Advanced Personalised, Multi-Scale Computer Models Preventing Osteoarthritis

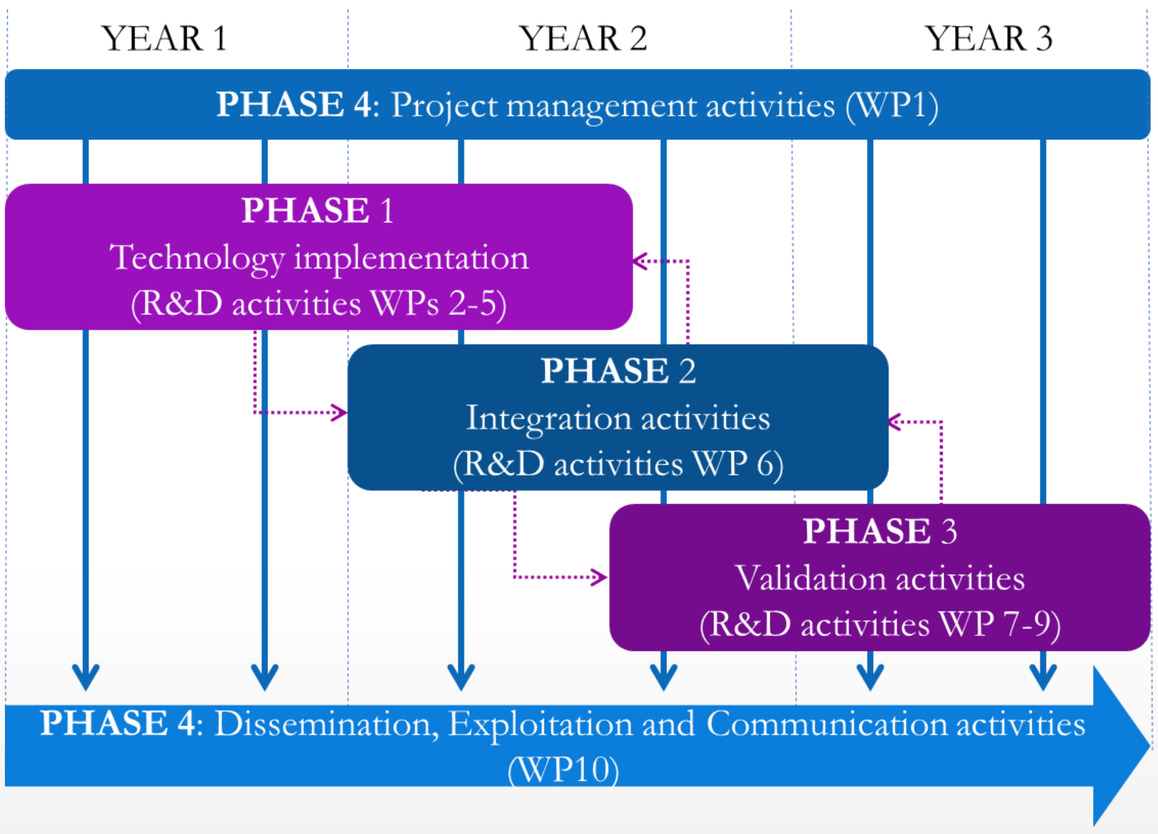
OActive

Expected Achievements

Through OActive project a multi-scale holistic analysis will be adopted, where patient-specific information from various levels, including molecular (e.g. biochemical/inflammatory biomarkers), cell, tissue and whole body, will be integrated and combined with information from other sources such as, environmental, behavioural and social risk factors to generate robust predictors for new personalised interventions for delaying onset and/or slowing down progression of Osteoarthritis (OA).

OActive targets patient-specific OA prediction and interventions by using a combination of mechanistic computational models, simulations and big data analytics. Augmented Reality (AR) empowered interventions will be developed in a personalised framework allowing patients to experience the treatment as more enjoyable, resulting in greater motivation, engagement, and training adherence.

OActive work plan



Objectives

- To develop in silico multiscale biomechanical models of healthy and knee joints with OA
- To model biochemical health indicators and inflammatory biomarkers
- To detect user's physical, mental and social behaviours and identify higher-level physical, mental/emotional, and social states
- To develop the hyper-modelling framework of OActive
- To establish an ontology-based framework for data/models reusability and sharing
- To issue personalised interventions using Augmented Reality (AR)
- To perform in vivo and in vitro studies and validation in large data registries

Impacts

Benefit for health and well-being: Prediction, Treatment & personalized interventions

Predictive and preventive methods focusing on the integrated diagnosis, treatment and prevention of disease

Uncover how medical, biological and environmental factors interact

Direct savings for the Health system

Societal benefits related to research and job creation

Employing knowledge discovery techniques capable of extracting interpretable rule-based knowledge from clinical time series

Key Innovations

KI 1 — **Multi-scale modelling framework empowered by big data**
An advanced 4-step data processing methodology will be followed including: a. Gathering, b. Analysis, c. Identification and d. Prediction.

KI 2 — **Early detection using personalised predictive OA models**
Development of computer-based, patient-specific predictive models of the occurrence and progression of OA, being a valuable medical tool for preventive medicine.

KI 3 — **Adopting an Open Platform philosophy**
Open source data and modelling standards will be used. Access to ongoing work by the research team, the biomechanics community, and public will be available.

KI 4 — **Personalised interventions through augmented reality**
Exploitation of haptic and vision technologies in correlation with biomechanical indicators for assessment and diagnosis support.

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