

Speech: Embracing AI and technology to improve patient outcomes

I know that my boss Matt Hancock and the brilliant Matthew Gould, CEO at NHSX, have already spoken this week about our immediate plans for NHS healthtech.

So I get the very best slot – looking a bit further forward at the future of the NHS.

All of us here will know someone living with cancer, heart disease, diabetes or an equally debilitating – and too often preventable – illness.

Diabetes costs the UK economy £23.7 billion, cardiovascular disease costs £29.1 billion, cancer £18.3 billion, mental illness £9.4 billion.

Of course, those statistics cannot possibly convey the scale of suffering – often hidden suffering – they represent.

As the NHS turns 71, we should be incredibly proud of its achievements: an extraordinarily dedicated workforce, delivering world-leading care. And, of course, underpinned by some of the most forward-thinking medical researchers and innovators in the world.

But, as the percentage of our population living with chronic and complex illness rises inexorably, we must also face the fact that, while NHS care will save your life, it will also consume your life if you have a long-term condition.

It was never designed to deal with the huge growth of chronic disease which now represents well over 80% of all healthcare spend.

The present healthcare system is still too much a sickcare system. Largely bricks and mortar where people who are sick or acutely ill come to be seen and treated by medically trained people.

This made sense when a stroke or a heart attack or an HIV diagnosis was a death sentence in most cases but, while tremendous progress on diagnosis and treatments has changed that prognosis, care delivery structures have struggled to keep pace with quite how differently patients experience healthcare today.

At the moment, if someone doesn't feel well, they may see their GP, have a few preliminary tests and follow-up appointments. If that doesn't solve the problem then they will be referred to a hospital specialist, have a few more tests or scans, have those results looked at, and then receive the necessary treatment.

Even if the condition is relatively straightforward to diagnose this can take a long time. And navigating that process – when you're sick – can be a

confusing, frustrating, anxious experience. The longer it takes, the sicker you get.

If you have a rarer or hard to treat disease like me, that process can stretch to years. In my case, it took me 30 years to get a diagnosis and a few more until my condition could be considered well-managed.

During that time – when I was undiagnosed, misdiagnosed and unmanaged – I was not only pretty miserable a lot of time, but I was costing the NHS a fortune in inappropriate tests, repeated trips to A&E, my GP and a merry-go-round of specialists.

The parts of the NHS that have begun to change this are those that have shifted their perspective to design their systems from the perspective of the patient.

Tower Hamlets is one of the most deprived parts of London, where the social determinants of ill health – unemployment, poor housing, debt, isolation – are all around.

For 2 decades, Bromley by Bow Health Centre has been pioneering a uniquely holistic, and tech-enabled combination of integrated medical care and social prescribing. From rolling out tele-care, video consultations and self-care, like the diabetic care packages enabling patients to self-manage their condition, to digitally referring patients for debt advice, language courses or art therapy.

This shift in focus, from just treating the presenting illness to actually helping the patient understand the drivers that impact their chronic condition better, means they can play a more active role in managing it.

The seamless integration of healthtech into day-to-day practice at the health centre means precious time is saved during appointments, patients are far more effectively monitored and managed and doctors have more capacity to be human.

This means getting involved in health rather than just sickness, supporting and coaching patients in relation to their sleeping, eating, smoking, drinking and exercise as well as all aspects of managing their condition properly, such as adherence to medication.

The aim is to proactively keep them well, rather than react when they become ill.

It's also not just about telling them what to do (most people who smoke know that it's bad for their health). It's truly engaging them, providing them with both the information and the smart tools so they can closely monitor themselves.

They can have devices that will constantly measure the likes of their heart rate, blood pressure, breathing, weight or activity levels. Indeed, many of us already do. I daily monitor my heart rate and blood pressure using apps in order to titrate my medication – this is my normal. Just as it is for

diabetics, kidney patients and many more patients with chronic conditions. In the future, though, this will become normal for healthy patients.

We're essentially talking about a 24-hour connection between the patient and those monitoring them. Patients have to live with their condition 24/7 and their care should reflect that.

One study which is thinking about healthcare in this way is the Technology Integrated Health Management (TIHM) Testbed for Dementia.

This uses a network of internet-enabled devices installed in a person's home, in combination with artificially intelligent systems (AIS), to enable clinicians to remotely monitor patients' health round the clock. This is helping to improve support for people with dementia – and their carers – so they can remain more independent within their own homes.

The vision I'm sketching is one where, for instance, a GP uses their tablet ultrasound to make a movie of a patient's beating heart – companies like Ultramics are demonstrating solution like this. When irregularities are flagged, the GP shares this immediately with a cardiologist to diagnose the patient and set up a care plan there and then.

There's no need to make an appointment in weeks or months – the issue can be dealt with in real-time. This is what we have become accustomed to when booking flights, doing our finances or shopping online.

As a patient 'in the system' I can tell you nothing is more frustrating than the tempo of appointments – to stay on a specialist's list you accept a distant appointment 6 or 12 months in advance, when you may or may not be unwell. Happily it's an eminently solvable problem.

Companies like DrDoctor and others have already helped hugely but we will go further to deliver the NHS Long Term Plan commitments for digital-first primary care and redesigning outpatient care and, of course, the embedding of AI for diagnostics. Starting with the 5 new centres of excellence for digital pathology and imaging, which are working to cut down manual reporting to free up more staff time for direct patient care in the NHS and find new ways to speed up diagnosis of diseases to improve the outcomes for patients.

We know it can be done though. East London, for example, established e-clinics to improve management of chronic kidney disease and reduce end-stage renal disease.

The new service supports timely provision of advice from the hospital specialist to the GP, to enable better management of the patient either in the community or with more specialist care where needed.

A single pathway from primary to secondary care, with rapid access to specialist advice provided by consultant-led e-clinics have transformed the way the outpatient service is delivered.

Since the e-clinic began in December 2015, 50% of referrals are managed without the need for a hospital appointment. The average waiting time for a

renal clinic appointment has fallen to 5 days, from 64 days in 2015.

We know patients will still need specialists with expert knowledge, but the patient and specialist don't need to be in the same space at the same time. A network of connected care means several experts can look at the case simultaneously. This would enable the early diagnosis of health issues by constant monitoring before they become more serious.

Not only will this help the patient, reducing long waits for diagnoses, but it will also free up time for clinicians, ensuring they can spend their time caring for patients quickly rather than waiting on admin or logistics.

Even the sickest patients can benefit.

In a US trial, 766 cancer patients at Memorial Sloan Kettering Cancer Center in New York, tested an app reporting in real time their symptoms and side effects while undergoing chemo.

The app allowed doctors and nurses to monitor a patient's recovery and follow up with additional treatment options. If a patient's side effects were severe or worsening, nurses received an email alert so they could call the patient to follow up, or make sure a doctor reached out to the patient later.

In Basch's study, patients with metastatic cancers who were undergoing chemotherapy and used the tool routinely during the study, lived an average of 5 months longer than patients who did not use the tool. They experienced a better quality of life and had fewer visits to emergency rooms and fewer hospitalisations.

By introducing a simple electronic tool, we remove that barrier through systematic, proactive collections and communications of patients' symptom data. This improves relationships between patients and clinicians because it eases communication and enables focus on those problems that really matter during encounters. These findings are now being confirmed in a larger clinical trial.

This will be normal practice within 10 years. The idea of maintaining people's wellbeing rather than reacting to an episode makes sense. It will be hard changing a system that is hard-wired to be more reactive, but that's how it will be in the future.

The NHS is engaged in one of the largest digital health and social care transformation programmes in the world, with investment of more than half a billion pounds a year nationally and a significant additional spend locally within hospitals, mental health services, primary care networks and across populations.

We all know the challenges this presents.

First, we need to get the basic infrastructure right so the data that feeds AIS is in the right format and is appropriately protecting.

This is why NHSX is so focused on open standards, as set out in our [tech](#)

[vision](#) last year.

Second, we need to make sure that the staff (healthcare professionals, managers, commissioners) have the skills that they need to feel confident using or procuring emerging technologies.

This is why we are so committed to working with Health Education England to work on implementing the recommendations of the [Topol Review](#), supporting the NHS Digital Academy which is delivering great things for CIOs across the system, and why we're so pleased that our [interim people plan](#) is out. People are at the heart of the NHS and technology must not change that.

Third, we need to work to encourage uptake. The average time it takes for new technologies to percolate through the NHS is 17 years. With the pace of technological development now, this is not viable.

We need to make sure that once a technology has been proven to deliver benefits to patients or the system, we help it save and improve lives as quickly as possible while still protecting patient safety.

This is why NHSX is coming together and working with the Accelerated Access Collaborative to make that pathway from ideation through to implementation at scale far more streamlined.

A major step to making this change has been to set up NHSX, a new joint team working to accelerate the digitisation of health and care.

NHSX is committed to creating an environment for innovation to flourish, with products for citizens and staff built by the market wherever possible and a focus on supporting the system to set standards and raise capability, both in skills and technology.

To deliver this vision, NHS organisations have to buy the technology they actually need, not just what the market wants to sell them.

NHSX has 3 delivery priorities, which are focused on how we can make things better for patients and staff as soon as possible.

These are:

1. cutting the amount of time that clinicians spend inputting and accessing data in NHS systems
2. making it easier for patients to access key NHS services on their smartphone
3. ensuring essential diagnostic information can be accessed safely and reliably, from wherever a patient is in the NHS

However, it is not just about improving systems and making more cutting-edge tech available. To be able to make the NHS work seamlessly in the digital age, we have to think about the ways we use data.

This is another priority for NHSX – to create a data-driven ecosystem. Not only allowing patients to have better access to their own data, but ensuring

relevant clinical, genomic, phenotypic, behavioural and environmental data from a range of sources can be circulated between patients, clinicians and care systems.

In such a closed-loop system, actionable advice could be given to people before problems become significant and demand for services could be predicted in advance. Proactive not reactive.

That's not to say that data isn't already being used in highly innovative ways within the NHS and other healthcare organisations around the country. I'm sure countless examples have been spoken about already at this event.

Early results from our 'state of the data-driven ecosystem' survey show that:

- 51% of those developing AIS solutions are building them for people with long-term conditions
- 72% are developing for clinicians
- and while 58% are developing with the purpose of improving quality of life, and improving the experience of care, 76% are developing with the intention of improving system efficiency

Just last week I was speaking to the extraordinary researchers at the Institute of Cancer Research about the potential for AI to improve the speed and accuracy of drug discovery.

As part of their work they have created a database that uses AI to discover the cancer treatments of the future. Their system called canSAR is the biggest disease database of its kind anywhere in the world, with almost 5 million experimental results.

It is freely available to help researchers worldwide and is already driving dramatic advances in drug discovery to identifying 46 potentially "druggable" cancer proteins that had previously been overlooked.

We have a responsibility to capitalise on these opportunities and ensure we do not miss our chance to save lives and money, but we must do this in the right way within a standardised, ethically and socially acceptable framework.

The fair and ethical use of health data by researchers and commercial partners can deliver better patient outcomes, improve safety, and contribute to a thriving economy. However, while we promote the latest data-driven scientific advances in healthcare, we must always ensure that patient data is respected and properly protected – and the people it is linked to.

Getting these foundations right matters hugely, 62% of those who have completed our survey thus far are using personal data to develop their AIS solutions and 49% got access to this data from NHS acute hospital trusts, yet only 38% believe that the trust is the data controller and nearly 30% of respondents don't know what type of commercial arrangement they have in place – highlighting how much confusion exists in the system.

To ensure the ethical and fair use of health data by researchers and commercial partners, last December we published 5 guiding principles for the

use of NHS data, along with plans to establish a national centre of expertise that will provide NHS organisations with high-quality commercial and legal expertise.

We have since road-tested and developed these principles and plans for the centre in partnership with a wide range of stakeholders from across NHS organisations, academic research, medical research charities and the life sciences industry.

We plan to publish an update and next steps on this work shortly, ahead of a full policy framework for data-sharing partnerships later this year.

I am delighted that we are able to work with real experts in this space, such as Natalie Banner from Understanding Patient Data, leading on phenomenally important participatory research designed to ensure that the ecosystem we are creating keeps society in the loop by making use of research methods that keep people regularly engaged throughout the design process.

I am excited to talk to her about how we, in the centre, can learn from her expertise – and that of others – to ensure that we maintain public and clinician trust as we move towards this data-driven future.

Because I know that, like me, each and every one of you here today believes that data can save more lives and wants to play your part in ensuring it does.