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A model of vascular refilling with inflammation

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Monitoring the fluid status of end-stage renal disease (ESRD) patients remains an important aspect in hemodialysis. Recently, de los Reyes *et al.* developed a two-compartment model describing vascular refilling with ultrafiltration during short-term hemodialysis in ESRD patients. Ultrafiltration is taking out fluid from the vascular space; and vascular refilling occurs through the capillaries and by lymph flow, driven by pressure and concentration gradients in the plasma and interstitial spaces. A feature common in ESRD patients on hemodialysis is inflammation. Inflammation is believed to greatly contribute to the progression of cardiovascular disease, the most common cause of mortality among hemodialysis patients. Increased vascular permeability associated with inflammation is likely to influence the capillary wall properties that may cause perturbations affecting capillary refilling. We propose a way to quantify inflammation by considering the concentration of the inflammatory biomarker C-reactive protein (CRP). A model that incorporates inflammation to the vascular refilling model is presented. Simulations and parameter estimation related to CRP and capillary wall properties are also presented.

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