The North of England – An Internationally Recognised Health and Life Science Ecosystem

The North of England's profile as a hub of health science has been on an impressive trajectory over the past five years, with some of the most illustrious health science institutions in the world.

Analysis funded by the Northern Health Science Alliance (NHSA) and conducted by the think tank IPPR North last year[1] shows that the health and life science economy in the north is worth over £17 billion to the UK economy, over £10 billion of which is contributed by private sector life science companies.

And this area of England, with a 15 million population, is starting to come together to bring its offerings in digital health, personalised medicine, health data and ageing to an international stage.

The Northern Health Science Alliance was set up as a body to represent the North's health science excellence. There are 20 members that constitute the alliance: eight research-intensive hospitals, eight pioneering medical schools and four academic health science networks.

When we set up the alliance we knew the North of England had great expertise – but we didn't realise how much and what depth of it there is. An analysis of all of the health science ecosystem threw up some very clear areas of excellence – which are opening doors to a global audience.

Through our work, the strength of the North's life and health science economy is becoming far more widely appreciated. It is now recognised by government, research funders, trade bodies, and national and international corporations.

There are over 570,000 people working in our universities, hospitals and companies, with over 38,000 of those jobs being highly-skilled private-sector positions in 1000 companies. Last year, the Bio Industry Association, as well as the then UK Parliamentary Under-Secretary of State, Lord Prior, both formally recognised the North of England as a 'rapidly developing clinical cluster'.

Our mission is to become an '**internationally recognised health and life science ecosystem**' and we are well on our way to delivering on this mission.

Important to this is how closely we work with government and industry. The NHSA has a seat at the UK government's policy table. Earlier this year, the government brought together a steering group to establish and structure a new life sciences industrial strategy. The group, led by Professor Sir John Bell, includes the Wellcome Trust, Cancer Research UK, other leading research charities, NIHR, NHS England, sector trade bodies, the NHSA, as well as our sister organisation in the South East, MedCity.

The group has worked collectively to offer advice and influence the development of the national strategy for the life science sector. Five years ago, at the launch of the last UK Life Sciences Strategy, the North was not at the table - we are now.

Connected Health Cities

Focus on the North's excellence in health data has led to the ground-breaking Health North: Connected Health Cities (CHC)[2] project, which is seeking to improve the lives of people across the North from Liverpool to Newcastle.

The government-funded scheme, delivered by the NHSA, is running across four 'city regions' in the North of England, each of which is looking at new ways of using health data. Each local city region will unite health and social care services so that together they can share information and improve the health of local people. At the heart of the health improvements is the efficient use of health data and technology. These two elements can unlock new meaning and, when analysed between services, can lead to new, more efficient processes and the continuous improvement of public health.

The aim of the CHCs is to develop learning health systems that will continually improve care services and health. This system will make healthcare more efficient by providing information to health service managers that can be quickly implemented into standard practice. They are also working with the public to gain their trust that health data is being used responsibly, safely and to improve services for the benefit of all patients.

CHCs will also stimulate the UK's digital health economy by encouraging new technologies to be developed and new services to be created. The project successes will be shared and could be scaled up across the UK.

Collaboration as a Catalyst

The NHSA has facilitated new conversations and a joined-up way of thinking for some of the largest and most competitive bids in the country, such as: the NIHR biomedical research centres, the NIHR MICs, the new UK Health Data Institute, the Active and Healthy Ageing Reference Sites, and establishing a collaboration between our four NIHR Clinical Research Networks through a signed memorandum of understanding.

While we all recognise areas of competition between the NHSA members, more often than not we are able to identify areas of collaboration and complementary activity. By working in this way, we have been able to demonstrate that the North

is at the forefront of a new model of health and research collaboration, designed to benefit patients faster.

Waking up the Global Audience to the North

It is time the international audience wakes up to health science research in the North of England. Most international corporations have heard of the so called 'golden triangle' of London, Oxford and Cambridge, but comparatively few have heard about the North of England.

This is despite the fact that the North has world-class research universities, fantastic quality of living and low start-up costs – in fact if the North of England was an independent country it would be the eighth largest in Europe, if measured on the size of its economy.

The NHSA has firmly established itself as a go-to point of contact for international companies and companies working across the UK.

We act as an independent broker to foster introductions between companies and our research capabilities. The commercial team at the NHSA have created dozens of significant new opportunities for our members in just five years that would not have been available to us without the NHSA.

This has meant the NHSA has given a financial return to the region in the form of over £50 million worth of research contracts from the public and private sector in the last three years.

Companies are now considering how they work with and most importantly deploy their R&D budgets in the North of England. One example of this is our work with Oxford Nanopore (ONP)[3]. The MinION, made by ONP, can be used to provide rapid identification of infectious agents

and identify genes involved in AMR from clinical samples. through whole genome sequencing. This can be used to identify genes involved in AMR, screen clinical samples and so determine which antibiotic will be effective when treating disease.

The NHSA introduced the MinION to clinical researchers across the North. With a trial initiating in Liverpool, it will then expand to centres in Sheffield, York & Hull Medical School, Newcastle and Lancaster.

We have achieved all of this in a unique period of political turmoil from Brexit, to the creation of the Northern Powerhouse and a new Industrial Strategy and now a general election.

Brexit – an Opportunity?

In response to article 50 being invoked, the NHSA has been working on two fronts. We've been working to build links back into the EU through the European Active and Healthy Ageing reference sites. We've been uncovering opportunities created by Brexit. These opportunities include the possibility of the UK to position itself in a new regulatory environment, developing potentially faster routes for the development of novel therapies and attracting the investment that would follow.

There are other opportunities, such as re-establishing links with Commonwealth sister nations, both developed and developing, from whom we have a huge amount to learn, and to whom we can contribute, when it comes to 21st-century models of healthcare research and delivery. We are also developing strong links with Singapore and Australia and continue to foster more relationships.

The opportunity here is not just the North, but the whole of the world. A stronger health science cluster in the North means a stronger UK life and health science sector, one that can work collaboratively across the globe to deliver a health and wealth agenda that we all benefit from.

How the NHSA helps global industry go North by Suzanne Ali-Hassan

Industry needs to consider clinical evaluation of new technology part of their market access strategy. By engaging with the NHS and the health research infrastructure in the UK to do this, they can guarantee the strongest case for adoption of technology by the UK and other international healthcare markets.

Post-Brexit, the **NHS** will remain the world's largest single payer for healthcare and provides enormous potential for companies wanting to enter the global market. It also hosts organisations such as the **National Institute for Care Excellence** (NICE) which provides its desirable gold stamp of approval for new technology. As a result, the UK and the NHS is still prime territory for developing and validating new technology and a spring-board to markets further afield.

However, knowing exactly how to engage is hard, and access points can be tricky to find, despite some core pieces of infrastructure in place to help bring innovation to the system. Companies will often approach me to support integrating new technology with the NHS too late in its development, where it is ready to 'sell', and consequently uptake is not as quick as first imagined.

The NHS is in need of transformative technology; not just technology making up part of a clinical care pathway, but systems and processes which support service delivery and efficiency. Why are in-patient vital signs still taken down by nurses using pen and paper? It is a public sector organisation with limited resource and decisions around budget need to be rigorously appraised, but industry needs to support this as best it can. By including the healthcare system in the clinical validation process, you are making the right connections early on, ensuring there is unmet need and so a route to procurement.

Clinical buy-in is the essential precursor for integration of any new technology. With coordinated outreach across our member institutions, it is the first step the Northern Health Science Alliance (NHSA) takes in securing engagement with the healthcare system. The NHSA sits at the interface between the health research infrastructure in the North of England; supporting eight medical schools, eight large research active NHS Trusts and four AHSNs. As a single point of entry to this ecosystem, the NHSA is well placed to assist industry in finding

the right institutions to evaluate their technology – and at various stages of its development.

With our large teaching hospitals bridged with their associated medical schools, they are able to provide translational research capabilities and are primed for partnering with industry. This is further supported by nationally recognised pieces of infrastructure funded by the **Medical Research Council** (MRC) and the **National Institute for Health Research** (NIHR), for example. Key opinion leaders and clinical investigators from our member institutions engage with industry partners through the NHSA and determine ways of evaluating the new technology in a meaningful way. This has often resulted in several institutions coming together as one and collaborating on a piece of technology with the industry partner, something the North of England is very content to do – perhaps more so than our Southern counterparts.

These multi-centre studies mean new technology is assessed in several intuitions at once, maximising the case for unmet need, as well as any outcomes being viewed as institutional preference. In this capacity, working with the NHSA and our 20 members can help establish inter-disciplinary consortiums to support the evaluation. This includes highly regarded health economic groups, NIHR infrastructure set-up to evaluate clinical validity and utility of new medical technology, and of course our four AHSNs who cover larger sub-regional footprints and can latterly support diffusion across their respective regions.

The NHSA has worked with large companies through to SMEs, where this multi-centre approach has been valued and resulted in some interesting collaborations. One of the most developed is a Singaporean medical technology company, **Biobot,** who now have a multi-centre study about to begin with their automated prostate biopsy robot.

This not only includes top urologists from two of our larger teaching hospitals, Leeds and Sheffield; but also robust economic modelling from a world-renowned health economics group based at the University of Sheffield, ScHARR. Supporting the collaboration is the Yorkshire & Humber Academic Health Science Network, who are able to ensure engagement with other regional centres post-evaluation. This strong consortium of centres and people means the right type of evidence will be generated for eventual NICE approval, as well as NHS adoption.

There is a cost associated with this type of work: engagement with multiple institutions and pieces of infrastructure requires more resource. Although, where the financial investment is considered part of the development process and with the returns almost guaranteed to be fruitful, it is surely a smart way to look at establishing a technology in the healthcare market.

Having worked with industry, the NHS and academia for a number of years in this capacity, I urge companies to look at validation of technology and perhaps further iterative development within the NHS itself. As a result, the evaluation will include key components for NICE approval and adoption by healthcare systems worldwide. A win-win situation for everyone.

REFERENCES

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Dr Hakim Yadi

CEO of the Northern Health Science Alliance Ltd (NHSA). He led the formation of the NHSA, bringing together 20 NHSA members as a single health partnership across the North of England, securing over £60m in contracts and raising the profile of the North's health research at an international level.

Hakim is co-founder of two women's healthcare companies and Vice-President and co-founder of the Global Heart Network. Hakim holds a PhD in the Immunology of Pregnancy from the University of Cambridge and has published a number of peer-reviewed papers as a consequence of his research at the Babraham Institute in Cambridge. He was awarded an OBE in the 2017 New Year's Honours list for services to healthcare technology and the economy.

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Suzanne holds an undergraduate degree in genetics, and an MPhil in biochemistry & pharmacology from the University of Bath. Throughout her academic studies, she spent several years working in frontline NHS and community services.