Modular workflow for in silico studies of atrial electrophysiology
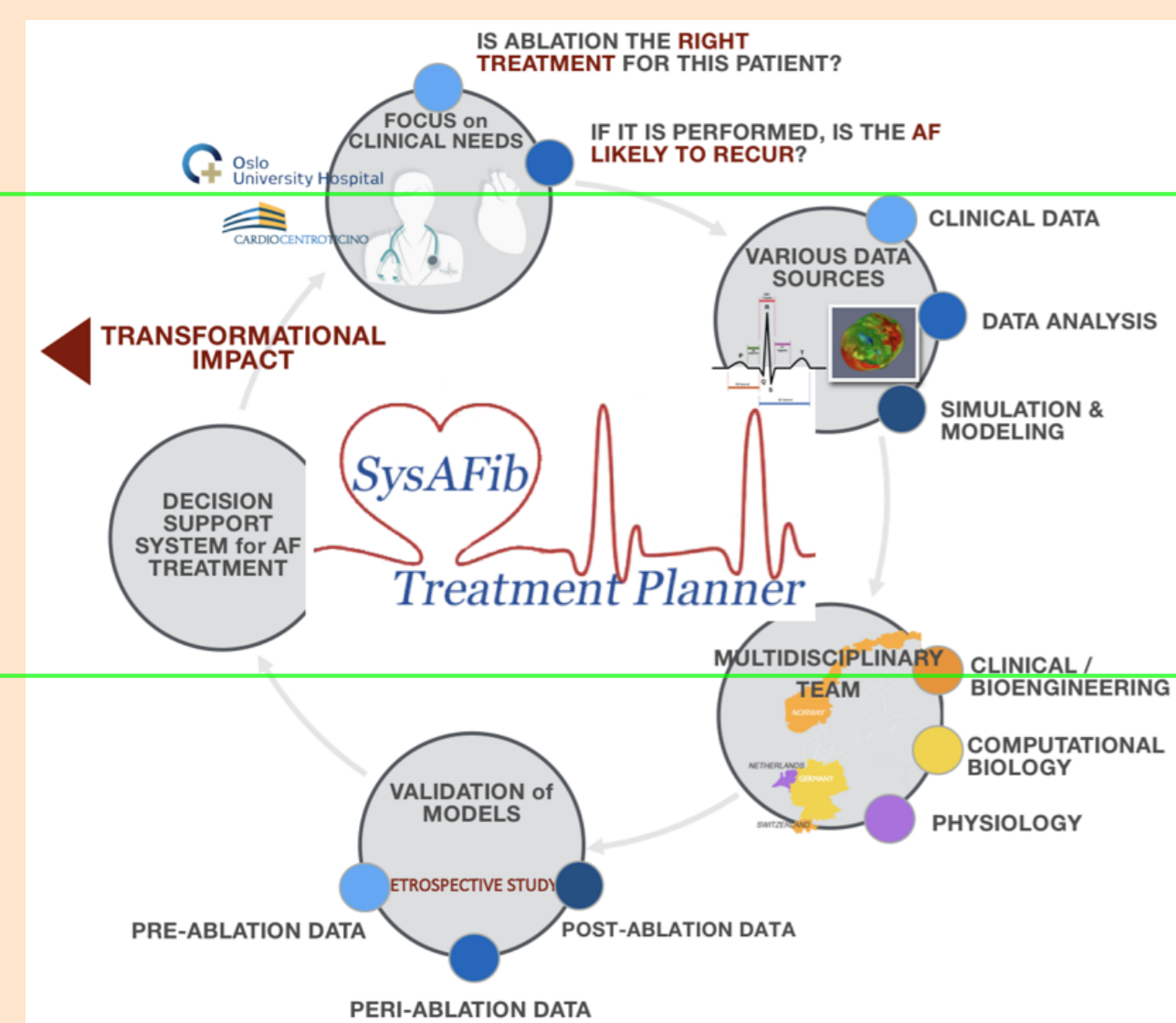
V. Carapella[1*], E. Zacur[2] , E. Kvalem Soto[1], B. Lino de Oliveira[1], J. Sundnes[1]

(1) Simula Research Laboratory (2) University of Oxford
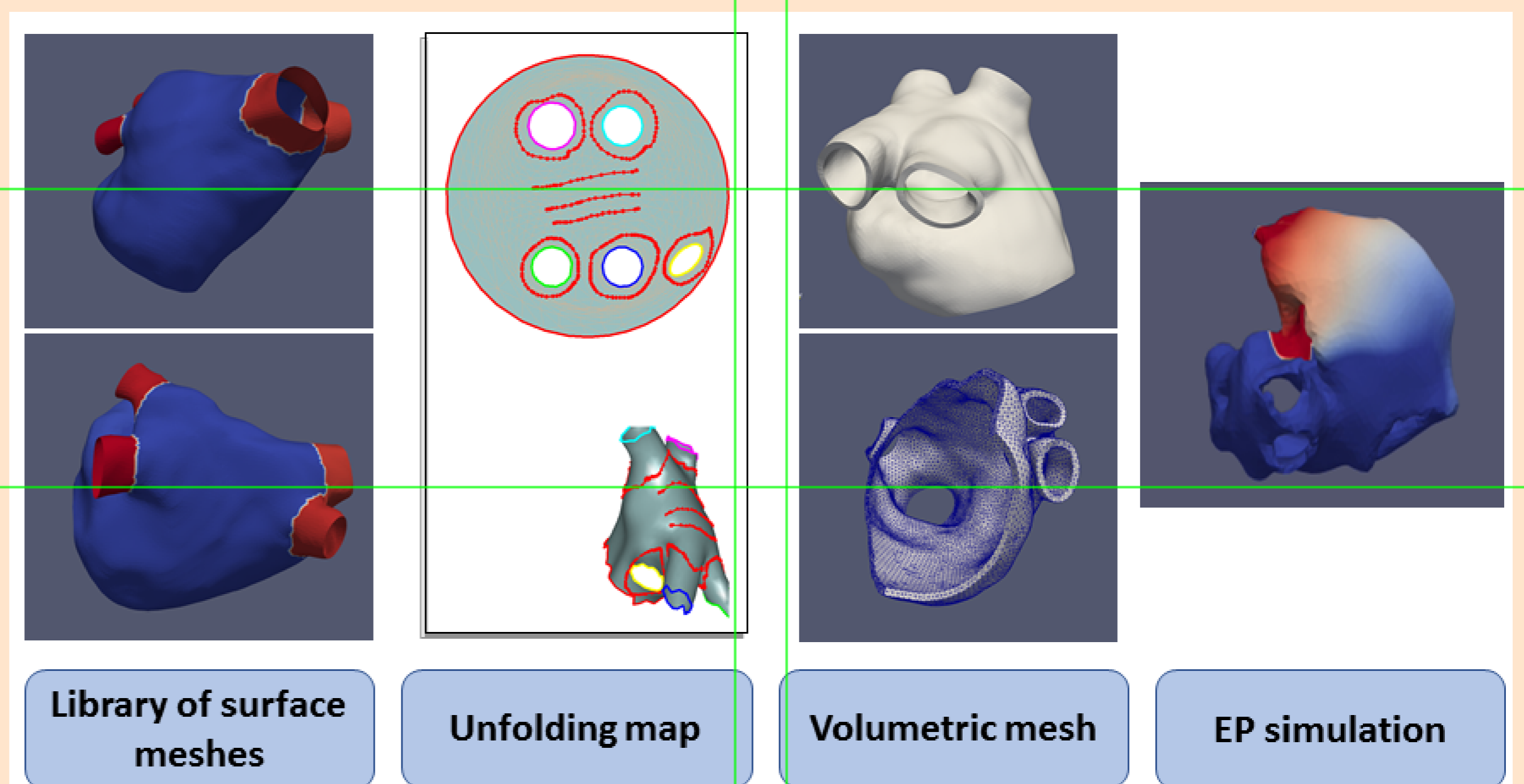
* vcarapella@gmail.com

Background

Systems Medicine for Diagnosis and Stratification of Atrial Fibrillation (SysAFib), is a multi-centre European project whose aim is to integrate medical data, computational modelling and image analysis to improve diagnosis and stratification in atrial fibrillation.
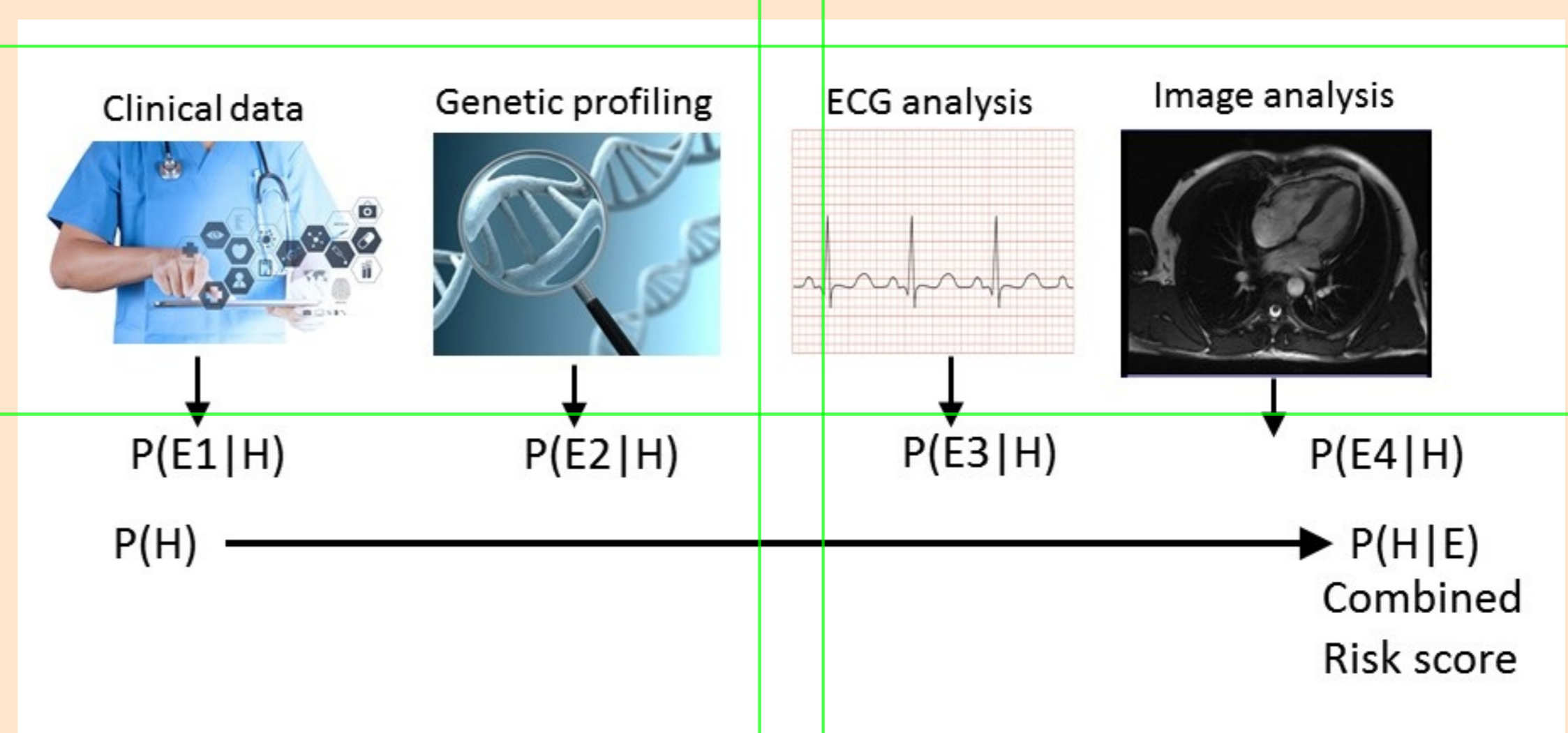

Introduction

In this context, our group at Simula has two tasks

- Set up a framework for computational modelling of atrial electrophysiology
- Combine the risk profiles obtained from different sources into a unified risk score by means of a Bayesian approach

References

[1] Boyle PM et al, Europace 18, pp.136-145 (2016).

[2] Jia S et al. LNCS 10263, pp.314-321.(2012).

[3] Tobon-Gomez C et al, Trans Med Imaging, 34 (2015).

[4] https://bitbucket.org/meg/cbcbeat.

(1) The EP simulation framework

Develop a simplified, modular, flexible and freely available pipeline for atrial EP simulations with

- a library of single atrium and bi-atrial volumetric tetrahedral meshes [3]
- an unfolding map-based tool to define regions and fibre fields developed to unfold each atrial surface mesh onto a unit disk by means of a conformal parametrisation.
- EP simulation tool developed using Fenics and cbcbeat [4]

| Library of surface meshes | Unfolding map | Volumetric mesh | EP simulation |

(2) Integration of risk scores

Retrospective data (approx 30 patients) provided by Oslo University Hospital will be processed by the various centres involved, each providing a separate risk profile. Integration of such results into a single risk score will be required. A simple Bayesian approach will be applied in the first instance.

Acknowledgements