Smartphone technology in bid to revolutionise early detection of kidney disease

Patients with diabetes and high blood pressure are benefiting from pioneering artificial intelligence (AI) that turns a smartphone camera into a clinical-grade tool to detect early kidney disease.

NHSX, the digital transformation arm of the NHS, is supporting Healthy.io to offer 500,000 patients technology-supported home-testing kits over the next 3 years. More than 3,500 patients have already received their kits.

Patients taking part receive a simple test kit and smartphone app that allows them to test, scan and transmit their results to their GP within minutes, without leaving home.

The technology developed by Healthy.io essentially turns patients' smartphone cameras into medical devices – analysing testing images and producing results regardless of lighting conditions, setting or camera type.

With chronic kidney disease affecting around 1 in 10 people in the UK, this new testing and technology is designed to reduce unnecessary trips to the GP and hospital. It should encourage more people to seek an early diagnosis, ultimately saving thousands of lives each year.

Health and Social Care Secretary Matt Hancock said:

> This is another brilliant example of how innovative technologies are transforming healthcare and improving lives. Patients are able to receive a diagnosis sooner, saving time for clinicians so they can spend more time on treatment, and ultimately saving more lives through earlier diagnosis.
>
> This innovation is another step forwards in making high-quality healthcare more accessible – in some cases without leaving the comfort of your own home.

Matthew Gould, Chief Executive of NHSX, said:

> Artificial intelligence holds enormous potential for the NHS and in many areas is already providing radical benefits for patients and clinicians.
>
> The use of this latest testing technology is another huge step forward enabling us to provide earlier diagnosis of disease and improve patient care and treatment outcomes while also freeing up

> NHS staff.

The technology is one of 42 innovations that are being supported by the first round of the AI in Health and Care Award programme, managed by the Accelerated Access Collaborative in partnership with NHSX and the National Institute for Health Research.

In a project at Sussex Community NHS Foundation Trust, the team found that by allowing people with type 1 diabetes to self-test at home, the testing rate rose from 0% to 79% among the consented untested population. Almost 1 in 5 were found to have abnormal or highly abnormal results.

Dr David Lipscomb, diabetes clinical lead at Sussex Community Foundation NHS Trust, said:

> The service has enabled us to identify and prioritise follow-up care for people who may have early-stage chronic kidney disease that could have otherwise gone undetected.
>
> It allows us to offer our patients a new way of engaging with their care that is more convenient for both patients and staff.

With Healthy.io's CKD Early Detection Service, people receive a test kit by mail, which includes a standard urine dipstick, a urine collection pot and a patented colour board. An app guides the user through the test, which includes scanning the dipstick on the colour board using a standard smartphone camera.

Using AI and colourmetric analysis, the app is able to read the dipstick results equivalent to a lab-based device. Results are then shared instantly with the individual's GP practice, which can follow up if there is an abnormal result.

During the ongoing pandemic, by offering at-home tests to populations at higher risk, such as those living with diabetes, the NHS can provide an easy alternative to visiting the clinic.

The technology is being tested and evaluated over a 3-year period to explore its benefits at scale before a potential roll-out across the NHS.

Dr Indra Joshi, Director of AI at NHSX, said:

> Technologies like this have great potential to identify serious disease earlier, and can empower people to make the lifestyle changes needed to help better manage their condition.
>
> Enabling people to self-test at home using their smartphone's camera can ease the burden on frontline services whilst encouraging uptake of an important test that is far easier to conduct at home.

> Through the AI Award we are testing some of the most promising AI-based innovations to see if the NHS should consider spreading them on a much larger scale to even more patients.

According to an independent evaluation by the York Health Economics Consortium, if rolled out nationally Healthy.io's solution has the potential to save more than 11,000 lives and save the NHS at least £660 million over 5 years.

Katherine Ward, Chief Commercial Officer and Managing Director of UK and Europe, Healthy.io, said:

> Chronic kidney disease is a silent killer and has a major impact on society, yet very few people are aware of its dangers. Early detection of the disease from the comfort of home will help people avoid dialysis or transplant and will be a huge cost saving for the NHS.

The NHS has been at the forefront of the AI revolution with the creation of the NHS AI Lab within NHSX and the £140 million AI in Health and Care Award programme, which in September announced the first 42 innovations approved, each receiving a share of over £50 million.

The package also includes funding to support the research, development and testing of promising ideas that could be used in the NHS in future to help speed up diagnosis or improve care for a range of conditions including sepsis, cancer and Parkinson's.

The NHS is committed to becoming a world leader in the use of AI and machine learning, aiming to reap the benefits that range from faster and more personalised diagnosis to greater efficiency in screening services.

To deliver technology for use in health and care, the NHS AI Lab in January published A Guide to Good Practice for Digital and Data-driven Health Technologies, setting out what the NHS is looking for when it buys digital and data-driven technology for use in health and care.

Read the full Sussex case study

Read a case study of the service that won an HSJ and BMJ award

Read the York Health Economics Consortium estimate of cost savings

Read the NICE Medtech Innovation Briefing on the product