

MODELLING CARDIOVASCULAR DEVICES: DESIGN, TESTING, AND PATIENT-SPECIFIC APPLICATIONS

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MINI-SYMPOSIUM PROPOSAL

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In recent years, mathematical modelling and numerical simulations of cardiovascular devices and implants have been increasingly used for analysis, assessment, and performance prediction in both patient-generic and patient-specific anatomies. The non-invasive nature of computer simulations and the ability to simulate many different scenarios make them an ideal tool for design, testing, and improvement of such devices. Realistic simulations can be based on well-established numerical methods from the areas of computational fluid dynamics, structural analysis and, increasingly, their coupling or on emerging methods, which tend to significantly reduce the computational costs (e.g. isogeometric analysis).

This mini-symposium aims to bring together engineers, device manufacturers, and clinicians to present advances and applications of computational modelling of cardiovascular medical devices. Such devices include coronary stents, valve replacements, ventricular assist devices, shunts, patches and other mechanical or electrical support devices. Advances in modelling of patient-specific treatments are also welcome. An important aspect of this mini-symposium is to present studies focused on the validation of the numerical models employed for simulation in the context of their potential clinical translation.

Suggested topics include, but are not limited to, the following

- 1) Structural analysis, deployment, and positioning of cardiovascular implants
- 2) Hemodynamic analysis, design, and development of cardiovascular devices.
- 3) Design and optimization of novel vascular and valve prosthesis.
- 4) Analysis of cardiac support devices.
- 5) Reliability engineering in mechanical devices.
- 6) Modelling of patient-specific treatments with or without implants.
- 7) Validation of numerical models in cardiovascular pathophysiology.
- 8) Image based analysis of medical devices.
- 9) Reduced order models for numerical predictions in cardiology.