<div align="center">**Project Summary for EPUAP website**</div>

Project Title:

Analysis of the temporal biomechanical signals for a predictive algorithm of posture and movement

Project Team:

University of Southampton: Silvia Caggiari, Dr. Peter Worsley, Prof. Dan Bader

University of Grenoble Alpes: Prof. Yohan Payan, Dr. Siamak Niroomandi

Project Enquiries:

Both project teams are interested in establishing research strategies for the early detection of mechanical-induced soft tissue damage, in the form of pressure ulcers. The PhD student in Southampton, Silvia Caggiari, is working on a project to develop a predictive algorithm to identify different range and frequency of movements, estimated from both body-worn and interface sensors, including a pressure monitoring technology. Activities led by Prof Yohan Payan provide complimentary analytical techniques in the form of machine learning, whereby interface pressure can be used to predict both movement and tissue deformation. This project provides a unique opportunity for shared learning and collaboration to bring these technologies closer to clinical translation and patient benefit.

Introduction:

There are many clinical situations in which soft tissues are subjected to sustained mechanical loading, particularly in individuals with a restricted mobility. For the last few decades, interface pressure measuring systems have been employed to assess the interaction between an individual and the underlying support surface, typically evaluating the performance of pressure redistribution. A number of parameters may be derived from these pressure mapping systems including peak pressures, pressure gradients and contact areas of interaction at the body – support interface, typically assessed over a relatively short time period i.e. 10s of minutes. However, to assess the effectiveness of individual movements, temporal pressure profiles over an extended time period need to be recorded. These temporal profiles have the

potential to act as objective measures for movements. However, to date, this has had limited investigation.

This EPUAP reasearch project collaboration funding provides Silvia Caggiari an opportunity to adopt research methodologies related to machine learning, under the supervision of Prof. Payan. Her visits to the Univeristy of Grenoble will focus on both learning and applying the fundamental of machine learning to complement her PhD project. An approach based on machine learning will support her research to develop a predictive algorithm to identify both the range and frequency of movements, estimated from a range of biomechanical and physiological measurement sensors, of vulnerable individuals supported for prolonged periods on a mattress or chair.

Project Aim:

Utilise machine learning to develop a predictive algorithm, which will be able to distinguish the nature of movements in both able-bodied and a range of at risk individuals. This will be achieved in a series of distinctive stages:

1. Examine the potential benefit of machine learning to analyse large data sets estimated from a range of biomechanical and physiological measurement sensors;

2. Develop a pilot version of the algorithm involving data sets acquired from able-bodied subjects;

3. Test predictive ability of the algorithm with data acquired from individual at risk of pressure ulcers development.

Key Milestones:

June 2018: First visit of Silvia Caggiari to the University of Grenoble Alpes

This enabled her to acquire the basic skills in the use of machine learning to analyse large data sets,

July 2018: Second visit to the University of Grenoble Alpes

Use machine learning to analyse large data sets acquired from movement analysis conducted on able-bodied volunteers in Southampton. Test pilot version of algorithm.

March 2018: Third visit the University of Grenoble Alpes

Test predictive capability of algorithm with data acquired from able-bodied and individuals at risk of developing pressure ulcers.

June 2019: Final meeting involving all members of the project team

Plan dissemination of the research project in terms of joint presentations e.g. 2019 EPUAP Scientific Meeting and journal publications