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# Synopsis

This is a tool for calculating aortic Pulse Wave Velocity (PWV) from cine 2D phase contrast (2DPC) and balanced Steady State Free Precession (bSSFP) data using the Flow-Area (QA) method [paper citations]. This tool was originally written by myself and Grant Roberts for use in the LIFE study as an alternative to the PWV-2DPC (time-shift) tool [Grant paper citation]. The primary difference between these methods is that the QA method calculates a local PWV using cross-sectional areas and local flow values at each ROI while the time-shift tool calculates PWV over segments between each ROI. Additionally, this tool utilizes our own mixed modality pipeline for calculating PWV-QA as described in our ISMRM abstract [ISMRM citation]. We use bSSFP images with their high spatial resolution and image contrast to perform semi-automated segmentation that would otherwise be impossible on the magnitude 2DPC scans. The QA method depends heavily on accurate cross-sectional area and flow calculations so the improved segmentation quality dramatically improves PWV results as well reducing analysis time compared to using 2DPC images alone. Additionally, this tool is capable of calculating certain cardiac flow parameters such as stroke volume. The general workflow is as follows:

* Create save directory for analysis data
* Load bSSFP data
* Perform semi-automated segmentation on the bSSFP data to find the aorta ROI(s) in each frame
  + Multiple automated segmentation algorithms are available to aid in segmentation
  + Manual segmentation is also available
* Load 2DPC data
* Interpolate both datasets down to 1 ms to ensure matching temporal resolutions
* Calculate flow
* Shift flow curves as needed to accommodate gating lag
* Calculate PWV
  + Circle all points in the early systole region (upslope of the flow curve)
  + If calculating cardiac flow parameters, circle points in all of systole and diastole as well
* Results are saved to an excel file in the analysis folder

*(more detailed guide coming soon…)*