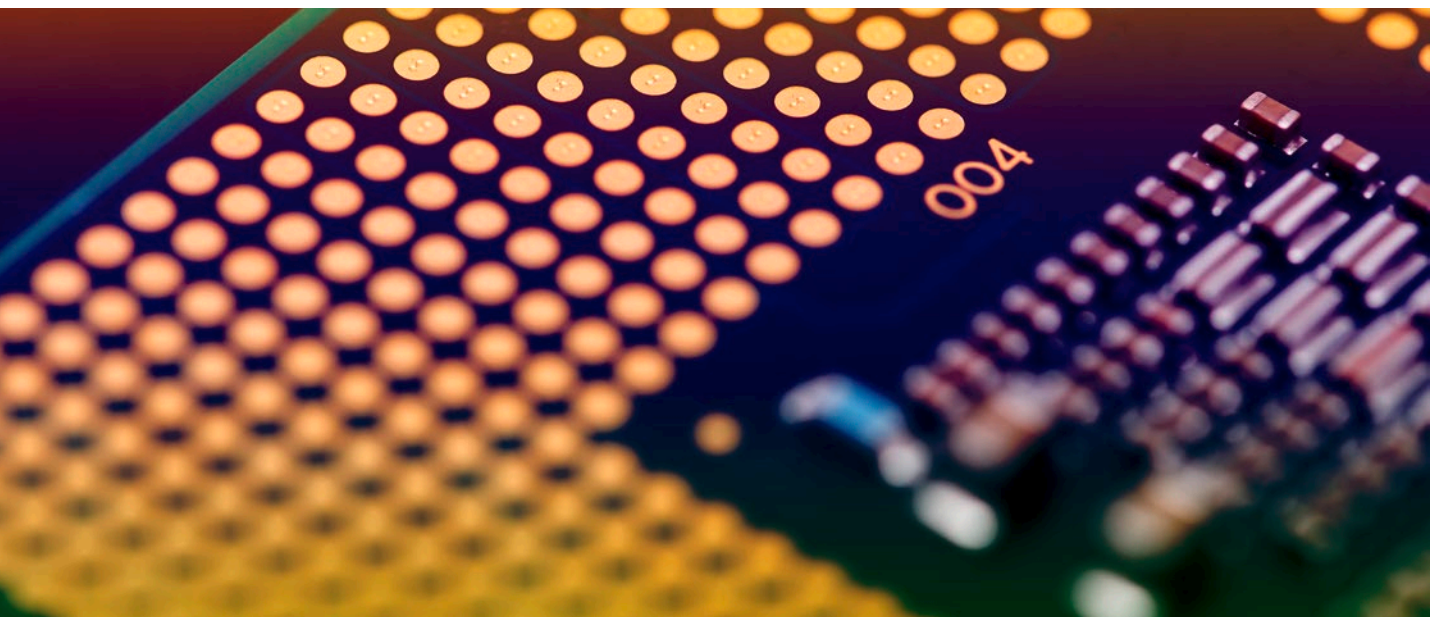
Too many expect AI to be 100% accurate and forget that it is designed to inform decisions, not necessarily make decisions.

Richard Bradford, Chief Executive at InHealth, believes that there is a tendency to point the finger at AI's lack of complete accuracy, even if it is more exact than human healthcare professionals. While the public has generally built trust in General Practitioners (GPs), that level of trust is not there for AI. For example, what if a patient was told that AI had got a diagnosis right and the GP was wrong? A GP's honest mistake might be viewed as acceptable, the same is unlikely to be afforded to AI.

Kishan Pattni (Deloitte) says that whilst AI cannot be 100% accurate, it's possible to form strategies for how to handle these imperfect outputs and still drive meaningful impact in traditionally human decision making. "At the moment, we can backtest AI models on historic data to understand where they are weak and subsequently wrap appropriate governance around them as they are deployed. In the future,

as models and the problems we solve with them become more complex, we could be in a world where another layer of AI monitors the first stage and better identifies these mistakes. AI monitoring and regulating AI, with human intervention as needed"

There are of course risks associated with the use of AI, especially when it is used in isolation with little human supervision or interaction. Lee Gluyas, a Dispute Resolution Partner at CMS says that when AI is implemented for analysis and diagnosis purposes, it should be viewed as "informative and not determinative" and that there should be a layer of human input to ensure necessary levels of contextual experience, creativity and emotional intelligence. "The information that is presented by computer analytics might inform decisions, AI should not determine the decisions that are made," he explains.







AI: a panacea for workforce attrition?

The numbers of healthcare professionals leaving the industry is well documented, but will AI alleviate the problem or force more people out of their jobs?

A growing and ageing population are key factors in the increasing demand for health and social care, at a time when the numbers of workers and professionals entering these sectors is diminishing. The BBC reported that more than 33,000 nurses left the NHS in England in 2017; this was 3,000 more than joined the service during the year. A Time to Care: Securing a future for the hospital workforce in the UK report by Deloitte in February 2018 refers to the 'growing mismatch between an inexorable rise in demand for hospital care and an increasing shortage of doctors and nurses to meet that demand'.

The issue is considered especially grave, because over half of leavers are under the age of 40 and Brexit is making the situation worse. The Deloitte report also notes that the UK has fewer nurses relative to the size of the population than the OECD average. AI could make a difference, remarks Karen Taylor (Deloitte), the report's lead author: "We need to be able to release staff and professionals to practice at the top of their qualification." The report indicates that 'future workforce shortages could be tackled more cost-effectively if the efficiency and productivity of clinical activities were addressed through innovative approaches to workforce planning, recruitment, skills development and use of technology'.

The idea that AI could radically lessen the administrative burden and "free up healthcare professionals to focus on caring" is a compelling one, says Richard Brown, an Employment Partner at CMS. AI is expected to create new jobs, particularly those that require STEAM (science, technology, engineering, art and maths) expertise, but Mr Brown questions where businesses are going to access those skills, especially when the education sector has only recently recognised this kind of demand.

Digital technologies, improved systems, processes and workflows are already able to soften the impact of workforce attrition, while AI could further smooth over the cracks. Not only can it enable greater output from a smaller workforce, it and other technologies can attract people into the industry and keep them there.

Dr David Jones, Chief Medical Officer at IMH Group, says that AI and equivalent technologies could be crucial in bringing workers and professionals into social care, a sector that is struggling to pull in talent. "The system has to change to allow us to use AI and change the way people work," he says.

Leveraging data and maintaining compliance

Leveraging AI technologies depends on the availability of relevant data, while ensuring regulatory compliance. There is an expectation that data will become a new currency in healthcare, a means of maintaining and developing market traction, though with a close attention to data security and compliance.

Data is expected to drive significant improvements in health outcomes, but it is dependent on service providers having access to significant volumes of statistics and figures. The availability of sufficient levels of data will provide effective insight into effective diagnoses and impactful treatments. Accessing and filtering that data poses a genuine challenge, especially with a tight regulatory climate imposed by the General Data Protection Regulation (GDPR).

There is an expectation that data will become a new form of currency in the healthcare sector. Patients and consumers could effectively charge healthcare companies and institutions for access to their data, enabling these organisations to turn this data into products and services that they can sell. Healthtech companies are also looking to cement and heighten their market standing through the use of data. Niall McAlister (CMS) says that they can only generate small profit margins by simply selling their products to the healthcare industry. "Healthtech companies could easily be swallowed up if they don't compete with the Googles and Amazons of this world. They'll need to challenge the data companies at their own game," he remarks. "They must integrate more with clients and with the healthcare provision ecosystem. They need to provide insights and answers, not just the raw materials." He believes that by utilising patient data, they can develop greater insights, products and services that can be commercialised.

This leveraging of patient data is expected to be transformational in promoting precision

medicine. Using patient data from a large demographic provides insights into effective treatment. GDPR clearly poses an obstacle, but Simon Hooper (RemindMecare) says that businesses can use it to their advantage and ask consumers to 'opt in' and share their data in compliance with the regulation. Hooper believes that patients should be encouraged to "own their own healthcare", akin to a patient data passport, and should be incentivised to share their health data. The notion is certainly gaining traction. Great Ormond Street Hospital now runs the Patient Knows Best programme, a patient-controlled online medical records system for the transfer of medical histories for intestinal failure patients to St Marks Hospital Northwick Park, London. GDPR and the data regulatory landscape should of course remain a major concern.

But should consumers and patients take control of their data? Warren Taylor, Co-head of Life Sciences & Healthcare at CMS says it is difficult to defeat the notion that "the doctor knows best". "Healthcare is a very sophisticated product so people will be wary of data owned by the individual," he says. Mr Hooper though believes this approach will be transformational as health and social care operators will be able to easily access patient data and make informed decisions about their care. He recognises that many of those in social care are referred or admitted for acute care along with their paper medical files, which frequently go missing. With individuals creating their own digital medical records, these can be accessed more easily and used in AI programmes.



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“Health data is very sensitive data and people don’t want that out in the public domain,” “The challenge around GDPR is the higher privacy obligations. This should be embedded into everything.”

Carina Healy (CMS)

Who is liable when things go wrong?

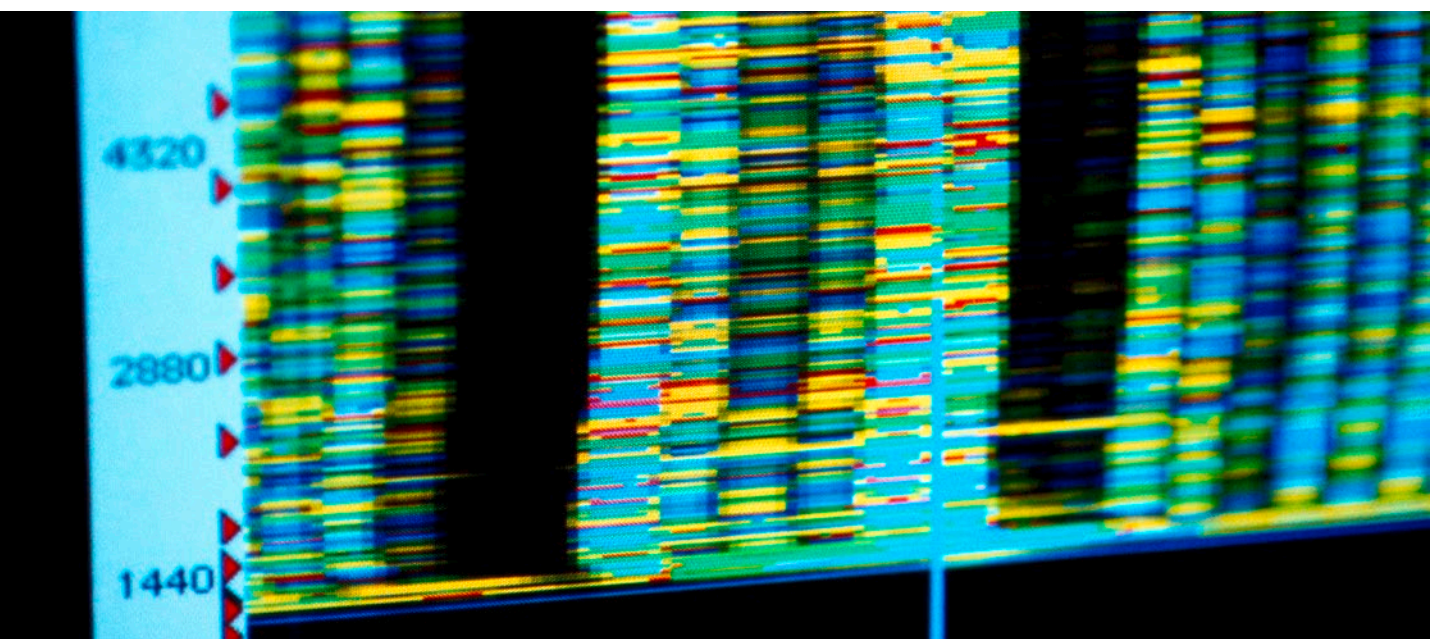
Human error is a fact of life and healthcare organisations are frequently forced to accept liability in the event of patient harm, injury or death. Yet where technology fails, where does the liability lie?

Where technologies play a consumer and patient-facing role, in diagnosis and treatment, it significantly complicates assigning liability in the event where patients suffer harm. Where AI is employed for augmented decision making, who accepts liability? If the GP doesn't identify a problem and the AI system fails to flag anything, then does the machine or human accept liability?

"What happens if things go wrong?" asks Lee Gluyas, (CMS). "The use of machine learning for diagnostics takes in vast amounts of information and uses algorithms to sift through data and come up with a diagnosis. Traditionally, liability would lie with the organisation that provided the system or its user. Now AI carries out its

own processes by analysing information and determining what information should be relied on. You have fully-robotic surgery to consider as well. It makes it much harder to judge where liabilities lie and how to manage those risks." He points to some suggestions that technology providers should pay a levy into a compensation payment pool that would pay out to any patient who suffers an injury and where liability is established. This would enable businesses to take the risk upfront, but could result in a barrier to entry and stifle innovation.

Moreover, if patients start taking greater control over their health records and plans, there could be a shift in liability to the consumer, says Warren Taylor (CMS).



Conclusion

Leaving aside the questions around liabilities, the arguments for use of AI in the healthcare sector are compelling. No one should dismiss the transformational opportunities presented by greater efficiency, more effective diagnoses and more targeted treatment methods. Yet AI needs a stable platform to truly deliver. The healthcare sector is still dealing with digitisation and other pressing issues such as data protection and privacy. It could be argued that these more immediate challenges must be dealt with before AI can realise its full potential.



The opportunity to change the way we deliver health and social care is huge and the potential time and cost savings and service quality improvements that can be delivered are there to be taken.

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