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INTER-USER VARIABILITY ON COMPUTATIONAL FLUID DYNAMICS IN HUMAN ARTERIOVENOUS FISTULAS

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Kidney failure occurs when chronic kidney disease (CKD) has reached the last stage, also known as end stage kidney disease (ESKD). ESKD is the cause of death for 5-10 million people in the world annually [1]. Many ESKD patients turn to hemodialysis to survive and must have a vascular access point where blood is drawn and purified through a dialysis machine. The most preferred vascular access type is the arteriovenous fistula (AVF), created by surgically connecting the vein to the artery within the forearm or upper arm [2]. However, many AVFs fail to adapt to the high blood flow rate needed for hemodialysis, causing AVF maturation failure [2-4]. Computational fluid dynamic (CFD) modelling is a method used to gain a deeper understanding of the role of aberrant hemodynamics in AVF maturation failure. However, variability between users regarding CFD results causes concern for reproducibility. This project analyzed the inter-user variability associated with CFD modelling between two (N=2) users. One human AVF at one day and six months after surgical creation was analyzed using CFD by two experienced users independently, and the results were compared. The parameters compared were cross-sectional area (CSA) and wall shear stress (WSS). Analysis showed a significant difference in CSA and WSS between users. However, both users observed the same increase in trend for the average CSA and WSS in the AVF from one day to six months. Understanding the variability of CFD modeling can help us gain a reliable understanding of AVF maturation and move towards the goal to lengthen the life of the AVF for dialysis patients.

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