

Spotlight: Vilmundur Gudnason, MD, PhD

Dr Vilmundur Gudnason is the director of the Icelandic Heart Association's Heart Preventive Clinic and Research Institute. He talks about the work of the clinic and his passion for genetics and epidemiology.

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Centres of Excellence: The Wessex Cardiac Centre

Cardiology is changing so fast that planning new facilities requires a highly flexible plan.

Iain Simpson, MD, FRCP, and his colleagues tell Barry Shurlock, MA, PhD, about their experience of spending €100 million of government money on a new centre.



The UK's National Health Service (NHS) was a pioneer in the provision of free health services, but its success has long been sullied by a near-perpetual state of crisis in which patients and specialists find themselves in the midst of political wrangles about resources, targets, and waiting lists. In the popular consciousness, waiting lists are the most distressing, and stories abound of patients waiting long periods, or even dying, before receiving appropriate treatment.

In the past decade, Prime Minister Tony Blair's Labour government has pumped huge sums of money into the system, but deficiencies continue to hit the headlines. Some observers may say the NHS is just too large and too complex ever to function optimally everywhere, while the simplest solution for politicians is to provide more resources. During 2005/2006 alone, the NHS spent €58 billion (£38.2 billion),¹ and there is an ongoing programme of €900 million (£600 million) to provide better cardiac care, especially heart surgery, at 19 locations throughout the United Kingdom.

One of these new centres is the Wessex Cardiac Unit at Southampton University Hospital, where €100 million of capital expenditure has recently been provided for a major expansion programme. The lead cardiologist in the project, which is set to make the hospital a world-class cardiac centre, was Dr Iain Simpson, MD, FRCP, director of specialist services. His account of the experience suggests that the NHS still gives "money before thinking" and engages in "not-joined-up planning."

An event suggesting that cardiology at Southampton was

in fine fettle took place in October 2006 at the Transcatheter Cardiovascular Therapeutics symposium, held in the Washington Convention Center in Washington, DC. Delegates sat in front of a large screen and watched 2 consultant cardiologists from Southampton, beamed to them via a satellite link-up, perform live, intricate cardiac procedures.

The 2 specialists were operating in brand-new, state-of-the-art catheter laboratories, with live running commentary from a colleague and additional input from the London Chest Hospital in London, United Kingdom. Clearly, the cardiac expansion project had put the Wessex Cardiac Unit on the map, but this positive aspect of the story is only part of a complex history that is laced with not a little anguish and frustration.

In November 2006, the British Secretary of State for Health, the Right Honourable Patricia Hewitt, MP, officially opened a new wing of the hospital that was built to house the Wessex Cardiac Unit (Figure 1). The name Wessex derives from the ancient Anglo-Saxon kingdom that included Southampton and was the nucleus of what later became England.

The top floor of the new unit houses a state-of-the-art education centre built with €4.5 million (£3 million), which was raised by a local charity, Wessex Heartbeat. The education centre was opened in January 2007 by the Countess of Wessex. The new facility serves a population of about 3.5 million in the city of Southampton and much of central southern England. By a quirk of history, it also covers the



Figure 1. The British Secretary of State for Health, Patricia Hewitt, (centre) officially opened the Wessex Cardiac Unit in November 2006.

Channel Islands, a small Anglo-French community off the coast of Normandy, France, that is separated from Southampton by 60 miles of water.

The new centre includes a dedicated cardiac magnetic resonance scanner, a 12-bed cardiac intensive care unit (Figure 2), and 3 new catheter laboratories. The hospital now has 4 catheter laboratories, with room for a fifth, and there are 4 additional intensive care facilities ready to be commissioned. Existing facilities in the hospital, including 3 cardiac operating theatres, will be refurbished. When fully functional, the Wessex Cardiac Unit is likely to match its claim to be a world-class centre. Even so, the original plans for the centre have been dramatically revised and are still not finalised, and some of the facilities are still not fully operational.

The new project owes its inception to the publication in March 2000 by the British Department of Health of the National Service Framework for Coronary Heart Disease,² which was largely the brainchild of cardiologist Roger Boyle, FRCP, FESC, who was appointed National Director of Heart Disease at that same time. Among other things, the framework called for improved facilities nationwide, and Southampton was an early priority. Dr Simpson comments, "Cardiologists at Southampton had long wanted to expand facilities as a regional centre. It always had a large catchment area and was always stretched. But rather than being driven by cardiologists, the push for cardiac expansion came from the Department of Health. Roger Boyle, the so-called 'heart czar,' was the real driver for changing the focus of the treatment of coronary heart disease in the United Kingdom."

The initial business plan was centred on increasing services for revascularisation in the region, mainly by increasing the capacity to perform coronary artery bypass grafts. "But," says Dr Simpson, "about 3 years ago it was recognised that the original business plan had become outdated—cardiology had moved on so quickly that it was not going to meet our needs. So, we totally revised the plan, and we decided to add on magnetic resonance. This was one of the best decisions we made. Originally, we planned to double the number of patients treated annually with coronary artery bypass grafts from 1000 to 2000, with a similar increase in primary percutaneous cardiac intervention." Dr Simpson explains, "In the meantime, because of trends away from coronary artery bypass graft towards angioplasty (currently running at 2:1 or 3:1 in favour of angioplasty), the numbers of surgical patients were falling. So, instead of large numbers of relatively straightforward coronary artery bypass graft operations, we foresaw more complex procedures involving older patients, with prolonged stays in the hospital, especially in intensive care. It was not so much a change in capacity that was involved; it was



Dr Iain Simpson, MD, FRCP

more in the types of patient we expected."

Dr Simpson says that the fast-track surgery that had been envisaged, with short-term intensive care and transference to high dependency care by the end of the day, was no longer the main concern. Many patients were receiving angioplasty at 3 nearby centres in the region (Bournemouth, Portsmouth, and Basingstoke) that had already developed their own facilities for primary percutaneous intervention. Another factor that rendered the original plans outdated was the improvements



Figure 2. The new centre has a 12-bed cardiac intensive care unit.

in surgical management of paediatric congenital cardiac disease, some of it pioneered at Southampton. This meant that patients who would not have survived into adulthood were now alive and requiring ongoing treatment.

Planned resources for electrophysiology services were also overtaken by clinical and technical advances, with an upsurge in requirements for new devices such as implantable defibrillators. According to Dr Simpson, this could not have been predicted at the time of the initial plan, and, therefore, "demand has well outstripped supply." In fact, so stretched was electrophysiology through 2006 that patients were referred to London hospitals, and the Southampton list was closed to all new referrals except emergencies. In Dr Simpson's opinion, the problem was caused not by a lack of awareness on the part of clinicians but by a slow recognition by management that electrophysiology needed more resources. He says, "During the last 18 months, we have been completely incapable of meeting the 6 months target for waiting times [for electrophysiology]." Another consultant electrophysiologist was employed in December 2006, and the referrals list was reopened in January 2007.

Along with the problems of keeping pace with technology, the cardiac expansion project at Southampton has had to contend with the financial constraints of the NHS itself. Although willing to come up with €100 million for new capital expenditure, the British government required local management to cater for the additional revenue requirements. In principle, it should have been possible for the hospital, as a healthcare provider, to have readily sold its new services to the purchasers of those services—that is, the primary care trusts and health authorities. This should have provided a revenue stream to run the expanded services. But, in practice, it was difficult to sell services that were not yet in existence, and the

involvement of local politics complicated the process further. As a major consequence of the revenue constraints, plans to prerecruit and train key staff—such as intensive care nurses, perfusionists, and cardiac technicians—have been stalled. The original plan foresaw the need for 400 new employees, but only a fraction of these have been taken on, partly for financial reasons and partly because of the changing clinical trends. Overall, the Southampton University Hospitals NHS Trust has been running up a £26 million deficit for 2005 and 2006. Hence, with plans well advanced, it was realised that money to train new staff was not available. The new education centre is well used, but the lecture theatres and breakout rooms still await the anticipated throng of new trainees, and alternative uses for these facilities are being explored.

The cardiac expansion programme is undoubtedly a huge asset for Southampton, but Dr Simpson acknowledges that it suffered from flawed initial planning, because, incredibly, concepts of networks of health services within the NHS had not yet been developed at that time. The need for such methods of planning has become more pressing as patients within the NHS are being encouraged, with the advice of their general practitioners, to choose the hospital where they wish to be treated rather than the closest. Mulling over his experience, Dr Simpson says, “The government often provided money without thinking things through, and the process of negotiating with all the bodies involved took up huge amounts of management and clinical time.”

He acknowledges the major contributions from other professionals, including the estates manager and director of finance. Referring to the planning of the facilities, he comments, “We learned at a very early stage that it is important to focus on the detail as well as the overall project. And we discovered the need to be highly flexible.”

Interventional cardiologist Dr Alison Calver, MD, FRCP, has worked at the hospital for 12 years. Working as a consultant with the new facilities, she offers a perspective based on experience. Contrasting the situation before and after the redevelopment, she says, “As a place to work it’s so much

better than the rather dingy place we had before. It’s great to have it all nice and bright, with new artwork—it gives everyone a lift.” Referring to the complete digitisation of clinical data, she adds, “It’s useful to be able to get rid of all the paper and to be able to view angiograms on-screen in the office if need be.” Data for outcome studies will be much easier to find because the information will not need to be extracted from paper files.



Dr Alison Calver, MD, FRCP

Dr Calver continues, “Image quality from the catheter labs is also so much better than it was, and it allows us to see what we couldn’t before. A dedicated magnetic resonance scanner has given us greater access and is particularly used for stress magnetic resonance imaging, allowing us—as with stress echocardiography—to distinguish those lesions that are causing ischaemia, especially with complex coronary artery grafts. Also, with congenital defects, we can now often diagnose problems using magnetic resonance imaging and so avoid angiography, which can be unpleasant for young children.”

Barry Shurlock is a freelance medical writer.

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Dr Gudnason is the director of the Heart Preventive Clinic and Research Institute of the Icelandic Heart Association (IHA). Now a geneticist, he gained a PhD at University College London, United Kingdom, after completing his medical degree in Iceland. He published his first

paper while still an undergraduate.

While working in the United Kingdom in 1995, he set up a genetics laboratory at the Institute in Iceland and was made director in 1999. He ended up commuting between the 2 countries for 8 years before finally moving to Iceland in 2003.

The IHA’s Heart Preventive Clinic and Research Institute was opened in 1967 for cardiovascular disease evaluation and soon initiated a population-based study of all individuals in the greater Reykjavik area who were born between 1907 and 1935—more than 30 000 men and women altogether. Participants have been examined up to 6 times during the last 35 years, using tools such as ECG, spirometry, chest x-ray, and measurements of serum cholesterol and blood pressure. This enterprise was called the Reykjavik study.

Dr Gudnason says, “This early research added greatly to our current understanding of the risk factors that contribute to cardiovascular disease. The risk calculators that were

subsequently developed have proved remarkably consistent with other European models.” In 2002, the IHA formed a collaboration with the US National Institutes of Health to take the work further. This resulted in the Age, Gene/Environment Susceptibility study, which was designed to look in greater detail at 6000 participants of the Reykjavik study who were still alive—now between 70 and 90 years of age. It has been described as the most detailed and most extensive study on ageing ever carried out, and it is making use of some exciting technology.

“We now have an opportunity to look at things in detail like never before,” says Dr Gudnason. “We can apply imaging such as ultrasound, magnetic resonance imaging, and computerised tomography scanning to epidemiology and look at the cardiovascular system and the coronary arteries,” he explains (see Figure). “We have a large group of people we are examining with magnetic resonance imaging, with the aim of understanding better the prevalence of silent myocardial infarction. We have looked at plaques. We are also looking at the brain, and we do extensive cognition tests, correlating them to cardiovascular disease and studying bone mineral density.”

In the past 2 or 3 years, the IHA Institute has obtained supercomputing technology capable of taking thousands of images and processing the data, tying the more modern technologies available to the researchers into the large-scale epidemiological studies at which they have always excelled. “It’s a major addition to epidemiology. We have focused generally on taking images and tying them into a number so we can use the research in epidemiology. We are probably one of the larger studies using images,” he claims.

“We are working at automating the analysis of images and automatic analysis of large studies of genetic information. Some of the work we do is very computer dependent. We have recently done an analysis of 3000 brains that took 14 days.”

Dr Gudnason is hoping that in the future there will be opportunities for prevention, even at advanced ages. “Prevention is not the privilege of the young, and that’s why we’re reexamining this population now,” he says. “We can see that cross-sectionally, there is an increase in coronary calcium, and the question now is, ‘How well does that predict disease?’ We have also managed to come up with the first risk calculator for people over 70.”

The Age, Gene/Environment Susceptibility study is just 1 of many that are under way at the Institute. Another key project is the IHA-funded study on a younger population which hopes to improve predictions of which people are most likely to have a myocardial infarction. “We have cardiovascular risk factors, but we lack discrimination, and one of the greatest problems we are faced with is that 80% of heart attacks occur in people with moderate risk—and that is 75% of the population,” says Dr Gudnason.

Dr Gudnason’s career-long interest in genetics is evident in much of the research being done at the Institute, which, since 2003, has held a large biobank. “There are 2 types of genetic epidemiology studies. One type is thin studies, which



Dr. Vilhundur Gudnason

Dr Gudnason says that magnetic resonance imaging is being applied to epidemiology to better understand cardiovascular events.

include a huge number of individuals but with relatively little information, such as the UK Biobank; then, you have thick studies, such as ours, which is relatively big compared with many others, where you have more detail on many fewer people.” He continues, “The question is, will you fine-tune the knowledge of genetics and disease with little information and large numbers, or on fewer but extremely well-defined individuals? It’s a competition, and only time will tell who wins,” he says.

“A few years back, when I took over the Institute, I had this feeling that there were 2 things that could solve the genetics problem,” he recalls. “One was to better understand the mathematical approaches, and one was to study people in greater detail. I’m sure genetics is going to help us better understand the development of disease.”

The Institute is currently collaborating with many centres around the world, including Johns Hopkins University in Baltimore, Md, and Cambridge University in Cambridge, England, with the facilities open to anyone with a good idea.

“I’m most proud of what I’m doing now,” says Dr Gudnason, “having been able to see through such a massive project. We have a lot of visitors, and people are very impressed. I get many letters, and I undertake many collaborations. Part of my vision is to allow other people to have their dreams come true, so if people have ideas, I’m happy to do that. What we have is so enormous and useful, and it offers the opportunity for people to answer questions.”

Dr Gudnason concludes, “The hallmark of what we do is 2-fold: basic science to understand what determines disease and translational medicine. Through our risk clinic, we are already starting to put our findings into practice.”

Emma Wilkinson is a freelance medical writer.

Editor: Thomas F. Lüscher, MD, FRCP, FACC
 Managing Editor: Keith Barnard, MB, BS, MRCS, LRCP
 We welcome your comments. E-mail the managing editor at
 Keith.Barnard@wolterskluwer.com