Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Hemodynamics of Central Venous Catheters: experiments and simulations MICHAEL BARBOUR, PATRICK MCGAH, ALICIA CLARK, CHIN HEI NG, University of Washington, KENNETH GOW, Seattle Children's Hospital, ALBERTO ALISEDA, University of Washington — Central venous catheters (CVC) are used to provide vascular access during hemodialysis in patients with end-stage kidney disease. Despite several advantages and widespread use, CVCs have a high incidence rate of clot formation during the interdialytic phase (48 hrs). In an attempt the prevent clot formation, hospitals routinely administer heparin, an anticoagulant, into the catheter after a dialysis session. It has been reported, however, that up to 40% of the heparin solution will leak into the blood stream during the interdialytic phase, placing the patient at risk for systemic bleeding incidences. The aim of this study is to determine the role that advective-diffusive transport plays in the heparin leaking process. Numerical simulations of heparin convective mass transfer have been conducted, showing that while advective losses may be significant at the tip, previous studies may be overestimating the total amount of heparin leakage. To validate the quantitative prediction from the simulations, P.L.I.F. is used to experimentally measure heparin transport from CVCs placed in an idealized Superior Vena Cava with physically accurate pulsatile flow conditions. Improved understanding of flow near the catheter tip is applied to improve catheter design and heparin locking procedures.

Michael Barbour
University of Washington

Date submitted: 02 Aug 2013 Electronic form version 1.4