

Project Summary for EPUAP website

Project Title: Heel Pressure Ulcers: Back to Basics

Project Team:

Dr Bethany Keenan - Cardiff University, Wales

Prof Cees Oomens - Eindhoven University of Technology, Netherlands

Prof Sam Evans - Cardiff University, Wales

Prof Mike Clark – Welsh Wound Innovation Centre, Wales

Project Enquiries:

Cardiff University and Eindhoven University of Technology have complimentary research activities for investigating the soft tissue surrounding the heel. Prof Sam Evans at Cardiff University and Prof Cees Oomens are world renowned experts in the field of soft tissue mechanics. Dr Bethany Keenan is currently working on a project in Cardiff in collaboration with the Welsh Wound Innovation Centre and Prof Michael Clark, investigating the internal strains of the heel (and was awarded the EPUAP & 3M Pressure Ulcer and IAD Innovation Award). Prof Oomens has been working in parallel on understanding the loading on the heel. His model of heel loading in particular will be a valuable addition to Dr Keenan's study, and his broader knowledge of pressure ulcer biomechanics will be beneficial.

Introduction:

Extensive work has been undertaken on pressure ulcers on patients in the seating posture, but research into heel ulcers has been relatively neglected. There are numerous medical devices available, but it is not clear which is the most effective for preventing the formation of pressure ulcers. With a better understanding of the mechanics of soft tissue damage many of these problems could be avoided through better treatment and medical devices or mattresses. There is therefore a need for accurate and realistic models that can predict these processes to enable the development of effective treatments (or prevention) and guide critical clinical decisions.

This EPUAP *Exchange Scholarships for Students* will provide Dr Bethany Keenan at Cardiff University an invaluable opportunity to learn new research methodologies and develop her knowledge of pressure ulcers, under the supervision of Prof Cees Oomens. Prof Oomens is planning to retire in two years, and this will provide an opportunity to pass on some of his knowledge and expertise to a new generation of researchers. As part of the project we aim to write a review paper which will capture some of this knowledge.

Project Aim:

1. Create subject-specific models of the heel and lower leg from high resolution 3D MRI scans to clearly show the calcaneus, talus, tibia Achilles tendon, and heel fatpad.
2. Use the models to better understand the mechanics of heel injury and develop statistical shape models to understand the differences between subjects and the effects of anatomical differences.
3. Model some common devices for pressure ulcer prevention (dressings, boots) in order to better understand which are more effective and why, and whether some actually pose additional risks.

Key Milestones:

March 25th - 29th 2019

First visit of Dr Keenan to Eindhoven University of Technology to share research methodologies and meet Prof Oomens and his team.

June 10th - 18th 2019

Second visit to Eindhoven University of Technology. Dr Keenan to have incorporated the methods learnt from her first visit to her subject-specific models of the heel and lower leg. Dr Keenan to present her work and learn how to develop meaningful statistical shape models.

October 28th - 1st November 2019

Third visit to Eindhoven University of Technology. Analyse and review work to date. Plan journal publications and conferences for 2020.

Proposed Conferences and papers:

- EPUAP 2020 annual meeting
- Computer Methods in Biomechanics and Biomedical Engineering
- Review paper on Pressure Ulcers (Dr Keenan to prepare draft prior to this visit)

March/April 2020

Fourth visit to Eindhoven University of Technology. Dr Keenan to take some examples of common European medical devices (known to be clinically good or poor) to TU/e. Learn how best to model these devices for pressure ulcer prevention. Final face to face meeting to discuss dissemination of the research project in terms of conferences, journal publications and future grant applications.

On completion of the four visits to TU/e, Dr Keenan will continue to analyse which medical devices are more effective and why, and whether some actually pose additional risks. Dr Keenan will continue to keep in regular contact with Prof Oomens and present her research findings via Skype.