

Project Summary for EPUAP websites

Project Title: Medical device-related Pressure ulcers

Project Team: Prof. Dan Bader, Dr. Peter Worsley, Dr. Luciana Bostan, Dr. Fran Henshaw and Dr. Joe Lemmens (all University of Southampton), Prof. Amit Gefen and Lea Peko-Cohen MSc (Tel Aviv University)

Project Focus:

Both the host and visiting research groups are interested in examining mechanisms of medical device-related pressure ulcers. Accordingly, the visit to Southampton by Lea Peko-Cohen will identify the range of experimental techniques and protocols used in a clinical setting, which can be used in conjunction with established computational methodologies to design safe medical devices that can minimize this medical problem.

Introduction:

The development of pressure ulcers (PUs) is often a consequence of prolonged mechanical loading to the skin and/or underlying soft tissue usually over a bony prominence [1]. It is prevalent in hospitalised individuals, who are particularly vulnerable due to their lack of mobility and sensation with other co-morbidities. Recent research has shown that medical devices used for diagnostic and therapeutic purposes can cause severe damage to the soft tissues when used for prolonged periods [2-11]. These devices are often secured tightly to achieve maximum functionality and cannot be moved or removed. Hence, medical device-related PUs may be more difficult to manage as they may not incorporate periods of pressure relief.

The University of Southampton and Tel Aviv University have complimentary research activities investigating MDRPUs, led by Profs Bader and Gefen. This EPUAP funded internship has provided Lea Peko-Cohen a unique opportunity to share research methodologies between the two groups. This includes quantification of skin and soft tissue deformation from devices using imaging modalities, biomarker sampling (see image) and biomechanical and physiological monitoring at loaded soft tissue sites and computational modeling of prototype medical device designs.

Project Aim:

- Document prevalence/incidence of tissue damage associated with a range of medical devices in a clinical setting. This will involve access to Intensive Care Units to examine the extent of the problems associated with respiratory masks, medical wards and the community to examine materials and structures commonly used to minimize risk of tissue breakdown in seating and lying individuals
- Monitor the interactions between devices and the skin by employing experimental research on healthy volunteers covering a wide age range



Cytokine analysis in a CAT2 biochemistry laboratory with Lea Peko-Cohen (PhD student Tel Aviv), Dr Fran Henshaw (podiatry visitor from Australia) and Dr Peter Worsley (Assistant Professor, UoS).

Key Milestones:

- Interrogate clinical data from the ICU/HDU wards regarding medical-device related pressure ulcers from both adult and pediatric settings.
- Analyse a series of MRI scans from a small cohort of patients with medical devices in-situ (penile clamps)
- Develop a finite element model of to predict compression of soft tissues when subjected to a penile clamp
- Support experimental research investigating inflammatory biomarkers of skin pre- and post-loading of a range of medical devices.

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