F14 Predicting Outcomes After Interventions in Mitral and Tricuspid Valve Dysfunction

HOST ORGANISATION

Fundació de Recerca Clínic Barcelona – Institut d'Investigacions Biomèdiques August Pi i Sunyer
(IDIBAPS), Barcelona, Spain

PHD AWARDING INSTITUTION

Universitat de Barcelona
(UB), Spain

Supervisory Team

Lead Supervisor

- Dr. Marta Sitges (IDIBAPS / Hospital Clínic Barcelona)

Co-Supervisors

- Prof. Eigil Samset (GE Vingmed Ultrasound/ University of Oslo)
- Prof. Pablo Lamata (King's College London)

Project Description

Mitral and tricuspid valve disease are increasingly being treated using minimally invasive procedures that offer alternatives to open-heart surgery. As the range of available interventions expands, there is a growing need for more accurate methods to assess valve dysfunction, select the most appropriate treatment strategy and predict the likely outcome of an intervention for each patient.

This project aims to improve the non-invasive assessment of mitral and tricuspid valve regurgitation and develop digital tools to support intervention planning and outcome prediction. The doctoral candidate will combine advanced cardiovascular imaging, artificial intelligence and digital twin technologies to better understand valve anatomy, function and the mechanisms underlying valve disease.

The research will build on technologies developed elsewhere within CDTnet, including automated echocardiographic image analysis, digital twin modelling and computational simulation of valve interventions. Using echocardiography, cardiac CT and cardiovascular magnetic resonance imaging, the project will create detailed models of patients before and after surgical and percutaneous valve procedures. These models will then be used to investigate whether intervention outcomes can be predicted more accurately than is currently possible using conventional clinical assessment alone.

The doctoral candidate will lead a clinical study involving both retrospective and prospective patient cohorts treated at IDIBAPS. By integrating imaging-derived biomarkers with

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simulation technologies, the project seeks to improve the assessment of valve dysfunction, optimise patient selection and support clinicians in choosing the most appropriate treatment strategy. Ultimately, the work aims to improve patient outcomes while increasing the efficiency and usability of advanced imaging and digital twin technologies in clinical practice.

Planned Secondments

- FEops, Belgium (1 month): training in patient-specific simulation technologies used for planning structural heart interventions.
- GE Healthcare, Norway (1 month): training in advanced imaging analysis technologies and their application to valve disease.
- King's College London, United Kingdom (2 months): training in statistical shape modelling and computational analysis of valve anatomy and geometry.

Desirable Project-Specific Qualifications and Skills

The candidate should possess a Master's degree in a relevant field such as Biomedical Engineering, Electrical Engineering, Mechanical Engineering, Medical Technology, Physics or Cardiovascular Science.
We are looking for a motivated candidate with an interest in cardiac modeling and clinical translation with the following skills:

- Knowledge of cardiac electrophysiology to tune and parameterize cardiac digital twin models
- Setting up simulations and running them on high performance computing faciltities
- Machine learning to tune models, and perform risk prediction
- Image analysis to characterize cardiac tissue and remodelling
- Python programming to automate tasks and analyse results

Desirable Project-Specific Qualifications and Skills

- Medical Degree
- Clinically oriented towards cardiology and cardiovascular medicine
- Experience with heart valve disease
- Advanced knowledge in computing
- English fluent

Please direct any query regarding this project to:
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