

**BIOGRAPHICAL SKETCH**

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NAME: Laura Jean Olivieri

eRA COMMONS USER NAME (credential, e.g., agency login): LOLIVIERI

POSITION TITLE: Assistant Professor of Pediatrics; George Washington School of Medicine

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Worcester Polytechnic Institute Worcester, MA	BS	05/1999	Biomedical Engineering
University of Chicago Pritzker School of Medicine Chicago, IL	MD	06/2003	Medicine
Brown University Department of Pediatrics Providence, RI		6/2007	Pediatric Residency Pediatric Chief Resident
Children's National Medical Center/GWU Division of Cardiology Washington, DC		6/2010	Pediatric Cardiology Fellowship
CNMC/NHLBI Lab of Cardiac Energetics		6/2011	Noninvasive Imaging/Cardiac MRI Research Fellowship

**A. Personal Statement**

Advancement of technology relating to pediatric cardiac imaging, particularly to cardiac MR, to improve diagnosis and management of pediatric cardiac disease is my main career goal. Pediatric cardiac imaging needs are distinct from the imaging needs of adult patients with adult cardiac disease. For us, it imperative that spatial and temporal resolution of any imaging modality are maximized for tiny hearts that are beating two to three times faster than adult hearts. Image acquisition must be as brief as possible and require little-to-no cooperative from the subject being imaged in order to avoid sedation and anesthesia. These considerations, combined with the breadth of variations of congenital heart disease have driven 3D echo, cardiac MR and cardiac CT to significant developments in the last 10 years for the benefit of pediatric patients with congenital heart disease. It is important to not only develop these technologies, but to also provide clinically relevant endpoints that advance our ability to diagnose and treat pediatric and congenital heart disease. Finally, the ability to harness these imaging developments that have occurred and are about to occur is important, thus I am investigating the ability to display cardiac defects with various tangible and digital 3D displays, as well as assessing the impact of these 3D cardiac models on patient care and clinician education.

- Olivieri LJ**, Cross RR, O'Brien KE, Ratnayaka K, Hansen MS. Optimized protocols for cardiac magnetic resonance imaging in patients with thoracic metallic implants. *Pediatr Radiol*. 2015 Jun 4.
- Olivieri LJ**, Krieger A, Loke YH, Nath DS, Kim PC, Sable CA. Three-dimensional printing of intracardiac defects from three-dimensional echocardiographic images: feasibility and relative

accuracy. J Am Soc Echocardiogr. 2015 Apr;28(4):392-7.

3. **Olivieri L**, Baba R, Bandettini I, Rosing D, Arai A, Sachdev V, Bondy C. Spectrum of Aortic Valve Abnormalities associated with aortic dilation across age groups in Turner Syndrome. Circ Cardiovasc Imaging. 2013 Nov 1;6(6):1018-23
4. **Olivieri L**, Krieger K, Chen M, Kim P, Kanter P. 3D Heart Model Guides Complex Stent Angioplasty of Pulmonary Venous Baffle Obstruction in a Mustard Repair of D-TGA. Int J Card. 2014 January. Int J Cardiol. 2014 Mar 15;172(2):e297-8
5. **Olivieri L**, Arling B, Friberg M, Sable C. Coronary artery Z score regression equations and calculators derived from a large heterogeneous population of children undergoing echocardiography. J Am Soc Echocardiogr. 2009 Feb;22(2):159-64

## **B. Positions and Honors**

### **Positions and Employment**

2006-07 Clinical Instructor, Pediatrics, Brown University  
2007-11 Clinical Instructor, Pediatrics, George Washington University  
2010-present Clinical Fellow, Intramural Research program, NHLBI  
2011-present Assistant Professor Pediatrics, George Washington University

### **Other Experience and Professional Memberships**

2003-present American Academy of Pediatrics  
2007-present American Heart Association  
2007-present American College of Cardiology  
2011-present Society for Cardiovascular Magnetic Resonance Imaging  
2011-present American Society for Echocardiography  
2011-present Children's National Medical Center, Pharmacy+Therapeutics Committee  
2014-present American College of Radiology

### **Honors**

2006 Brown University Excellence in Teaching, Providence, RI  
2009 American Heart Association Outstanding Female Trainee Award  
2013 "Rising Stars®" Pediatric Cardiologist Awardee, Washington Post  
2014 National Heart, Lung, and Blood Institute Director's Award for Partnership/Collaboration (Launching the Pediatric Interventional Cardiac Magnetic Resonance Program, a Collaboration Between NHLBI and Children's National Medical Center)  
2016 National Heart, Lung, and Blood Institute Orloff Award

## **C. Contribution to Science**

Imaging the human heart is a delicate endeavor, usually undertaken with ultrasound and magnetic resonance imaging. My subspecialty training in cardiac imaging has led to several small developments in imaging pediatric and congenital heart disease. As more information surfaces regarding the use of anesthesia in small infants, and the use of radiation to image human beings, it is becoming clearer that sedation and radiation should be used sparingly, if at all, to image small hearts and guide procedures. Cardiac magnetic resonance imaging technology is rapidly advancing to be faster, more accurate and informative, such that these invasive procedures may not be necessary if cardiac MRI can provide more information as this technology advances. Together with engineers and physicists who are developing hardware and software to work in this space, cardiac imagers who use and develop CMR have important work to do to improve outcomes of children and adults with congenital heart disease and advance cardiac MR as an important diagnostic imaging modality.

1. **Olivieri LJ**, Cross RR, Donofrio MT. Influence of fetal diagnosis on the clinical presentation of a vascular ring. Pediatr Cardiol. 2012 Feb;33(2):351-3.
2. **Olivieri L**, Ratnayaka K, Levy RJ, Berger J, Wessel D, Donofrio M. Hypoplastic left heart syndrome with intact atrial septum sequelae of left atrial hypertension in utero. J Am Coll Cardiol. 2011 May 17;57(20):e369.

3. Matisoff AJ, **Olivieri L**, Schwartz JM, Deutsch N. Risk assessment and anesthetic management of patients with Williams syndrome: a comprehensive review. *Paediatr Anaesth*. 2015 Dec;25(12):1207-15.
4. Bondy C, Bakalov VK, Cheng C, **Olivieri L**, Rosing DR, Arai AE. Bicuspid aortic valve and aortic coarctation are linked to deletion of the X chromosome short arm in Turner syndrome. *J Med Genet*. 2013 Jul 3.
5. **Olivieri L**, Baba R, Bandettini I, Rosing D, Arai A, Sachdev V, Bondy C. Spectrum of Aortic Valve Abnormalities associated with aortic dilation across age groups in Turner Syndrome. *Circ Cardiovasc Imaging*. 2013 Nov 1;6(6):1018-23
6. He D, Sinha P, **Olivieri L**, Jonas R. Congenital Aneurysm of the Aorto Mitral Intervalvular Fibrosa. *Annals of Thoracic Surgery*. 2015 Jan;99(1):314-6.
7. Hansen M, **Olivieri L**, O'Brien K, Cross R, Inati S, Kellman P. Method for calculating confidence intervals for phase contrast flow measurements. *Journal of Cardiovascular Magnetic Resonance* 2014, 16:46

A new technology is on the horizon – development of 3D modelling, and 3D display of cardiac images in three-dimensional digital and physical models through segmentation and printing based on medical imaging. My talented team of engineers and I began working together some years ago with the idea that, perhaps, we could print an echo to hold in one's hand in order to better understand the heart defect that was being displayed. Now, our program is one of the leaders of 3D cardiac segmentation, with collaborators from around the world working on pushing the boundaries of this technology and understanding what this technology has to offer. A newly developed application allows for easy manipulation and display of these 3D models, developed in conjunction with an industry partner. Work is underway to determine the clinical relevance of 3d models of the heart prior to surgery in a multi-center trial of cardiovascular surgical outcomes.

1. **Olivieri L**, Krieger K, Chen M, Kim P, Kanter P. 3D Heart Model Guides Complex Stent Angioplasty of Pulmonary Venous Baffle Obstruction in a Mustard Repair of D-TGA. *Int J Card*. 2014 January. *Int J Cardiol*. 2014 Mar 15;172(2):e297-8
2. Costello JP, **Olivieri LJ**, Krieger A, Thabit O, Marshall MB, Yoo SJ, Kim PC, Jonas RA, Nath DS. Utilizing Three-Dimensional Printing Technology to Assess the Feasibility of High-Fidelity Synthetic Ventricular Septal Defect Models for Simulation in Medical Education. *World J Pediatr Congenit Heart Surg*. 2014 Jun 23;5(3):421-426.
3. Costello JP, **Olivieri LJ**, Krieger A, Thabit O, Marshall MB, Yoo SJ, Kim PC, Jonas RA, Nath DS. Incorporating Three-Dimensional Printing Into A Simulation-Based Congenital Heart Disease and Critical Care Training Curriculum for Resident Physicians. *Congenit Heart Dis*. 2014 Nov 11.
4. **Olivieri LJ**, de Zélicourt DA, Haggerty CM, Ratnayaka K, Cross RR, Yoganathan AP. Hemodynamic Modeling of Surgically Repaired Coarctation of the Aorta. *Cardiovasc Eng Technol*. 2011 Dec;2(4):288-295.
5. Cardiac Review 3D application. Co-developed with Indicated, Inc. [Link here](#).
6. NIH 3DPX – 3D Cardiac Print Exchange – Editorial board and founding member of this NIH-hosted webforum to catalogue, display and share 3D models of heart defects that are peer-reviewed and accessible to all. [Link here](#).

[My complete published work](#).

#### **D. Research Support**

List both selected ongoing and completed research projects for the past three years (Federal or non-Federally-supported). *Begin with the projects that are most relevant to the research proposed in the application*. Briefly indicate the overall goals of the projects and responsibilities of the key person identified on the Biographical Sketch. Do not include number of person months or direct costs.

##### **Ongoing Research Support**

NHLBI Contract No. HHSN268200900052C (PI: Olivieri, Cross), 2014-2019  
Principal Investigator, Pediatric Cardiac Magnetic Resonance Imaging Project

40% salary support to direct noninvasive imaging research using cardiac magnetic resonance imaging, including creation of research protocols related to MR imaging, interpretation of CMR studies, and enhancement of clinical imaging to guide percutaneous interventions.

\$7.3 million

Children's National Health System Board of Visitors Grant, 2015

3D Models and their impact on surgical team and surgical consent – focused on use of the 3D model, both printed and digital, to streamline surgical team processes including consent with patients and their families

\$24,000

### **Completed Research Support**

AHA Travel Grant, 2009 – to support travel required to present my research in repaired coarctation of the aorta at the AHA meeting

\$1,000

Children's National Health System Board of Visitors Grant, 2014 - 2015

Create 3D models of the heart from cardiac imaging – focused on developing technology surrounding imaging, segmentation and printing capabilities

\$14,000, (PI: Olivieri, Krieger)

Children's National Health System Board of Visitors Grant, 2014 - 2015

Use of 3D Models of the heart in clinical team education – focused on use of the 3D heart models in clinical team simulation to discover their added value

\$21,000, (PI: Olivieri, Nath, Krieger, Su)