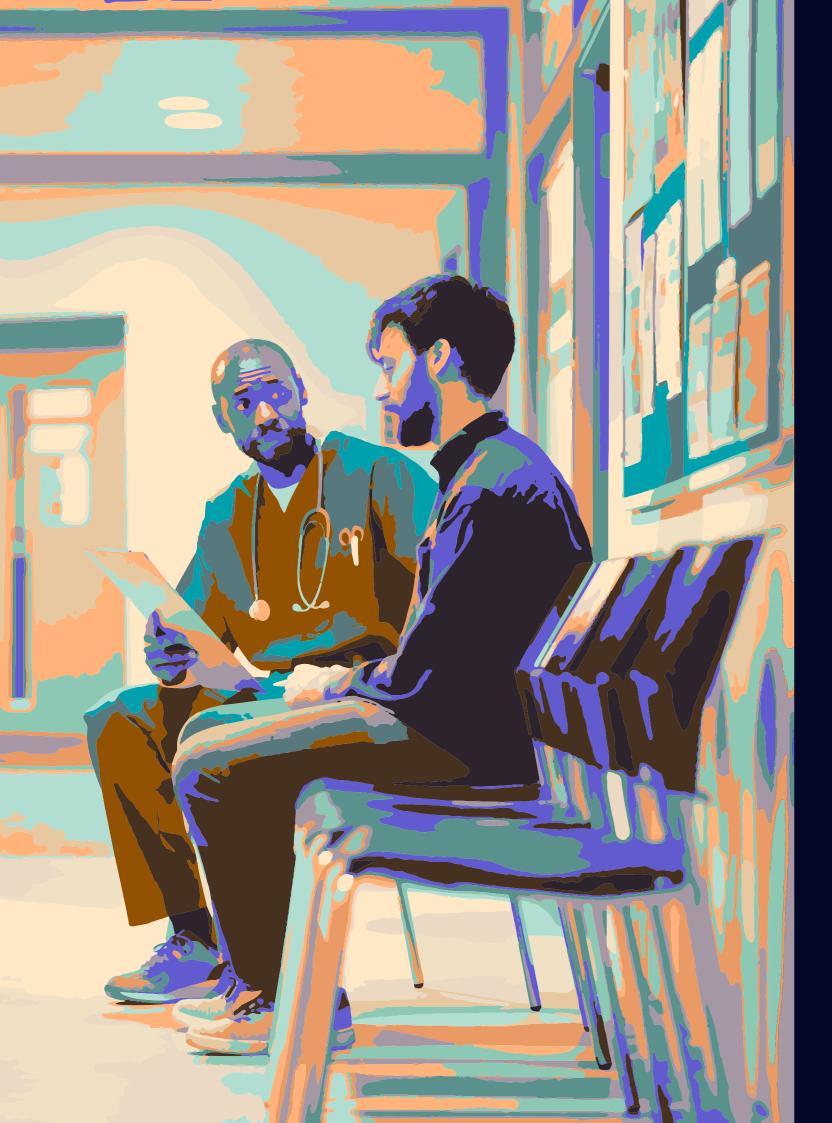# *AI*-ENABLED *FASTER* DIAGNOSTICS:

How the NHS can build for the future

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As the NHS continues to battle the backlog, the myriad of challenges it also has to contend with are inhibiting the health service's ability to adequately fight.

With patient safety always the top priority for healthcare professionals and the unprecedented demand unrelenting, it feels like the NHS will have to turn to increasingly innovative methods so it can realise efficiencies and scale down waiting lists while not sacrificing in other important areas of care.

One of the main avenues of innovation that is driving real progress in patient outcomes is the health service's digital transformation journey.

Whether that be harnessing the power of data to discover the world's first effective treatment for Covid–19, or allowing patients to access high–quality care from the comfort of their own homes via the enablement of virtual wards.

One area that is beginning to see more and more traction though, is the world of artificial intelligence (AI). AI is becoming increasingly important as big technology corporations in all sectors unveil their own innovations and try to propel themselves to the top of the global stage.
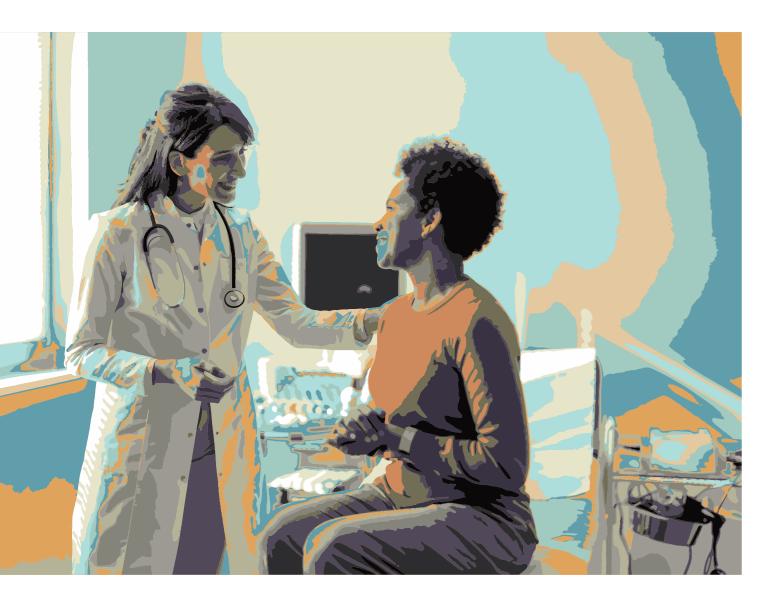
This is no different for the NHS either.

Some of the UK health sector's most influential organisations even recently came together to launch a new service so developers and adopters could properly understand the relevant regulations behind AI and other digital technologies.

That service is only at a BETA testing stage though, and with much of the health service's AI initiatives also in their nascency, National Health Executive and SAS discuss in this whitepaper how the NHS can use AI to turbocharge its adventure into the next generation of healthcare and help tackle some of its most pressing concerns.

Annual data from the Nursing and Midwifery Council puts this figure at almost half of all of the people who registered with the organisation in 2022, for example.

The overarching theme for all these statistics is the unsustainability of them – the NHS cannot indefinitely function with a 100,000+ workforce gap, nor can it outsource its domestic issues to the international market forever.

This is only speaking for the short–term though; as people begin to live longer and healthcare challenges get more complex, the NHS needs a way to combat the issues of the future as well as the ones that are presenting themselves now.

Leading think tank the Health Foundation recently published a report with some very worrying projections in this regard.

AS OF **MAY** THIS YEAR, THE AMOUNT OF *PATIENTS WAITING* FOR TREATMENT STOOD AT NEARLY *7.5 MILLION*

WHAT IT *CAN* HELP

The NHS finds itself in a particularly precarious position as the workforce continues to mount industrial action in the face of record–breaking backlog and eye–watering vacancies.

The latest NHS staff survey revealed that almost one in three (32.3%) respondents were deliberating over their position in the health service, while nearly two in 10 (17.3%) felt more definitively about their futures and were planning on leaving the NHS as soon as possible.

Perhaps most worryingly, especially when put against the backdrop of the last two statistics, is the fact that only around a quarter (26.4%) of people thought there were enough staff at their organisation in order for them to do their job properly.

The government's shrouded attempts to convince people that all those leaving by the back door is not upsetting the equilibrium is perhaps best explained by the amount of internationally educated staff being recruited.

As of May this year, the amount of patients waiting for treatment stood at nearly 7.5 million, according to the British Medical Association – this is what the strikes are ultimately about: the patients.

The concerns around patient safety were echoed by a survey from the union Unite when it found almost half of its respondents thought that, in the last year, staffing levels had crossed a point where patient care had been compromised.

It is clear: the growing workforce tensions are only exacerbating an already hamstrung health service and it needs to find a way to get back on track.

By 2040, the organisation predicts that 2.5 million more people will be living with major illness in England compared to 2019 – up to 9.1 million overall. The Health Foundation warns that there is no panacea for the upcoming surge in ill health and that supporting the general public to live with their health complications will become an increasingly integral part of health systems in the future.

The NHS needs to find a way of helping staff respond to the problems of today which also gives them enough breathing room to head–off the challenges of tomorrow.

WHY IT **CAN** HELP

"ARTIFICIAL INTELLIGENCE IS ALREADY *TRANSFORMING* THE WAY WE DELIVER HEALTHCARE AND AI TOOLS ARE ALREADY MAKING A *SIGNIFICANT IMPACT* ACROSS THE NHS IN DIAGNOSING CONDITIONS EARLIER, MEANING PEOPLE CAN BE TREATED *MORE QUICKLY*."

AI is becoming an eminently prominent fixture in the healthcare zeitgeist as researchers continue to explore how different tools can be used to optimise pathways and boost outcomes.

In fact, NHS expert, Prasanth Peddaayyavarla, believes AI has "great potential" to vastly improve the diagnostic process as it can quickly and accurately triage urgent cases and help staff make important decisions – particularly by using "deep learning" to interpret images.

June 2023 saw the roll out of a £21m AI diagnostic fund which coincided with a government commitment to integrate AI-enabled diagnostic technology across all of England's stroke networks.

Announcing the investment, health secretary, Steve Barclay, said: "Artificial intelligence is already transforming the way we deliver healthcare and AI tools are already making a significant impact across the NHS in diagnosing conditions earlier, meaning people can be treated more quickly."

Prasanth, who is the head of data science – advanced analytics at NHS Arden & GEM CSU, added: "AI has already been shown to improve outcomes for patients by speeding up stroke diagnoses, enabling patients to receive the right treatment more quickly and improve their chances of living independently after a stroke."

Speeding up diagnoses has been a marked focus for the NHS – the 28-day faster diagnosis standard, for instance, was introduced in October 2021 following a recommendation from the Independent Cancer Taskforce.

This is a target that NHS staff ensure patients are either diagnosed with, or cleared of, cancer within four weeks of a referral.

A policy that reduces anxiety and gives patients the peace of mind provided by an all-clear, or the clarity of an earlier diagnosis and thus a more promising range of treatment options.

An example of how AI can be harnessed to speed up cancer diagnostics is in the Netherlands where SAS has partnered with Amsterdam UMC – one of Europe's largest academic oncology centres.

Doctors at Amsterdam UMC wanted to identify a way of overcoming some of the limitations in the way cancer patients are triaged and prioritised for surgery.

Zoning in on one particular instance where SAS's technology has helped would be colorectal cancer – the third most common cancer globally.

In around half of all cases, the cancer spreads to the liver which is when clinicians typically look to remove it via surgery. Some tumours are too large to be removed however, and must first be subjected to chemotherapy in order to shrink them.

The success of this procedure is then evaluated by radiologists using CT scans, which is, not only time-consuming for health professionals, but also a system prone to subjectivity and human error.

"A tumor might shrink but not symmetrically," explained Amsterdam UMC's director of surgical oncology, Dr Geert Kazemier.

"This is difficult to quantify with the human eye."

SAS FIGURES SUGGEST THAT, IN ACUTE SETTINGS:

- three in five cases (60%) of misdiagnoses are due to the wrong laboratory analysis (or no laboratory analysis at all);

- around 11 in 20 (55%) can be put down to inadequate record-keeping of patient symptoms and complaints;

- half (50%) are because of mistakes during clinical examinations;

- and approximately a fifth (20%) are a result of referrals for the wrong treatment.

What this ultimately leads to are poor patient outcomes and litigious troubles later down the line.

Data released by NHS Resolution via a freedom of information request revealed that, between the financial years of 2017/18 and 2020/21, the number of claims and incidents received where the primary cause was cited as a diagnosis that was failed, delayed or just incorrect totalled 8,718.

Back in November 2021, then-parliamentary under secretary of state at the DHSC, Lord Kamall, addressed this growing issue in the House of Lords.

He said: "The costs of clinical negligence are rising at an unsustainable rate, eating into resources for patient care. Annual cash payments have quadrupled in the last 15 years to £2.2bn in 2020/21. That is equivalent to 1.5% of the NHS budget and these costs are forecast to continue rising."

While a share of this figure cannot be put down to erroneous diagnoses alone, it conveys the overarching point of the costly nature of human error effectively.

By fully embracing AI, providers can address patient safety issues *and* save themselves a lot of money.

"We are now capable of fully automating the response evaluation, and that is really big news," added Dr Kazemier. "The process is not only faster but more accurate than when it is conducted by humans. AI will help us save lives – I am absolutely sure about that."

By completing procedures quickly, and with more accuracy, providers can optimise pathways and keep patients flowing through healthcare services fluidly, rather than the congested experience that can be observed currently.

Using AI to do this also represents a more stable approach too, opposed to a series of stopgap funding injections which can offer momentary respite, but no real long-term solution that clinicians can rely on.

Enabling earlier and faster diagnostics does not just pose benefits to the patient though, facilitating more effective working practices is a demonstrable way of improving staff retention. A lot of staff protestations derive from patient safety being compromised and some of the nebulous routes in which concerns are being addressed.

For example, the aforementioned statistics pertaining to staff evaluating their future in the health service can perhaps be explained by other figures from the 2022 NHS staff survey.

From the circa 636,000 people who responded to the survey, nearly half (46.3%) said they felt worn out by the end of their shift, while four in 10 (39.9%) reported frustrations with their work, alongside almost seven in 20 (34%) with burn out.

It is mental and physical exhaustion like this that the NHS has a chance to avoid by setting out the long-term pathway ahead; but to plan for the future, health leaders must first look to the future and embrace the innovation that it brings.

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Worn out by the end of their shift

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frustrations with their work

34%
7 *IN* 20 Burnt out

The idea of harnessing AI to improve processes may appeal to many clinicians already, but how it can actually work in practice may be a barrier to adoption.

What SAS does to combat this is bring potential customers their innovative AI hospital concept or startup service. The AI hospital is a vision, and the startup service is how you executive that vision.

"We start by innovating the business," explained SAS director, Morten Krogh Danielsen. "In this process, we meet with clinicians that are having a problem, say too many errors in their acute diagnostic department, and then we describe a use case and put a value on it.

"The business case for this is fantastic."

What SAS will look to do here is explain what is necessary for the project to succeed. Around 60% of the project will revolve around data, so organisations will need the right people in place to ensure that data is properly recorded and understood.

This enablement of data will not be a foreign concept to healthcare leaders; last year's data strategy outlined how the government intended to leverage data for the betterment of the health sector, with concrete commitments to invest in secure data environments and using technology to allow health professionals to spend more time with patients, both being made.

Steven Shepherd, who is the healthcare director at SAS, further explained that, to encourage uptake within the workforce, providers need to be able to demonstrate to staff how it adds value to their working practices.

Referring to work SAS has done in Cambridge with surgeons to identify whether a kidney can be transplanted, Steven said: "Clinicians often use something called a remuzzi score, which is a way to score various structures on a kidney and assess whether they are viable [for transplant] or not.

"If you can automate that, as you can with AI to be able to spot these structures electronically, and you do it in the same way a doctor would, that kind of thing really matters."

This is because doctors can then analyse how the AI has come to its conclusions and assess whether they would agree or not, which subsequently builds trust and understanding in the innovation.

"It is a matter of bringing people along [with the process] so they can see how it works and understand how they could use it in their practice," explained Steven.

The next integral pillar is governance. For all the promise AI presents, it could be argued it poses just as much consternation – certainly from an ethics perspective.

"We have built up a clinical governance structure [at SAS]," commented Morten. "This can be reused from one customer to another and it encompasses simply defining the business problem, what data is needed, what competencies are necessary, how to build the model, and how to test and validate the model.

"We also make sure the model is working as intended."

But how should the model work?

By using their own data from their collaboration with Lillebælt Hospital in Scandinavia, SAS can give the NHS reliable estimates of the impact their AI initiative can make.

Based on the average of 16,000 acute patients the Southern Danish hospital treats per year, SAS estimated that clinicians would see a mortality reduction of around 10–20%, working out to 84–167 fewer deaths after 30 days, per year.

The Danes also expected that 10–20% fewer patients would developed sepsis – something that costs up to 48,000 people their lives in the UK each year, according to the UK Sepsis Trust.

What this then does is draw capacity efficiencies throughout the year as the health service incurs less burden. The reduction in the number of intensive care admissions was anticipated to be around 8–18%, with the readmission rate also being 18%.

It is important to remember these figures are based on a relatively small sample size, so if the same mechanism that achieved them was to be adopted in the UK, they would likely be even greater.

If the savings achieved in reduced intensive care admissions were converted to between 10–20%, approximately 8.9 million to 17.8 million Danish Krone (DKK) would be saved – this is around £1.02m to £2.05m.

This works for readmissions too, with annual savings in bed days estimated to be between 11.4 million DKK and 22.7 million DKK; or £1.3m to £2.62m.

There is also a reduced number of blood tests thanks to AI's greater oversight: the 3,403 fewer expected blood tests per year would save 458,261 DKK – £52,985.

THE FOLLOWING EIGHT-STEP PROCESS IS HOW AI COULD WORK FOR THE NHS:

1. A patient comes into hospital and gets a blood test

2. The blood test is shipped to a laboratory for analysis

3. The blood test is received

4. The blood is distributed by robots

5. The blood test is analysed by robots

6. The results are sent to SAS's streaming analytics server

7. AI algorithms are applied to the data

8. A risk assessment for the patient alongside diagnostic suggestions for the clinician is then curated

All of this is done in one hour.

BY FULLY ADOPTING PROVEN
AI WITHIN THE DIAGNOSTIC
PROCESS, THE NHS **CAN**
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The idea behind the startup service is to show health leaders, not only the value of AI as demonstrated above, but how to harness it in such a way that is scalable and can thus expand into multiple different areas and specialties.

"We have this service which focuses in on identifying one-to-five use cases [of AI] to then model them out and test the hypotheses," explained Steven.

"We do this to bring the right stakeholders together – whether that be clinical, IT, management, data – to be able to make this happen, so those people can actually see how they could work together, not just for this project, but for a whole range of other projects that follow.

"It is [about] building out a capability as you go."

By fully adopting proven AI within the diagnostic process, the NHS can alleviate staff workload and make clinical decisions reliable, accurate and fast.

This is something that could strike at the heart of some of the core issues affecting NHS processes which are then leaking into other areas and exacerbating already present issues, such as recruitment and retention.

More accurate diagnostics >>> better patient outcomes >>> happier workforce >>> more productivity

If you want to learn more about how you could leverage AI to do this,

CLICK HERE.

in
partnership
with

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