The best research laboratory in the world

NHS Research Scotland is supporting cutting-edge medical research that aims to tackle the country's toughest health problems • ***By Jenni Davidson***

WHILE SCOTLAND'S CONTRIBUTION TO MEDICAL discoveries such as insulin, surgical anaesthesia, penicillin and the syringe is well known, perhaps less so is the significant volume of current cutting-edge medical research taking place daily at hospitals and universities across the country, and what this means for Scottish patients.

"Scotland is the best clinical research laboratory in the world," Scotland's chief scientist and head of the Scottish Government's Chief Scientist Office, Professor David Crossman, tells *Holyrood*.

"Scotland has absolutely excellent medical discovery science, driven by world-leading universities, a unified healthcare system and the fact that every person in Scotland has a unique identifying number in the health service, called the Community Health Index, or CHI, number. It means national medical data exists on everybody in the country.

"We've had it for years and it's one of our unique advantages when it comes to data science in Scotland," says Crossman. This kind of data is an "enabler", Crossman says, but it's not just the scientific environment, but also the social nature of Scotland that feeds into this excellence.

"Something that probably goes understated is the very altruistic nature of Scottish people," he says. "I think Scotland is the best clinical research laboratory in the world as a result. It's hard to argue against, because it is a really joined-up, collaborative environment. It is home to some of the best medical experts working in world-class facilities, hosts exceptional health data and informatics and that results in absolutely excellent science that translates into real opportunities for patients to get involved in research.

"There's a very willing population, and whilst we are unfortunate to have high levels of complex disease in Scotland, it also presents an opportunity to find treatments that can transform the lives of patients, not only in Scotland but also around the world. So, I think that is our opportunity, and I don't think that's overstating it, really."

It's in this fertile and internationally leading research environment that NHS Research Scotland (NRS) works to ensure that the NHS in Scotland provides the best setting to support and attract research to Scotland.

NRS is a collaboration between Scottish NHS boards and the Chief Scientist Office that promotes and supports excellence in clinical research in Scotland. Among its functions is ensuring national coordination of research across the country; providing clinical research facilities; connecting the NHS, academia and industry; and helping to involve patients and the public in medical research.

But this is by no means a one-way street, because the people of Scotland also benefit from this excellence in medical research, which feeds back into the kind of innovative treatment patients have access to. Data from around the world shows "very clearly" that centres of medical research have better clinical outcomes for patients, Crossman points out, and in Scotland, research truly is a cornerstone of person-centred care.

And it is not only the nation's health that gains from this; evidence suggests that research in the life sciences can also be a driver of economic growth.

Crossman explains: "There's a lot of jobs in this, and those jobs are quite inclusive, and I think it fits with government policy of inclusive growth, not just pounds, shillings and pence. And so more people get employed, and more people get trained, and so on and so forth. But if you want to do economic growth through the life sciences agenda, quite simply, you have to work with the NHS, because that's the engine that is going to allow that to be driven."

Crossman suggests that the power of that is "perhaps slightly underrealised", but it's definitely there, and it's another good reason for Scotland to be embracing it, "because hopefully, we can make people better, we can keep people healthier, we keep them in their jobs and with their families longer, and we can also grow the economy of Scotland".

Current research is helping to tackle some of Scotland's toughest health challenges and some of the main causes of early deaths.

Heart disease is a major killer in this country, causing around 7,000 deaths per year, and a new study by the University of Edinburgh, involving over 19,000 heart attack patients across all health boards in Scotland, will look at the optimum use of blood-thinning drugs. The duration of a dual anti-platelet therapy trial will compare two groups, one taking the treatment for three months and one for 12 months, to settle the question of the ideal duration.

This follows other trials, such as the Scot Heart Study, which reported in 2015 and changed the management of chronic angina, while the High-STEACS study, which recently reported to the European Society of Cardiology, is expected to reduce the stay in A&E of people coming to the hospital with chest pains. There is, says Crossman, a "very admirable platform of really practical cardiovascular research that has happened in Scotland, which is transforming the care and treatment of patients. It is something we can be really proud of."

> *"All the examples I'm giving you are not Alice in Wonderland stuff; this research is happening in Scotland right now"*
>
> PROFESSOR DAVID CROSSMAN, SCOTLAND'S CHIEF SCIENTIST

Another of Scotland's major problems is stroke and a clinical trial at the Queen Elizabeth University Hospital in Glasgow tested the Vivistim system, a medical device that is surgically implanted just below the collarbone and delivers electrical stimulation to the vagus nerve. This, in conjunction with rehabilitation physiotherapy, is believed to cause the brain to be more receptive to stroke recovery training exercises.

Crossman explains: "In stroke, the big breakthroughs have been avoiding disability, and Scotland leads many intervention studies – indeed, the Imaging Centre of Excellence in Glasgow is home to world-leading clinical expertise in stroke, cardiovascular disease and brain imaging and houses the UK's first ultra-high field 7 Tesla (7T) MRI scanner. There are only a few such machines worldwide, so it really does place Scotland at the forefront of medical imaging and is important in stroke diagnosis, treatment and care.

"But there are, of course, some people who present late, for whom revascularisation [restoring blood supply] doesn't work, and so they're left with a persistent disability. Technological developments are being trialled in Scotland to help get limbs moving again. And of course, it brings in the issue of long-term supportive care and research around that."

Pancreatic cancer is another problem area. Crossman describes it as "one of the most awful, lethal, egregious" cancers and points out that the survival rate has not changed since he qualified in 1982. But there is now "a big push" to change that.

Precision-Panc is a multi-fund initiative, based in Glasgow but working across the UK, which has now recruited its 200th patient and is taking a systematic, research-based approach to finding a cure for pancreatic cancer by tailoring treatments to the individual patient's cancer.

"Research is the answer," says Crossman, "but we're moving to a phase where there has to be a breakdown of the research and clinical service dichotomy. And to break this down and to move some of the major advances in genomics forward, that grey area between research and clinical service is going to have to get blurred. And I think cancer genetics is a very good example of that."

But the focus of the research is not just on dealing with the effects of diseases in the later stages or dealing with the after-effects, but also on early intervention, which is a major priority for the NHS.

Crossman explains: "We're talking about the really nasty diseases that haven't yielded, and supporting early diagnosis and the benefit of testing to pick things up at a very early stage where people aren't aware, because one of the things about the human body, wonderful thing that it is, is that almost every organ system has built in huge reserve, and so actually, by the time you present with symptoms, quite often it's all a bit late because all that reserve's been used up."

One example of this is liver disease. You can have chronic and progressive liver disease for years, either from the effects of alcohol or being overweight, and by the time it has become established cirrhosis, it's too late. Intelligent liver function tests, which will automatically carry out further tests on a blood sample if there is reason to suspect a liver problem, have been developed at Ninewells Hospital in Dundee and led to a 44 per cent increase in liver disease diagnosis.

Meanwhile in St Andrews, a team is developing blood tests for early diagnosis of lung cancer, which will mean people can be diagnosed with stage one disease and have the lung tumour removed, instead of presenting with stage three or four disease, which is basically incurable.

Crossman says: "Our problem in Scotland, and Britain, really, is lung cancer presenting too late. And there are real, real prospects that by developing these tests, we can do population-level screening, or select high-risk populations to be screened, to take things forward.

"And all of these things now, all the examples I'm giving you are not Alice in Wonderland stuff; these are ambitious research projects taking place in Scotland right now. I think they're really exciting and can make a real difference and impact on diseases that are common and dangerous, and heretofore have been quite stubborn.

"I've touched on pancreatic cancer, lung cancer, the growing problem of liver disease in Scotland, and heart disease, but Scotland is leading research in so many other areas: dementia, diabetes, mental health, infectious disease and so many more.

"We have a very vibrant and innovative research environment, with real progress being made in the treatment of some very difficult diseases. I truly believe Scotland is the best research laboratory in the world."