

ESTIMATING VENTRICULAR STROKE WORK FROM AORTIC PRESSURE WAVEFORM

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Introduction

- Ventricular Stroke Work (VSW) is an important physiological parameter when assessing patient cardiovascular performance.
- Quantifying VSW requires ventricular pressure-volume measurements, which are highly invasive and clinically not feasible.
- This research presents a model-based analysis of aortic pressure contours to estimate VSW changes.

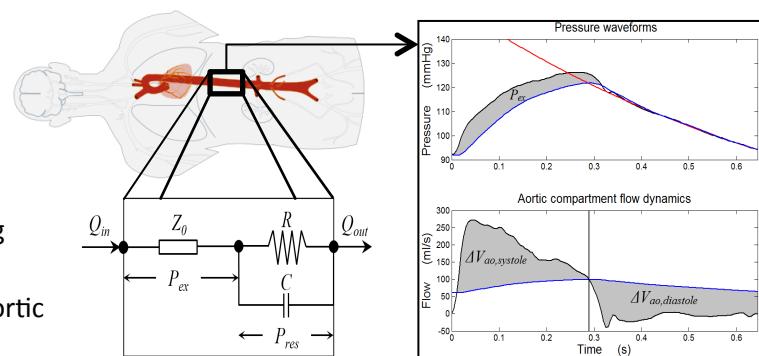
Methods

Data from porcine experiments were used to validate accuracy of the model where both aortic pressure and ventricular pressure-volume were measured.

VSW index estimation procedure

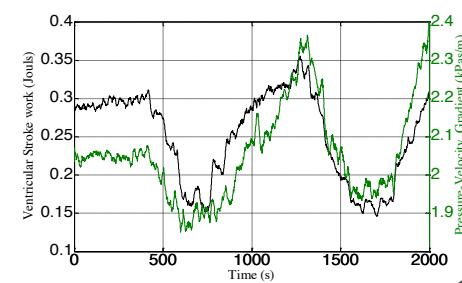
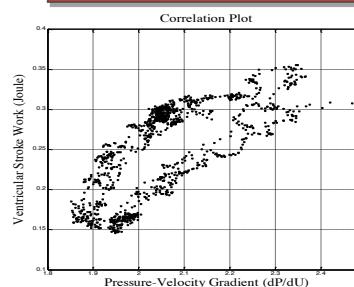
1. Identify physiological parameters RC and Z_0C from measured aortic pressure (P_{ao}) contour
2. Separate P_{ao} into excess and reservoir pressure using identified parameters
3. Identify Pulse Wave Velocity (PWV) using Bramwell & Hill Equation
4. Calculate pressure-velocity gradient in aortic compartment using Joukowsky Equation

Model-Based analysis of aortic pressure



Results

The correlation coefficient between measured VSW and model-based estimation of pressure-velocity gradient in aorta (VSW index) showed good agreements with $R=0.71$.



Conclusion

- The model only requires aortic pressure waveform, and thus clinically feasible for patients in ICU.
- The method presented in this study show the potential for continuous, accurate monitoring of VSW trends

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Te Poari Hauora o Waitaha

