

Title: SMASH-HCM - Stratification, Management, and Guidance of Hypertrophic Cardiomyopathy Patients using Hybrid Digital Twin Solutions

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Abstract

Hypertrophic cardiomyopathy (HCM) is the most common inherited cardiac disorder. It affects all age groups, while being a leading cause of death among young athletes. Despite highly diverse phenotypes and patterns of disease progression, HCM is still diagnosed as one single disease, leading to suboptimal care. The SMASH-HCM EU Horizon project is developing a multiscale digital twin platform to support patient self-management and aid clinicians in delivering optimised cost-effective stratification that are tailored to individual patient pathophysiology. At TUNI MET, the activities focus on integrating in vitro cell and tissue models with computational modelling of cardiac and vascular cell and tissue level electromechanical function. Furthermore, the insights gained from experiments and simulations on the disease and drug mechanisms, feed together with structured and unstructured clinical data into data-based models, with emphasis on explainable artificial intelligence. With respect to the whole consortium, SMASH-HCM unites 8 research partners, 3 hospitals, 3 SMEs, and a global health-technology corporation in collaboration with patient organisations. The project will deliver a decision support solution for both healthcare, with deep phenotyping and risk stratification tools to support clinical workflows and decision making that enable the development of effective personalised treatments, and novel self-management approaches for the patients. SMASH-HCM presents a paradigm to understand the broader spectrum of cardiac hypertrophy, translating to other myopathies and diseases. In reaching its goals, SMASH-HCM has potential to serve as a basis for future digital-twin platforms for other cardiac diseases integrating models and data from various scales and sources.