UCLA Engineering
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BIOENGINEERING

PRESENTS

Patient-specific modeling in pediatric cardiology: from computation to clinic

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ABSTRACT:

Computational simulation has become a powerful tool for non-invasive assessment of cardiovascular hemodynamics, enabling quantitative patient risk assessment, and systematic design of devices and surgical methods. Patient-specific image based modeling increasingly allows simulations to be used in personalized medicine and individualized treatment planning. With the first FDA approval of simulations for routine clinical use in coronary artery disease at the end of 2014, the door is now open for a wide range of simulation technologies to significantly impact clinical care in both children and adults. In this talk we will discuss recent advances in cardiovascular simulation methodology, including patient specific multiscale modeling, fluid structure interaction, uncertainty quantification and optimization. We will then discuss the clinical application of these methods to patients with severe congenital heart defects, including babies born with a single ventricle. We will present examples in which virtual surgery has been used to design novel surgical methods for patients born with single ventricle physiology. We will discuss recent successes and challenges of translating simulation technology to animal studies and ultimately to the clinical setting.

BIOGRAPHY:

Dr. Alison Marsden is an associate professor and Wall Center scholar in the departments of Pediatrics, Bioengineering, and, by courtesy, Mechanical Engineering at Stanford University. From 2007-2015 she was a faculty member in the Mechanical and Aerospace Engineering Department at the University of California San Diego. She graduated with a bachelor's degree in Mechanical Engineering from Princeton University in 1998, and a PhD in Mechanical Engineering from Stanford in 2005 working with Prof. Parviz Moin. She was a postdoctoral fellow at Stanford University in Bioengineering and Pediatric Cardiology from 2005-07 working with Charles Taylor and Jeffrey Feinstein. She was the recipient of a Burroughs Wellcome Fund Career Award at the Scientific Interface in 2007, an NSF CAREER award in 2011, and is a member of an international Leducq Foundation Network of Excellence. She received the UCSD graduate student association faculty mentor award in 2014 and MAE department teaching award at UCSD in 2015. She has published over 80 peer reviewed journal papers, and has received funding from the NSF, NIH, and several private foundations. She is an associate editor of the Journal of Biomechanical Engineering and PLOS Computational Biology. Her research focuses on the development of numerical methods for cardiovascular blood flow simulation, medical device design, application of optimization to large-scale fluid mechanics simulations, and application of engineering tools to impact patient care in cardiovascular surgery and congenital heart disease.