

Abstract Submitted
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Non-Dimensional Formulation of Ventricular Work-Load Severity Under Concomitant Heart Valve Disease¹ MELODY DONG, University of California, San Diego, RACHAEL SIMON-WALKER, LAKSHMI DAS, Colorado State University — Current guidelines on assessing the severity of heart valve disease rely on dimensional disease specific measures and are thus unable to capture severity under a concomitant heart valve disease scenario. Experiments were conducted to measure ventricular work-load in an in-house in-vitro left heart simulator. In-house tri-leaflet heart valves were built and parameterized to model concomitant heart valve disease. Measured ventricular power varied non-linearly with cardiac output and mean aortic pressure. Significant data collapse could be achieved by the non-dimensionalization of ventricular power with cardiac output, fluid density, and a length scale. The dimensionless power, Circulation Energy Dissipation Index (CEDI), indicates that concomitant conditions require a significant increase in the amount of work needed to sustain cardiac function. It predicts severity without the need to quantify individual disease severities. This indicates the need for new fluid-dynamics similitude based clinical guidelines to assist patients with multiple heart valve diseases.

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Lakshmi Dasi
Colorado State University

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