Disabling foot and ankle conditions affect approximately 200 million European citizens. Over £230m per annum is spent treating many of these people with orthoses and splints, often relying on hand-crafted manufacturing techniques which are slow, costly and difficult to reproduce. With an increasingly ageing population and a growing health burden in long-term conditions, the global market for custom foot orthoses continues to grow.

GCU’s research through the £3m EU-funded A-Footprint project has beneficially impacted on patients’ health and wellbeing as new 3D-printed orthoses have been designed and produced, as well as helping to enhance the reputation of the institution through the achievement of ‘Flagship’ project status by the European Commission.

The University has subsequently been awarded the £3.6m KNEEMO project, one of Europe’s largest ever investigations into the diagnosis and treatment of Knee Osteoarthritis, a painful condition which affects around 500,000 people in Scotland, including one in five people over the age of 50.

GCU’s Musculoskeletal Health research group has been conducting research to characterise and quantify changes in foot structure and function in important musculoskeletal conditions such as neuromuscular disorders and arthritis, to adopt manufacturing and enabling technologies to support this work, and to develop and test highly personalised foot orthoses as part of complex interventions.

“As access to the GCU gait laboratories, analysis skills and know-how in biomechanics and clinical trials have complemented our own, to help us create the clinical and scientific base for our product development.”

As well as producing commercially available foot orthotics, and cementing long-term research partnerships with commercial collaborators and universities, A-footprint has significantly enhanced GCU’s standing in the international musculoskeletal health research field. The team has secured research grants from the EU and UK.
to support this work totalling more than £7m since the start of the A-footprint project.

3D printing is now being used for an increasing number of healthcare applications, with reports estimating the global market will more than treble to $1bn by 2019. 3D printing technology for healthcare has dramatically taken off, and GCU researchers are right at the heart of it.

A-Footprint was funded from 2009 to October 2013 by the European Commission’s FP7 programme under a call for nanosciences, nanotechnologies, materials and new production technologies specifically focused towards consumer-centred products.

Co-ordinated by GCU’s Professor Jim Woodburn, the project brought together a European consortium of 12 partners from the SME foot orthotic sector, large industry and academia.

The four-year project focused on the development and integration of enabling technologies such as computer-aided design and shape capture as well as benchmarking and testing additive manufacturing techniques.

Working with a Danish SME, AnyBody Technology, GCU developed the world’s most detailed virtual human foot to enable personalisation of custom orthoses based on optimising foot and ankle biomechanics. This permitted new freeform design opportunities that can be developed and made through 3D printing not achievable with previous manufacturing techniques.

The project culminated in a fully operational pilot factory at Peacocks Medical Group in Newcastle with new product lines that were tested in small-scale clinical trials for safety and efficacy. The project brought new skills in digital manufacturing technologies to the traditional craftsman in the company. SME partners benefited from developing computational software to functionally optimised prototype orthotic devices with commercial products released to market.

Peacocks Medical Group is the first European-based orthotic SME to adopt additive manufacturing technology for custom orthotics. New foot orthotic products developed and verified in clinical trials are in phased production, and commercialisation began in September 2013 (www.podfo.com). GCU is now supporting these activities through a dedicated training programme on additive manufacturing for prescribing clinicians.

Peacocks Medical Group’s R&D Manager Dr Jari Pallari said: “Peacocks Medical Group has collaborated with GCU since 2009 to improve our products and level of care to our patients and customers at the NHS and the private sector. Access to the GCU gait laboratories, analysis skills and know-how in biomechanics and clinical trials have complemented our own, to help us create the clinical and scientific base for our product development.

“We aim to base all our product features on solid clinical evidence and scientific principles and an established academic partner is a key asset in achieving this. Our recent 3D printed PODFO product success would not have been possible without our essential development partners at GCU. We look forward to continuing our collaboration with Professor Jim Woodburn and his research group for years to come.”

GCU is continuing to collaborate closely with partners on new orthotic product design and evaluation in clinical trials in some important clinical areas including diabetes and arthritis, and has captured grants to continue this work from SBRI Healthcare and the Dr William M. Scholl Podiatric Research and Development Fund.

Further information:
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At Glasgow Caledonian University, we provide solutions to real-world problems through applied research and development, working in partnership with business, the public and voluntary sectors. GCU’s strategic business and knowledge exchange teams work with academic experts across the University to support businesses with a problem-solving approach so that they can innovate for social and economic impact.

Contact us to find out more about working with GCU at www.gcu.ac.uk/business