Reducing the burden of diabetic foot disease

Drs Jaap J van Netten and Jeff G van Baal are dedicating their careers to multidisciplinary research and treatment of the diabetic foot. Here, they talk in detail about their work.

To begin, could you introduce the core elements and objectives of your current research endeavours?

JJvN: With our studies, we aim to reduce the burden of foot problems in diabetes. Our research is embedded within a multidisciplinary diabetic foot clinic, allowing us to continuously translate findings into improvements for daily clinical practice while at the same time obtaining new research questions from the problems we encounter in our care for these people. The core elements of our investigations concern advanced imaging to improve diagnostic and prognostic measurements, outcomes of vascular surgery, and the working mechanisms of offloading the foot.

What are your responsibilities as secretary of both the Editorial Board and the Prevention Working Group of the International Working Group on the Diabetic Foot (IWGDF)? How do you contribute to the wider academic community?

JJvN: Since 1999 and the first version of an International Consensus on the Diabetic Foot with accompanying practical guidelines, the IWGDF has been updating these important documents every four years. This guidance has been translated into 26 languages, and over 100,000 copies have been distributed in more than 100 countries.

As secretary of the Editorial Board, my role consists of some typical ‘secretarial’ functions (e.g. communicating with other stakeholders, editing documents and planning aspects), whilst at the same time providing input to the guidance, as board member, in my areas of expertise. I also serve as secretary of the IWGDF Prevention Working Group, where I perform and write the systematic review that provides evidence for our guidance on prevention of foot problems in diabetes and assist the chair in writing the guidance document of evidence-based recommendations for daily clinical practice.

When did you become interested in the study of diabetes mellitus and the treatment of foot ulcers?

JGvB: As a vascular surgeon I have been interested in the diabetic foot since 1992. In 1994 I started my present job in Almelo in the Netherlands. I happened to cooperate with a casting technician who later became a wound care consultant, and who had a special interest in offloading casts for diabetic feet. The combination of offloading and wound care after revascularisation worked remarkably well, and as a result we started to expand our activities from there.

JJvN: Whilst studying human movement sciences I got the chance to work on a research project investigating people’s use of custom-made orthopaedic shoes. I’d never heard about the various foot problems for which these shoes are prescribed, but I was quickly intrigued by the enthusiasm of all people making these shoes and working with these patients.

I noticed that healthcare professionals and researchers working with people with diabetes and foot problems seemed somehow ‘infected’ with a special virus – every clinician and every scientist I met in the field seemed really enthusiastic about caring for patients and studying the various aspects of this complex multidisciplinary condition. I got infected with this enthusiasm soon after starting work in the field, and it has never left!

As a clinician, how do you combine scientific research with daily clinical practice?

JGvB: Currently, several scientists are working in our team, particularly in the area of movement and offloading. We also have an extensive collaboration with the University of Twente on the field of imaging. Moreover, we thoroughly evaluate our results regarding revascularisation in the diabetic foot, and there are weekly scientific meetings with all members of the team. In this way, we can successfully combine clinical activities and scientific work, with each informing and improving the other.

One of your most innovative technologies has been the development of a home monitoring system. Do you think moving imaging technology into the home is a key factor to improving outcomes for diabetes patients?

JJvN: Although there are many uncertainties to investigate and overcome, I firmly believe that home monitoring can improve outcomes for people with diabetes. When techniques are properly applied, home monitoring will allow people with diabetes, their carers and clinicians to recognise foot problems before they have developed into a medical emergency. This will improve both outcomes and quality of life for all involved.

www.internationalinnovation.com
DIABETES MELLITUS, OFTEN referred to simply as diabetes, is a set of metabolic diseases in which high levels of blood sugar are present over a prolonged period of time. If not properly treated, individuals with diabetes can suffer from severe complications including diabetic ketoacidosis and nonketotic hyperosmolar coma; long-term and potentially fatal complications such as stroke, cardiovascular disease and kidney failure; and permanent damage to the eyes resulting in reduction or loss of vision. Foot problems including serious ulcers are an arguably lesser known complication, but reduce quality of life and can ultimately lead to amputation.

In attempting to prevent this largely avoidable outcome of diabetes, Ziekenhuisgroep Twente (ZGT) – a centre of expertise based in the east of the Netherlands – is treating patients from around the country whilst simultaneously performing cutting-edge scientific research. By combining these activities, ZGT is able to implement its findings swiftly and effectively into daily clinical practice. In this way, ZGT offers a new paradigm for healthcare and research, and its work is already contributing to the improvement of care, the advancement of diagnosis and prognosis, and the prevention of catastrophic, avoidable complications.

THE BASICS
Many individuals with diabetes experience a loss of protective sensibilities in their feet, an important element of peripheral neuropathy that can help patients to detect crucial warning signs of damage. Failure of this function can lead to undetected foot ulcers which, in conjunction with artery disease or infection, often results in difficulties in healing and even amputation.

In many cases, by the time an ulcer is identified by healthcare professionals it is too late for effective treatment. This has led the ZGT researchers, in collaboration with the University of Twente, to seek novel methods of ensuring that ulcers are detected at the point of pre-sign development, or when the ulcers are still relatively easy to heal.

Given that the incidence of diabetes is rising, and with 25 per cent of all patients with diabetes in need of medical help regarding foot problems at some point in their life, the economic and social burden is growing in line with patient suffering. Team leader within ZGT and vascular surgeon Dr Jeff G van Baal explains: “One of the reasons for starting our multidisciplinary project in 1994 was that this burden can be prevented by three things: good wound care, revascularisation and offloading”. By working in a large group and conducting yearly symposia for over a decade and a half, ZGT has made great strides towards this goal.

ADVANCED IMAGING
Much of this success is based on ZGT’s exciting use in daily clinical practice of cutting-edge imaging techniques, many of which have not yet become established elsewhere. Working closely with the University of Twente and benefiting from their technical expertise, the team’s latest projects involve employing laser speckle imaging to detect microcirculation and using infrared imaging to automatically pick up on diabetic foot problems.

Human movement scientist and senior researcher at ZGT Dr Jaap J van Netten describes the team’s approach in more detail: “On the one hand we are trying to develop intelligent imaging methods that not only measure a person’s foot but also perform offloading the foot.

Once ulcers have been detected at an early stage, the first line of treatment is offloading the foot in order to avoid the common repetitive microtrauma experienced. In an attempt to make this process more effective, ZGT
researchers have come up with their own method of offloading using a cast. Working closely with Dr Sicco A Bus, van Netten and their colleagues have recently completed a randomised controlled trial to compare this method with those that are currently employed by healthcare professionals around the world. “We’ve found that ‘removable’ devices that patients can take off themselves result in lower healing percentages than non-removable devices, and we are currently developing trials to investigate their working mechanisms and to find out what contributes most to pressure reduction and ulcer healing,” explains van Netten.

In addition to casts, the team has a distinguished history of using orthopaedic shoes for offloading to prevent foot ulcers. ZGT also contributed greatly to a recently published randomised controlled trial on this topic coordinated by Bus and his research team at the Academic Medical Centre in Amsterdam.

**VASCULAR SURGERY**

Led by van Baal, a third prong in ZGT’s battle against diabetic foot is vascular surgery. Because exactly half of all patients with foot ulcers also present ischaemia that requires percutaneous transluminal angioplasty or a bypass, the ZGT vascular surgeons have a high workload. The team monitors every operation onsite in order to investigate the clinical outcomes and draw broader conclusions, and is currently working to develop this research strand further in order to make surgery success rates even higher.

**PATIENT WEBSITE**

Complementing their outstanding research and healthcare work, van Baal and his team are also in the process of launching an innovative patient website (please visit: www.diabetische-voeten.nl). The site is designed to keep individuals with diabetes better informed about the severity of complications arising from foot problems and the many avenues for treatment and self-management that can prevent or reduce such problems.

van Netten argues that the website’s combination of a user-friendly interface and advanced data processing is crucial: “Part of the website is an easy screening tool, which we hope will ultimately give us some Big Data insights on the complaints patients report themselves, as well as insights into patients’ experiences of foot problems”. In this way, ZGT is successfully taking work out of the laboratory and healthcare facilities and into the homes of huge numbers of individuals with diabetes.

**20 YEARS OF RESEARCH**

2015 marks the 20th year of ZGT conducting field-leading work, and van Netten and his colleagues are eager both to celebrate their successes and look to the future. Arguably, the group’s biggest achievement has been the consistency with which they have provided outstanding, multidisciplinary healthcare to individuals with enormously challenging conditions.

ZGT has risen to prominence over the last two decades through a combination of stability and ambition, with the founding clinicians all remaining a part of it. Meanwhile the team has tripled in size, with each new member adopting the same enthusiasm held by van Baal and his co-founders. Crucially, the work conducted in Twente also stands out for being highly patient-focused, with van Baal and his colleagues proudly sticking to their motto in every situation: ‘Make the patient part of your team.’