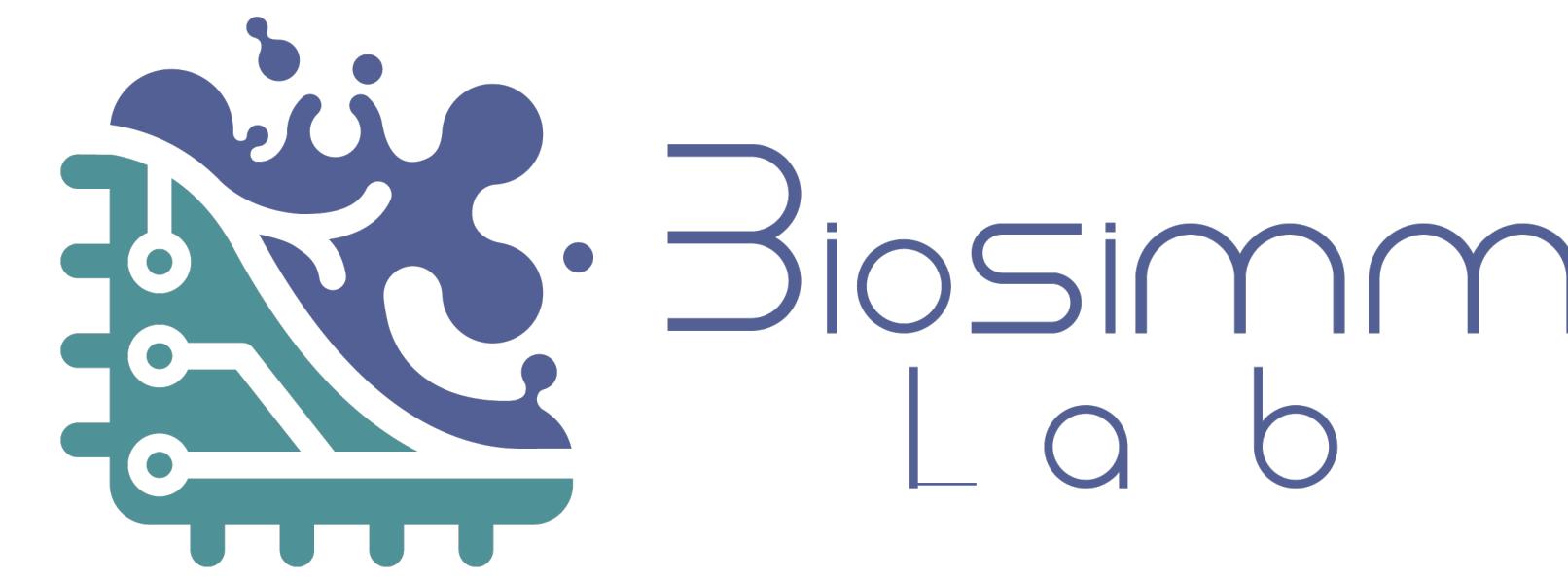




The influence of microvascular resistance on diagnostic indices of coronary hemodynamics

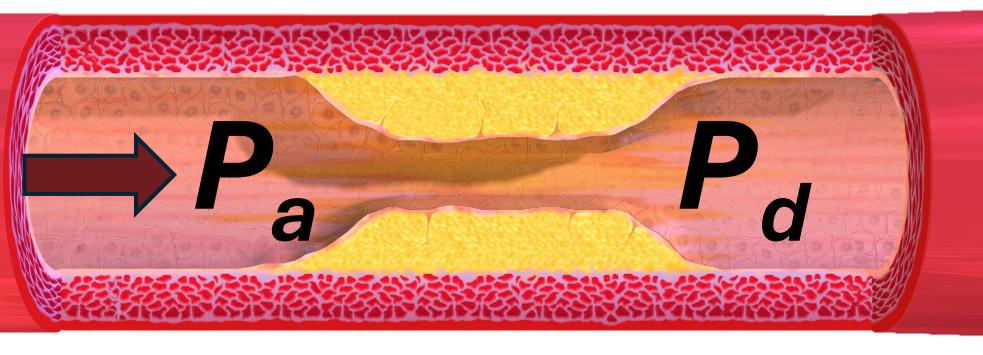


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Background

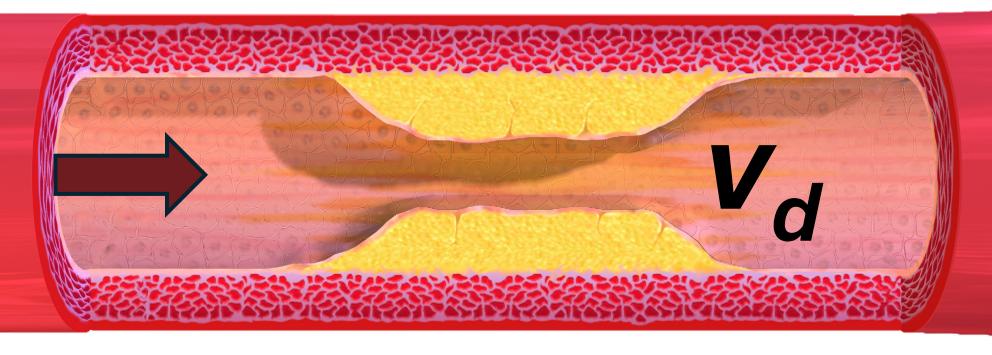
Two metrics to identify ischemia prone lesions

Fractional Flow Reserve (FFR)



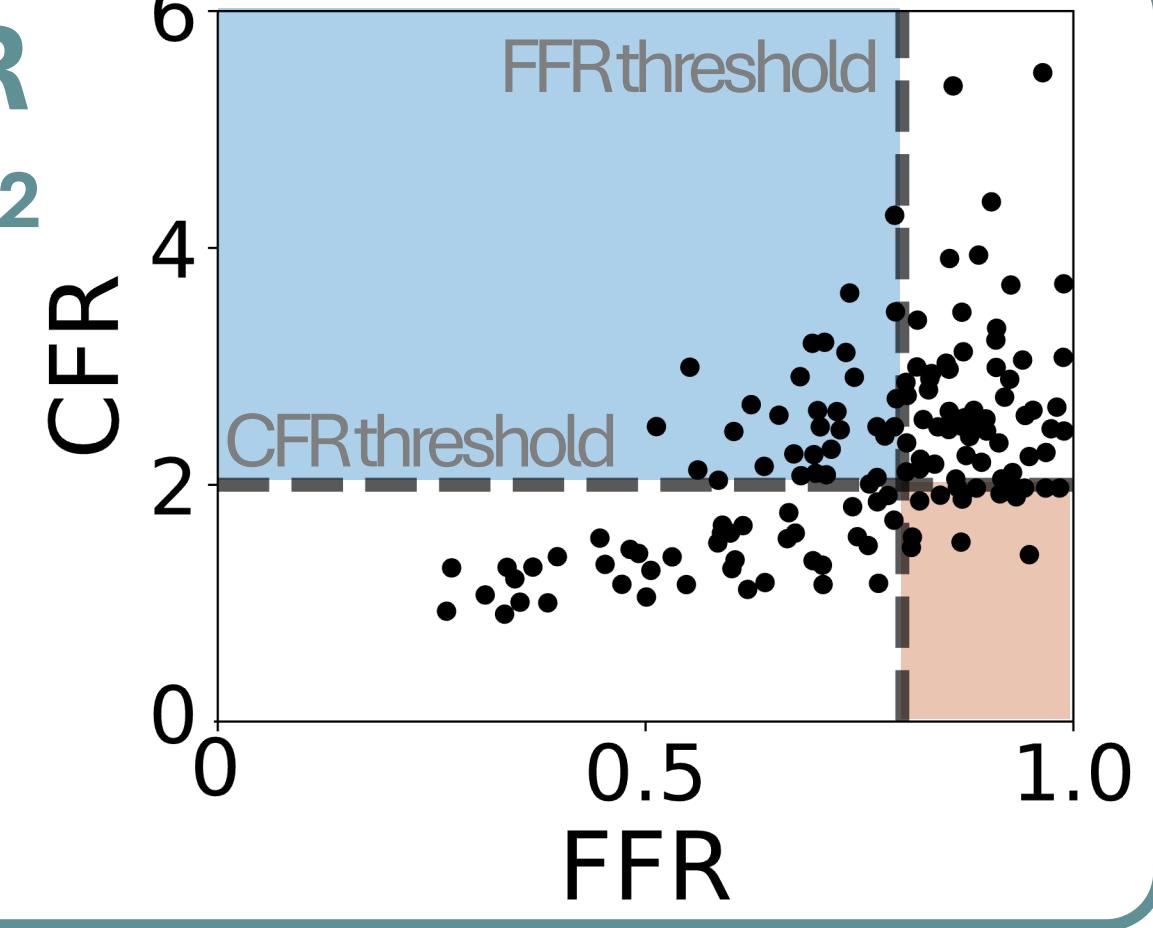
Pressure-based

Coronary Flow Reserve (CFR)



Flow-based

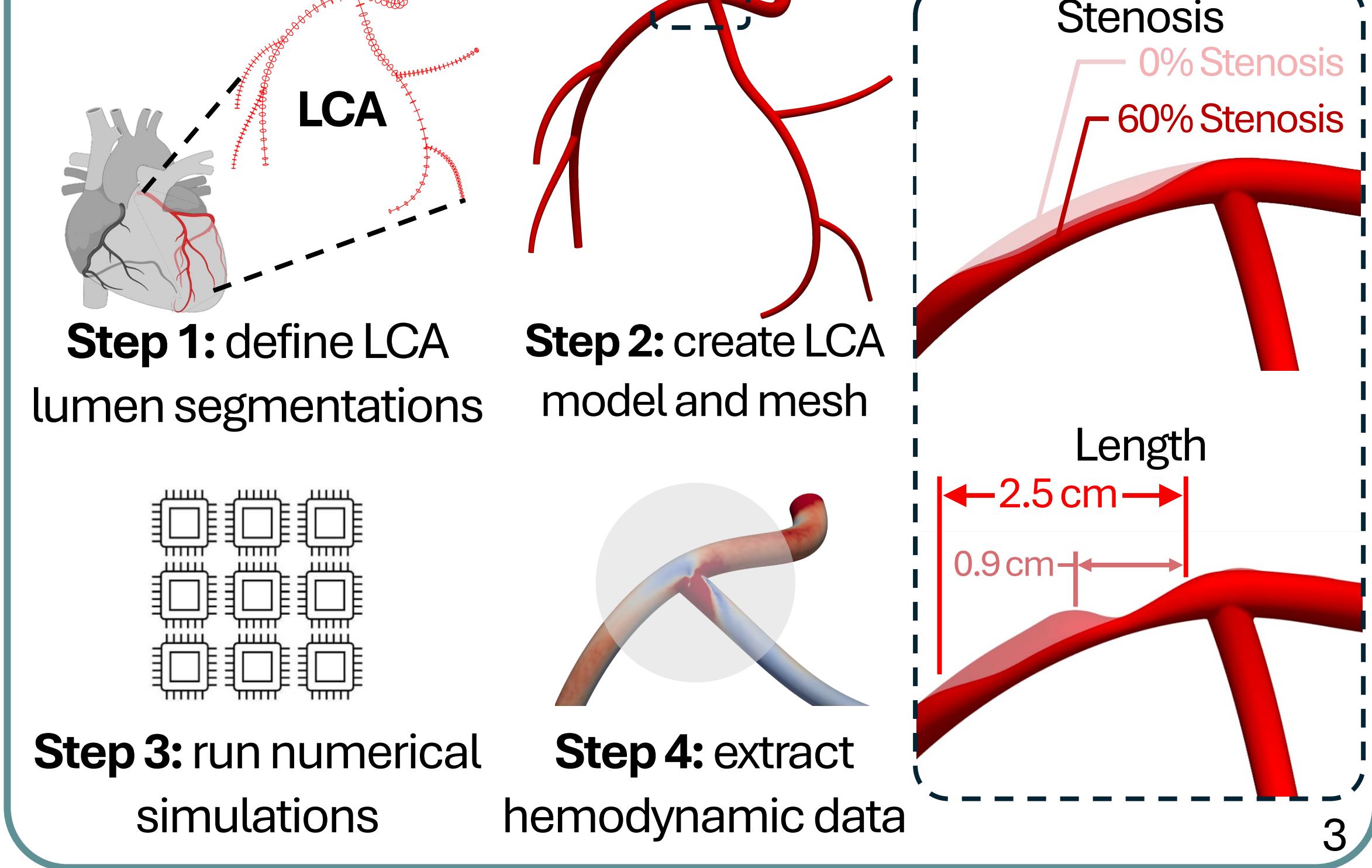
In 30% of cases, FFR and CFR contradict²



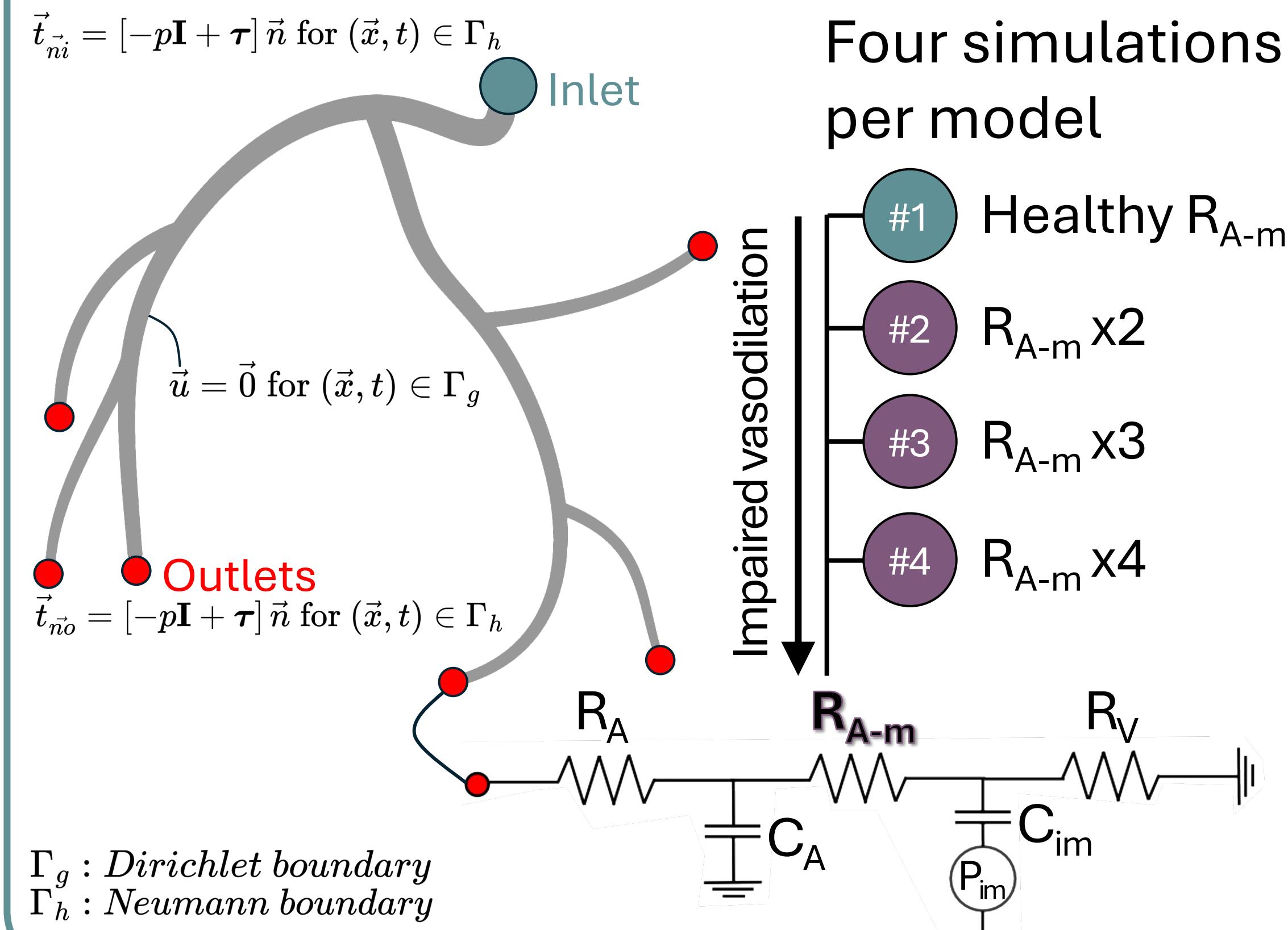
Goal: Quantify how hyperemic microvascular resistance (HMR) affects FFR and CFR

Method

Build left coronary artery (LCA) models to span broad range of lesion morphologies

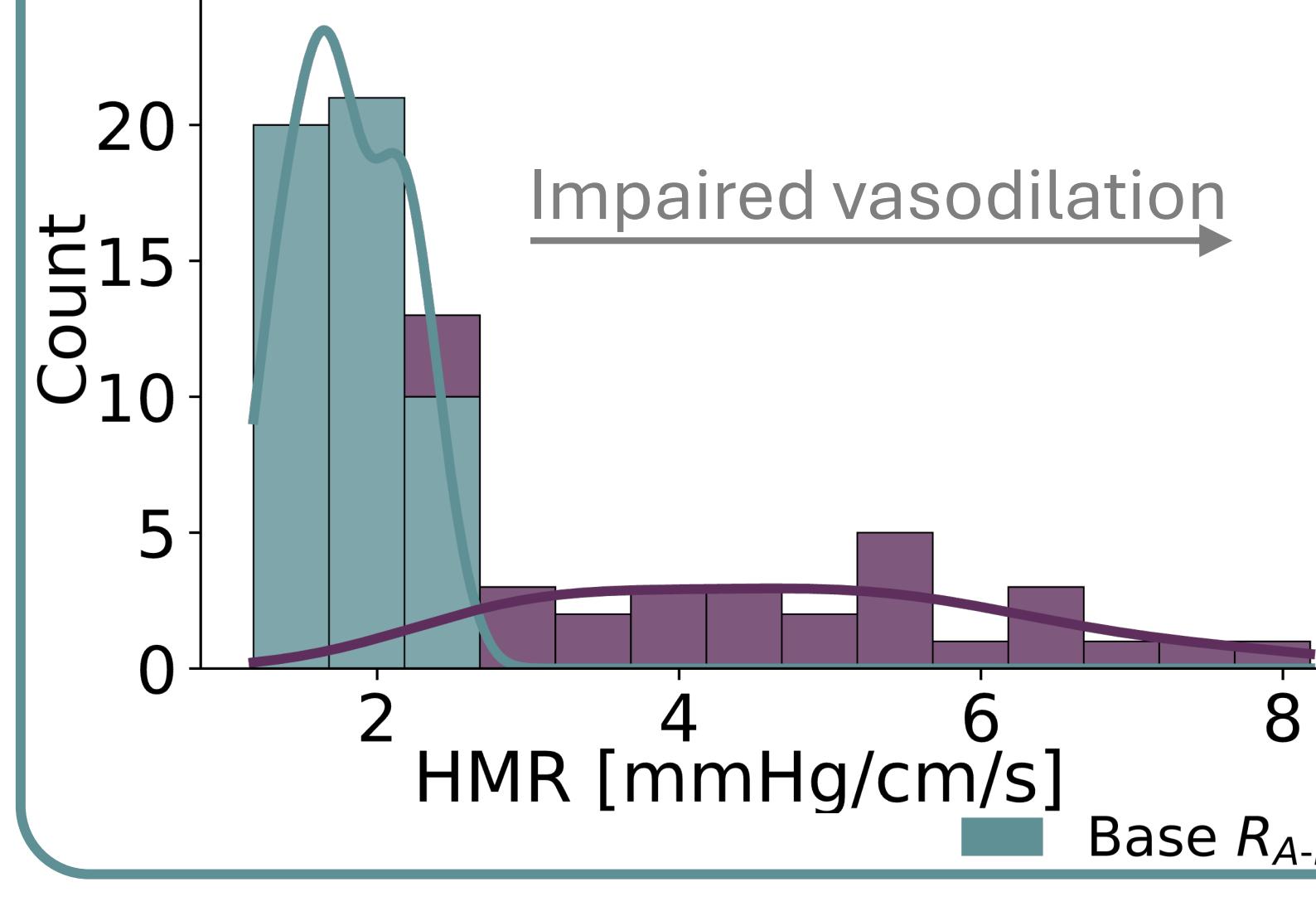


Alter coronary microvascular resistance

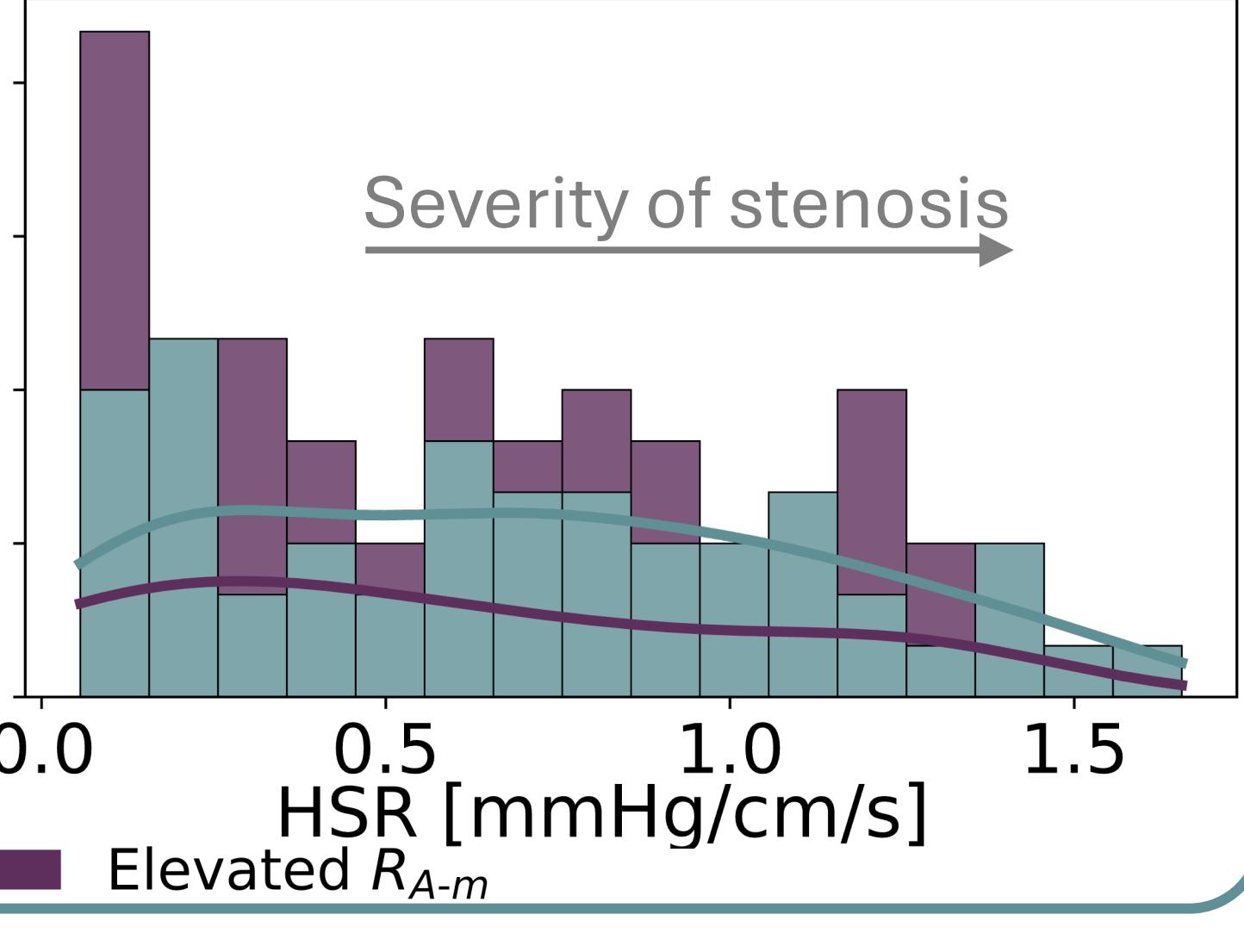


Results

Increase in range of observed hyperemic microvascular resistance (HMR)



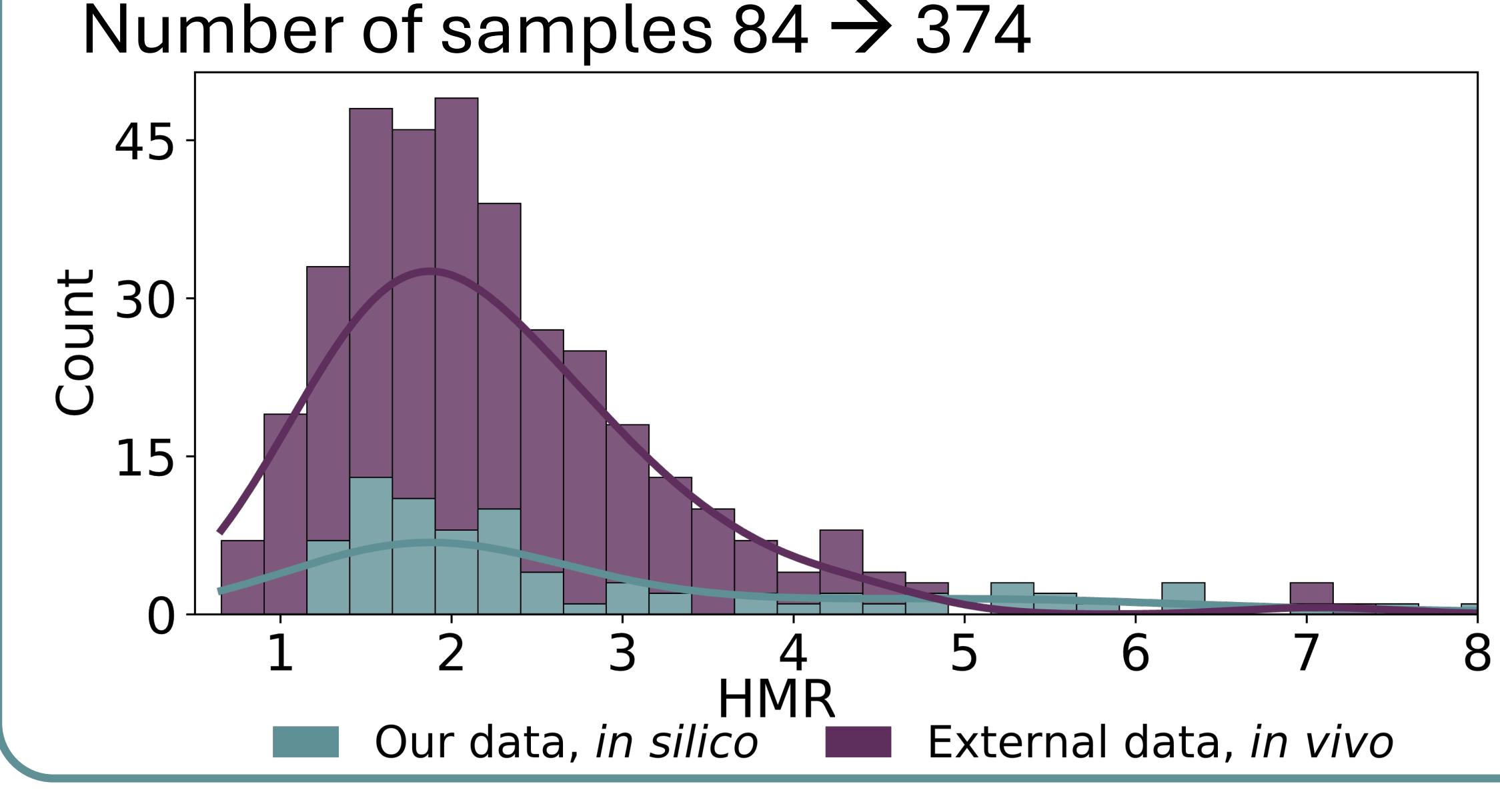
No change in range of observed hyperemic stenotic resistance (HSR)



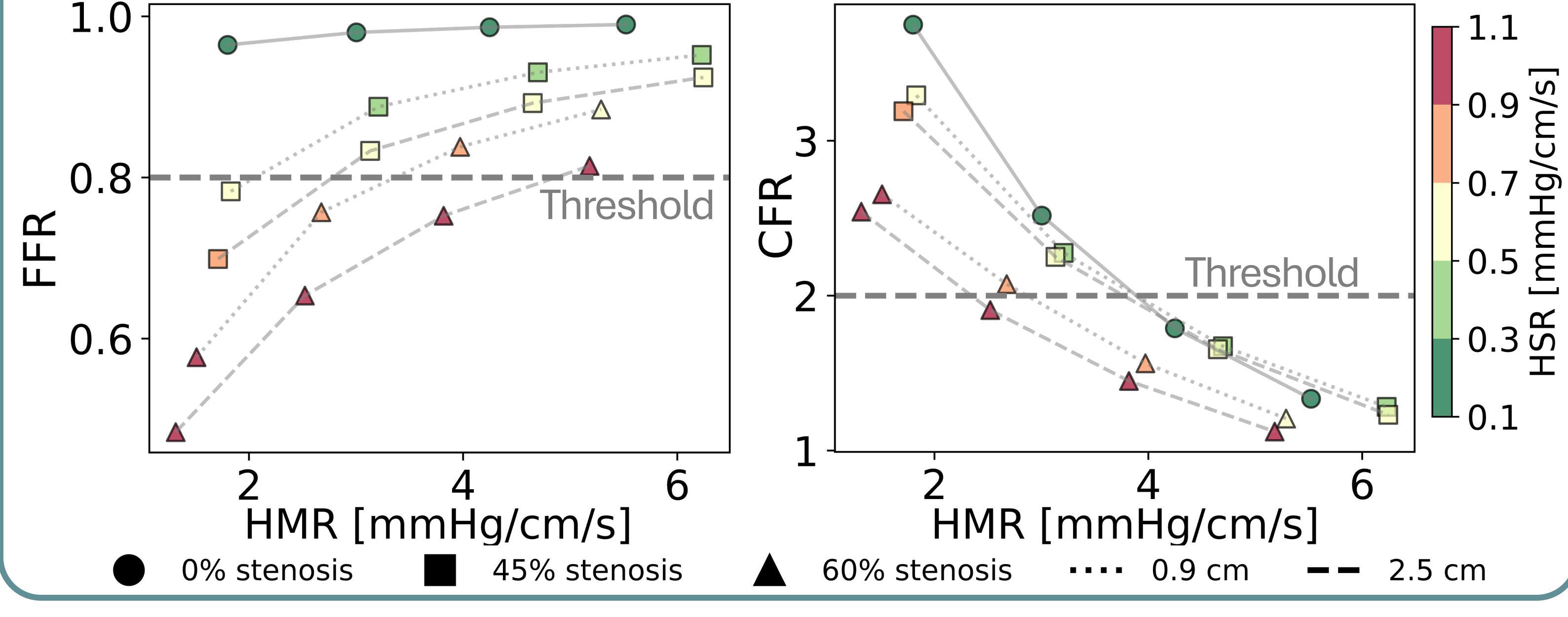
Analysis

Augmented data with clinical data from the literature⁴

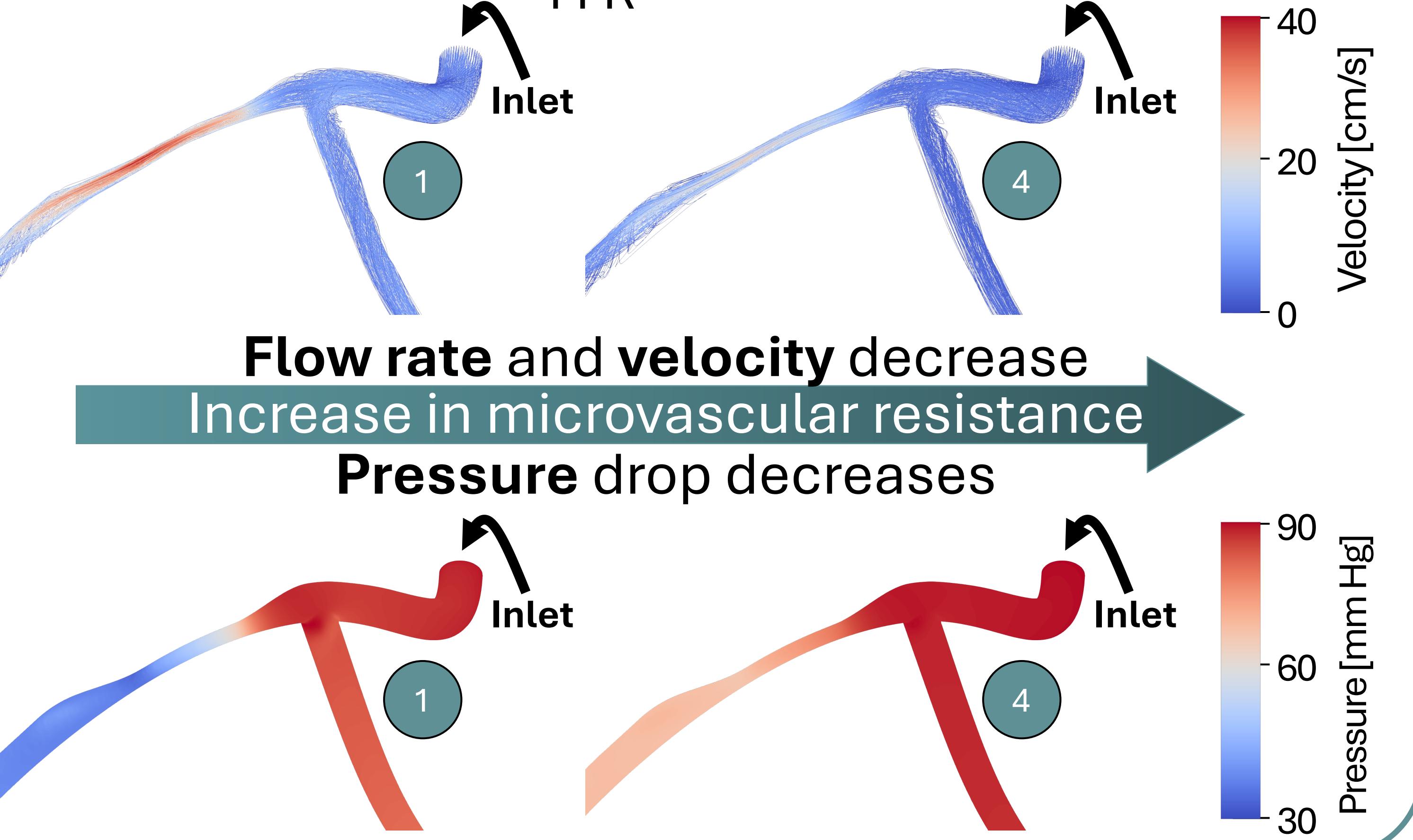
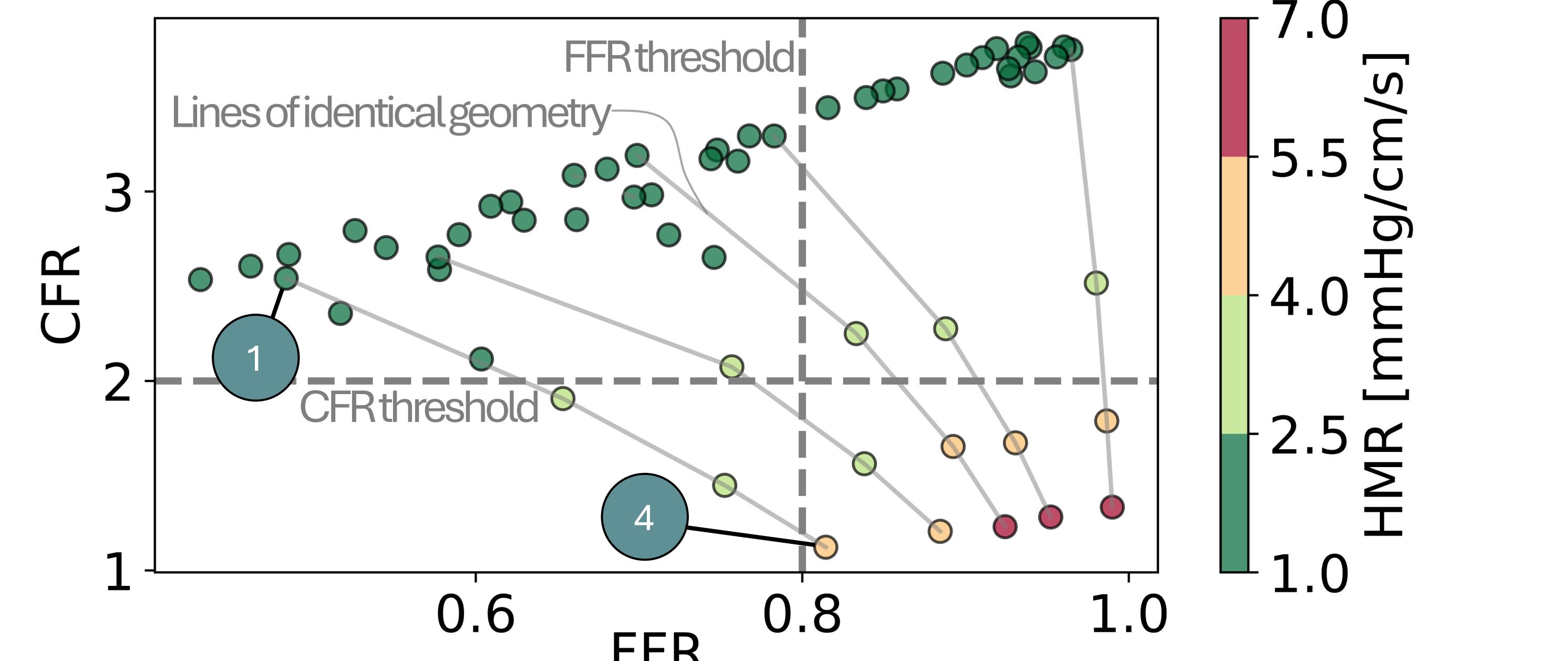
Number of samples 84 → 374



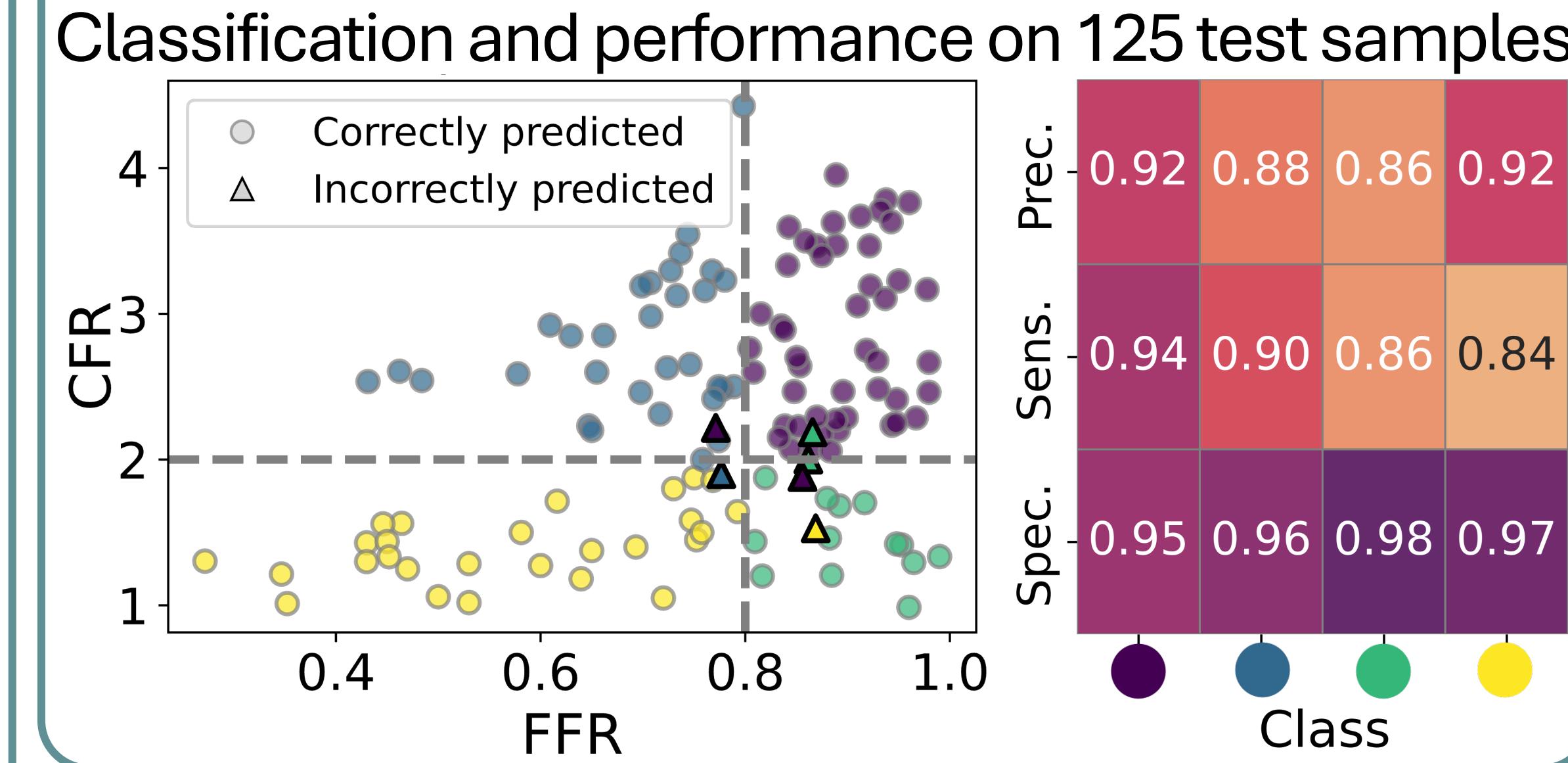
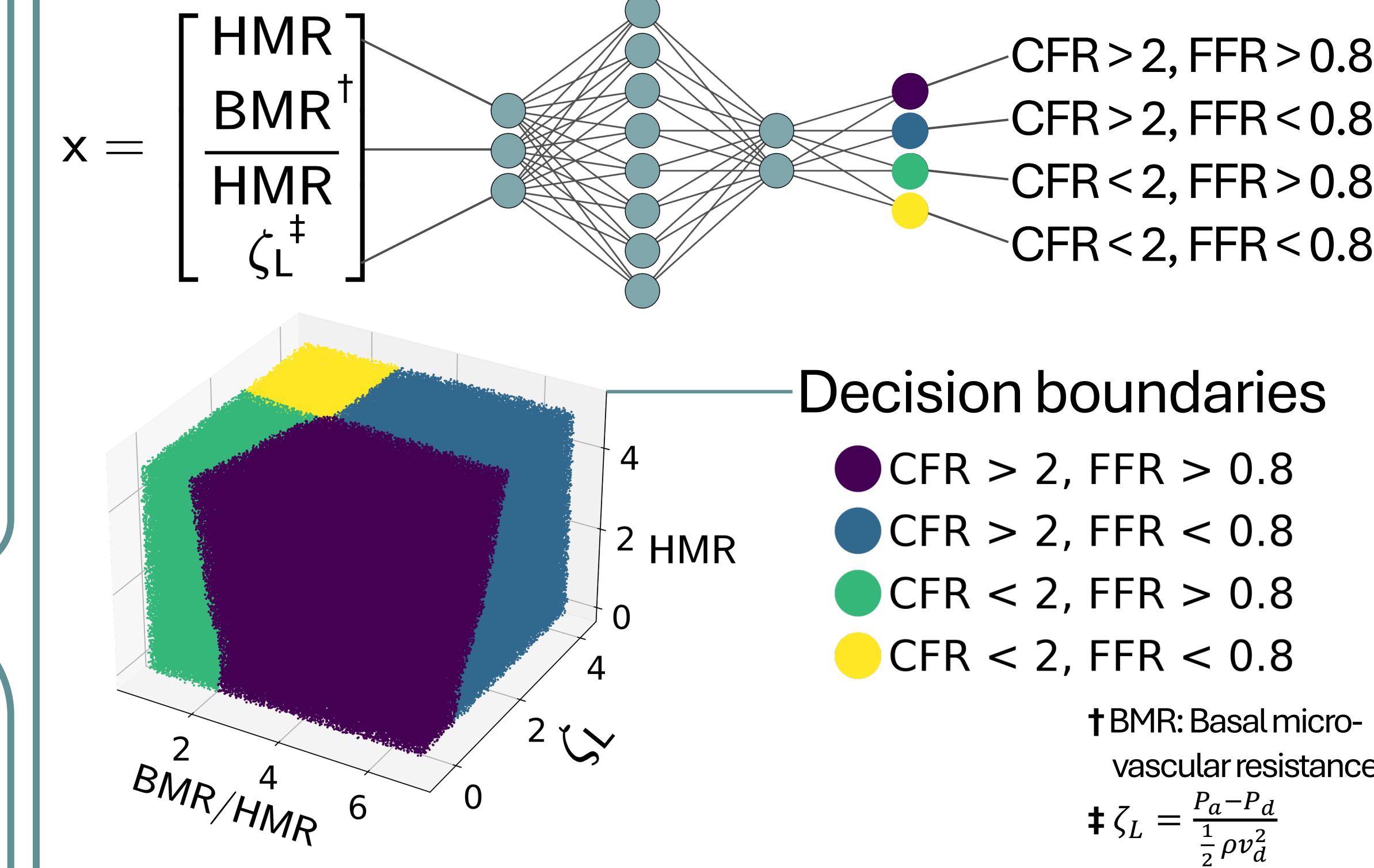
For identical lesions, increased HMR elevates FFR: lowers CFR



Identical lesions can be driven beyond both CFR and FFR thresholds by changes in HMR alone



Multilayer perceptrons are able to map nonlinear boundaries in three dimensions to classify CFR & FFR



Discussion & Conclusions

- Pressure-based or flow-based metrics in isolation are insufficient for coronary artery disease (CAD) assessment
- Discordance between diagnostic metrics is driven by downstream microvascular resistance, not plaque morphology

Next steps

- Investigate effects of HMR on other hemodynamic parameters (e.g., wall shear stress)
- Test robustness of trends on patient-specific cases
- Develop non-invasive surrogates for microvascular resistance to drive data-driven CAD assessment