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Uncertainty quantification in virtual surgery predictions for single ventricle palliation DANIELE SCHIAVAZZI, ALISON MARSDEN, Univ of California - San Diego — Hemodynamic results from numerical simulations of physiology in patients are invariably presented as deterministic quantities without assessment of associated confidence. Recent advances in cardiovascular simulation and Uncertainty Analysis can be leveraged to challenge this paradigm and to quantify the variability of output quantities of interest, of paramount importance to complement clinical decision making. Physiological variability and errors are responsible for the uncertainty typically associated with measurements in the clinic; starting from a characterization of these quantities in probability, we present applications in the context of estimating the distributions of lumped parameters in 0D models of single-ventricle circulation. We also present results in virtual Fontan palliation surgery, where the variability of both local and systemic hemodynamic indicators is inferred from the uncertainty in pre-operative clinical measurements. Efficient numerical algorithms are required to mitigate the computational cost of propagating the uncertainty through multiscale coupled 0D-3D models of pulsatile flow at the cavopulmonary connection. This work constitutes a first step towards systematic application of robust numerical simulations to virtual surgery predictions.

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