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CARDIOVASCULAR DISEASE-COMPUTATIONAL MECHANICS AND AI

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ABSTRACT

The SILICOFCM platform offers a innovative, multi-modular approach designed to optimize overall heart function and monitor the effectiveness of pharmacological treatments, aiming to decrease dependence on animal and human trials. The platform specifically targets hypertrophic (HCM) and dilated (DCM) cardiomyopathy through coupled macro- and micro-scale simulations utilizing finite element modeling of fluid-structure interaction (FSI) and molecular interactions within cardiac cells. This enables the simulation of left ventricular mechanics and the assessment of how different drugs influence electro-mechanical processes, including changes in calcium (Ca2+) handling and kinetic parameters. The overarching goal of the STRATIFYHF project is to develop and clinically validate an innovative AI-driven Decision Support System (DSS) to predict heart failure risk, support early diagnosis, and forecast disease progression—offering a paradigm shift in heart failure management across primary and secondary care. The DSS integrates patient-centered data from existing and emerging technologies, a digital patient library, and AI-based algorithms combined with computational modeling. Through workflows dedicated to improving heart performance and evaluating pharmacological effects, SILICOFCM and STRATIFYHF are paving new pathways to accelerate drug development and clinical testing.

REFERENCES

[1] www.silicofcm.eu

[2] www.stratifyhf.eu