



HEART INSTITUTE RESEARCH NEWSLETTER

Research Updates

Semi-Annual Newsletter



CONGRATULATIONS!

Dr. Howaida El-Said's "Re-stenting Improves Vessel Patency, Lumen Area and Endothelialization: A Feasibility Study in Piglets Demonstrating Re-Stenting with Simultaneous Intentional Fracture of Previously Placed Stents" won the 2017 Pediatric Interventional Cardiac Symposium Annual Scientific Sessions Oral Abstract Award recognizing the best oral abstract presentation at this year's conference in Miami, Florida.

Recruiting Studies

Fontan Udenafil Exercise Longitudinal Trial (FUEL)

Sponsor: Pediatric Heart Network

PI: Christopher Davis, MD, PhD

Randomized, double-blind, placebo controlled phase 3 clinical trial to evaluate the efficacy and safety of Udenafil versus placebo. Please let us know of any adolescents (ages 12-18) who have undergone the Fontan procedure.

For more information, please contact:

Gail Aguilar: gaguilar@rchsd.org 858-576-1700 x3457

Panorama-HF: Pediatric Heart Failure study

Sponsor: Novartis

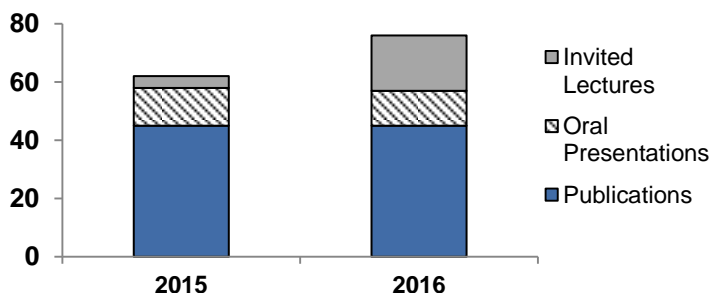
PI: Rakesh Singh, MD, MS

A multicenter study evaluating the safety and efficacy of LCZ696 (Entresto®: valsartan + sacubitril) compared with enalapril. Please let us know of any eligible patients from 1 month to 18 years of age with LVEF \leq 40% or SF \leq 20% and biventricular physiology.

For more information, please contact:

Danica Griffin: dgriffin1@rchsd.org 858-576-1700 x7139

Heart Institute Research Metrics 2015-2016



Heart Institute Research

Ongoing Studies

Clinical Trials:	10	Retrospective Chart Reviews:	23
Prospective, Data Collection:	14	HDE:	2
Translational:	3	Educational:	2
Registry, QI:	6	Community Service:	1

Cardiovascular Surgery Spotlight



Please welcome Dr. John Nigro as the new Division Chief of Cardiovascular Surgery for Rady Children's Specialists of San Diego and Director of the Heart Institute at Rady Children's Hospital. Dr. Nigro is a congenital cardiothoracic surgeon and has been in practice for more than 20 years. We sat down with Dr. Nigro for a Q&A and discussed his visions for the Heart Institute.

Q: What are your research interests?

A: My research interests include outcomes analysis, especially for patients with Hypoplastic Left Heart Syndrome, cerebral blood flow and 3-D printing, simulation and imaging.

Q: What is your vision for the Heart Institute Research Program?

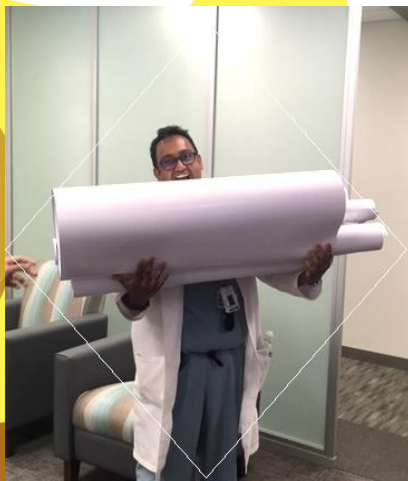
A: My vision is to create a multi-disciplined integrative initiative focused on results and improved quality of life for congenital heart disease patients. It would involve clinical outcomes analysis, basic science initiatives, and the evolution of virtual surgery and simulation.

Q: Amongst all your research interests, what are you most passionate about?

A: Outcomes analysis specifically for Hypoplastic Left Heart Syndrome and transplants. I am most passionate about this because they are the most challenging conditions. We have the opportunity to improve the quality of life and survival for our congenital heart disease patients.

Dr. John Nigro – We are glad to have you on our team!

STAR RESEARCHER: Dr. Raghav Murthy



Highlighted are just a few of Dr. Murthy's many research accomplishments for the year of 2016!

2016 First Author Publications:

- A Novel Method for Epicardial Defibrillator Lead Placement in Young Children: Coil Between the Great Arteries. *Ann Thorac Surg.* 2016 Oct;102(4):e377-8.
- Gore-Tex Wrap Technique for Outflow Graft and Driveline Following HeartWare Implantation in Pediatric Patients. *Indian J Thorac Cardiovasc Surg* (2016) 32: 226.
- Heart Xenotransplantation: Historical Background, Experimental Progress, and Clinical Prospects. *Ann Thorac Surg.* 2016 Apr;101(4):1605-13.
- Mechanical Support for Biventricular Failure using the HeartWare (HVAD) Pump. *Indian J Thorac Cardiovasc Surg,* (2016) 32:197.
- Selective Use of the Blalock-Taussig Shunt and Right Ventricle-to-Pulmonary Artery Conduit During the Norwood Procedure. *World J Pediatr Congenit Heart Surg.* 2016 May;7(3):329-33.

Philanthropy

The Donald C. & Elizabeth M. Dickinson Foundation recently made a generous \$2 million gift to help establish a pediatric Image-Guided Intervention Center; the first of its kind in the nation. Kris Dickinson, a Rady Children's Hospital Foundation Trustee and executive director of the family foundation, championed support for the project. Long-time and generous supporters of Rady Children's, the Dickinson Foundation also have made gifts supporting the Heart Transplant program and MRI center at Rady Children's.

When fully funded, the planned Image-Guided Intervention Center will utilize real-time cardiac MRI to address the two main limitations of conventional imaging and image guidance: the need for better visualization of 3-dimensional structural relationships and minimizing radiation exposure. A cardiac MRI's dynamic, 3-D images will create a complete anatomic map that can both guide interventions and help avoid complications; it could mean being able to repair a child's heart without opening the chest and stopping the heart for surgery. Learn more about the Heart Institute's Image-Guided Intervention Center at:

<https://www.rchsd.org/programs-services/heart-institute/innovation/interventional-cardiac-mri/>



Donald C. and Elizabeth M. Dickinson

Frank Subaru Share the Love Campaign

From November 17, 2016 to January 3, 2017, Frank Subaru donated \$250 for every new Subaru vehicle sold or leased to the customer's choice of charity. Approximately 90% of the customers selected Rady Children's. Monica Salem, Marketing Director for Frank Motors Group, inspired the employees to share her passion for giving back to Rady Children's, through Isabel's (Izzy's) story. A total of \$50,718 was raised for the Heart Institute.



Monica Salem pictured with her husband, Robert and daughter Isabel (Izzy).

The 10th Annual Run to the Max 5K – February 25, 2017: Proceeds went to the Heart Institute's Image-Guided Intervention Center.

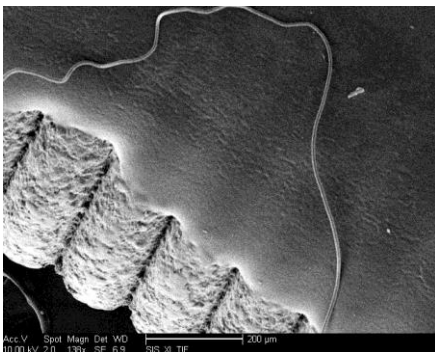
Little Hearts Big Hopes – May 21, 2017: Proceeds went to Dr. Paul Grossfeld's research on the ETS-1 gene, which is linked to human congenital heart defects.

New Research Website

We are pleased to announce the launch of our new updated website. You can check it out at:

<https://www.rchsd.org/programs-services/heart-institute/>

Intramural Grant Funding



Nanocomposite coating of guidewire

A team of pediatric cardiologists from Rady Children's Hospital San Diego and mechanical engineers from UCSD led by Dr. Sanjeet Hegde (principal investigator) were selected for the inaugural cohort of the new UC San Diego Technology Accelerator. Other members of the team are Professor Prabhakar Bandaru (co-principal investigator), Dr. John Moore (advisor), Dr. James Perry (advisor), Dr. Kanishka Ratnayaka (co-investigator), Zichen Zhang (graduate student) and Abhishek Sathisha (graduate student). The team is developing electromagnetically shielded devices for MRI guidance of minimally invasive procedures.

More information can be found here:

http://ucsdnews.ucsd.edu/pressrelease/new_uc_san_diego_technology_accelerator_selects_five_teams_for_its_inaugura

UCSD/RCHSD Pediatrics Research Symposium, January 2017

Fourteen posters were presented by members of Cardiology and Cardiovascular Surgery at last year's symposium.

Poster topics included:

- Interventional pediatric cardiology
- Biomedical engineering and imaging
- Cardiovascular surgery long-term outcomes
- Arrhythmia diagnostics
- Fetal echocardiography

HIRC Members

Gail Aguilar
 Christopher Davis
 Danica Griffin
 Paul Grossfeld
 Sanjeet Hegde
 Robyn Jucius
 John Moore
 Kanishka Ratnayaka
 Rakesh Singh
 Heather Sun



Gail Aguilar
 gaguilar@rchsd.org
 858-576-1700 x3457

Danica Griffin
 dgriffin1@rchsd.org
 858-576-1700 x7139



Featured Publication:

- Ratnayaka K, Moore JW, Rios R, Lederman RJ, Hegde SR, El-Said HG. First-in-Human Closed-Chest Transcatheter Superior Cavopulmonary Anastomosis. *J Am Coll Cardiol*. Aug 2017, 70;(6) 745-752.

Rady Heart Institute's Publications:

- Ding L, Pockett C, Moore J, El-Said H. Long sheath use in femoral artery catheterizations in infants <15 kg is associated with a higher thrombosis rate: Proposed Protocol for Detection and Management. *Catheter Cardiovasc Interv*. 2016 Dec;88(7):1108-1112.
- Ebrahim M, Hegde S, Printz B, Abcede M, Proudfoot JA, Davis C. Evaluation of Impedance Cardiography for Measurement of Stroke Volume in Congenital Heart Disease. *Pediatr Cardiol*. 2016 Dec;37(8):1453-1457.
- Farrar G, Suinesiaputra A, Gilbert K, Perry JC, Hegde S, Marsden A, Young AA, Omens JH, McCulloch AD. Atlas-based ventricular shape analysis for understanding congenital heart disease. *Prog Pediatr Cardiol*. 2016 Dec;43:61-69.
- Gordon JB, Daniels LB, Kahn AM, Jimenez-Fernandez S, Vejar M, Numano F, Burns JC. The Spectrum of Cardiovascular Lesions Requiring Intervention in Adults After Kawasaki Disease. *JACC Cardiovasc Interv*. 2016 Apr 11;9(7):687-96.
- Grossfeld P. Brain hemorrhages in Jacobsen syndrome: A retrospective review of six cases and clinical recommendations. *Am J Med Genet A*. 2017 Mar;173(3):667-670.
- Hegde S, Hsiao A. Improving the Fontan: Pre-surgical planning using four dimensional (4D) flow, bio-mechanical modeling and three dimensional (3D) printing. *Progress in Pediatric Cardiology*, Volume 43, 2016, 57-60.
- Lee JW, Printz BF, Hegde SR, Vargas LA, Sun HY. Double trouble: fetal diagnosis of a pulmonary artery sling and vascular ring. *Clin Case Rep*. 2016 Nov 11;4(12):1187-1190.
- McCanta AC, Perry JC. Cardiac resynchronization therapy in children with heart failure. *Prog Pediatr Cardiol*, Volume 43, 2016, Pages 17-22.
- Molkara D, Silva Sepulveda JA, Do T, Davis C, Goldstein GP, Moore JW, El-Said HG. Tissue Plasminogen Activator for Neonatal Coronary Thrombosis Presenting with Mitral Valve Regurgitation and Impaired Ventricular Function. *Congenit Heart Dis*. 2017 May;12(3):270-274.
- Murthy R, Lamberti J, Saenz N. Esophageal Bronchus. *Ann Thorac Surg*. 2017 Jun;103(6):e519-e520.
- Murthy R, Williams MR, Perry JC, Shepard S, DiBardino D. A Novel Method for Epicardial Defibrillator Lead Placement in Young Children: Coil Between the Great Arteries. *Ann Thorac Surg*. 2016 Oct;102(4):e377-8.
- Nakamura T, Arima-Yoshida , Sakaue F, Nasu-Nishimura Y, Takeda Y, Matsuura K, Akshoomoff N, Mattson SN, Grossfeld PD, Manabe T, Akiyama T. PX-RICS-deficient mice mimic autism spectrum disorder in Jacobsen syndrome through impaired GABAA receptor trafficking. *Nat Commun*. 2016 Mar 16;7:10861.
- Pathak SJ, Pockett CR, Moore JW, El-Said HG. Effect of Balloon: Annulus Ratio on Incidence of Pulmonary Insufficiency Following Valvuloplasty. *Congenit Heart Dis*. 2016 Sep;11(5):415-419.

- Perry JC, Williams MR, Shepard S, Bratincsak A, Murphy C, Murthy R, Ebrahim M, Lamberti J. Intraoperative 3-dimensional mapping of supraventricular tachycardia in a young Fontan patient. *Ann Thorac Surg.* 2017 May;103(5):e453-e456.
- Pockett CR, Moore JW, El-Said HG. Three Dimensional rotational angiography for assessment of coronary arteries during melody valve implantation: introducing a technique that may improve outcomes. *Neth Heart J.* 2017 Feb;25(2):82-90.
- Ratnayaka K, Lederman R. Interventional Cardiac MRI. *Congenital Cardiology Today.* 2016 Aug; 14(8): 1-6.
- Sah SP, Bartakian S, El-Said H, Molkara DP, Printz B, Moore JW. Preprocedural Transthoracic Echocardiography Can Predict Amplatzer Septal Occluder Device Size for Transcatheter Atrial Septal Defect Closure. *Congenit Heart Dis.* 2016 Dec;11(6):656-662.

Rady Heart Institute's Collaborative Publications:

- Baruteau AE, Perry JC, Sanatani S, Horie M, Dubin AM. Evaluation and management of bradycardia in neonates and children. *Eur J Pediatr.* 2016 Feb;175(2):151-61.
- Cevallos PC, Rose MJ, Armsby LB, Armstrong AK, El-Said H, Foerster SR, Glatz AC, Goldstein BH, Hainstock MR, Kreutzer J, Latson LA, Leahy RA, Petit CJ, Torres A, Shahanavaz S, Zampi JD, Bergersen L. Implementation of Methodology for Quality Improvement in Pediatric Cardiac Catheterization: A Multi-center Initiative by the Congenital Cardiac Catheterization Project on Outcomes-Quality Improvement (C3PO-QI). *Pediatr Cardiol.* 2016 Dec;37(8):1436-1445.
- Ferro G, Murthy R, Sebastian VA, Guleserian KJ, Forbess JM. Single-Center Experience With the Senning Procedure in the Current Era. *Semin Thorac Cardiovasc Surg.* 2016 Summer;28(2):514-520.
- Gilbert K, Farrar G, Cowan B, Suinesiaputra A, Occlshaw C, Pontre B, Perry J, Hegde S, Omens J, McCulloch A, Young A. Improving assessment of congenital heart disease through rapid patient specific modeling. *Conf Proc IEEE Eng Med Biol Soc.* 2016 Aug;2016:1228-1231.
- Grant EK, Berul CI, Cross RR, Moak JP, Hamann KS, Sumihara K, Cronin I, O'Brien KJ, Ratnayaka K, Hansen MS, Kellman P, Olivieri LJ. Acute Cardiac MRI Assessment of Radiofrequency Ablation Lesions for Pediatric Ventricular Arrhythmia: Feasibility and Clinical Correlation. *J Cardiovasc Electrophysiol.* 2017 May;28(5):517-522.
- Gupta P, Rettiganti M, Gossett JM, Yeh JC, Jeffries HE, Rice TB, Wetzel RC. Risk factors for mechanical ventilation and reintubation after pediatric heart surgery. *J Thorac Cardiovasc Surg.* 2016 Feb;151(2):451-8.e3.
- Herrick N, Davis C, Vargas L, Dietz H, Grossfeld P. Utility of Genetic Testing in Elite Volleyball Players With Aortic Root Dilatation: Clinical Implications. *Med Sci Sports Exerc.* 2017 Jul;49(7):1293-1296.
- Johnson TD, Hill RC, Dzieciatkowska M, Nigam V, Behfar A, Christman KL, Hansen KC. Quantification of decellularized human myocardial matrix: A comparison of six patients. *Proteomics Clin Appl.* 2016 Jan;10(1):75-83.
- Kumar SR, Kung G, Noh N, Castillo N, Fagan B, Wells WJ, Starnes VA. Single-Ventricle Outcomes After Neonatal Palliation of Severe Ebstein Anomaly With Modified Starnes Procedure. *Circulation.* 2016 Oct 25;134(17):1257-1264.

- Masoudi FA, Ponirakis A, de Lemos JA, Jollis JG, Kremers M, Messenger JC, Moore JW, Moussa I, Oetgen WJ, Varosy PD, Vincent RN, Wei J, Curtis JP, Roe MT, Spertus JA. Executive Summary: Trends in U.S. Cardiovascular Care. *J Am Coll Cardiol*. 2017 Mar 21;69(11):1424-1426.
- Masoudi FA, Ponirakis A, de Lemos JA, Jollis JG, Kremers M, Messenger JC, Moore JW, Moussa I, Oetgen WJ, Varosy PD, Vincent RN, Wei J, Curtis JP, Roe MT, Spertus JA. Trends in U.S. Cardiovascular Care: 2016 Report From 4 ACC National Cardiovascular Data Registries. *J Am Coll Cardiol*. 2017;69:1427-50.
- May LJ, Montez-Rath ME, Yeh J, Axelrod DM, Chen S, Maeda K, Almond CS, Rosenthal DN, Hollander SA, Sutherland SM. Impact of ventricular assist device placement on longitudinal renal function in children with end-stage heart failure. *J Heart Lung Transplant*. 2016 Apr;35(4):449-56.
- Mavrothalassitis O, Lodin D, Swami N, Moon-Grady A, Tabbutt S, Sunderji S, Peyvandi S, Karamlou T, Lamberti J, Murthy R, Subramanyan R, Raff G, Rahm A, Reemsten B, Almeida-Jones ME, Starr JP, Gates R, Setty S. Towards standardization: Analysis of specific modifiable perioperative process measures among neonates undergoing arterial switch operation for transposition of the great arteries with intact ventricular septum—A mini-pilot for the California Congenital Cardiac Consortium Progress. *Progress in Pediatric Cardiology*, Volume 42, 2016, Pages 71-72.
- Mazal JR, Rogers T, Schenke WH, Faranesh AZ, Hansen M, O'Brien K, Ratnayaka K, Lederman RJ. Interventional-Cardiovascular MR: Role of the Interventional MR Technologist. *Radiol Technol*. 2016 Jan-Feb;87(3):261-70.
- Moore JP, Wang S, Albers EL, Salerno JC, Stephenson EA, Shah MJ, Pflaumer A, Czosek RJ, Garnreiter JM, Collins K, Papez AL, Sanatani S, Cain NB, Kannankeril PJ, Perry JC, Mandapati R, Silva JN, Balaji S, Shannon KM. A Clinical Risk Score to Improve the Diagnosis of Tachycardia-Induced Cardiomyopathy in Childhood. *Am J Cardiol*. 2016 Oct 1;118(7):1074-80.
- Murthy R, Bajona P, Bhamra JK, Cooper DK. Heart Xenotransplantation: Historical Background, Experimental Progress, and Clinical Prospects. *Ann Thorac Surg*. 2016 Apr;101(4):1605-13.
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- Murthy R, Price J, Williams D, Guleseria K. Gore-Tex Wrap Technique for Outflow Graft and Driveline Following Heartware Implantation in Pediatric Patients. *Indian J Thorac Cardiovasc Surg* (2016) 32: 226.
- Murthy R, Sebastian VA, Huang R, Guleserian KJ, Forbess JM. Selective Use of the Blalock-Taussig Shunt and Right Ventricle-to-Pulmonary Artery Conduit During the Norwood Procedure. *World J Pediatr Congenit Heart Surg*. 2016 May;7(3):329-33.
- Narayan HK, Finkelman BS, French B, Plappert T, Hyman D, Smith AM, Margulies KB, Ky B. Detailed Echocardiographic Phenotyping in Breast Cancer Patients: Associations with Ejection Fraction Decline, Recovery, and Heart Failure Symptoms over 3 Years of Followup. *Circulation*. 2017 Apr 11;135(15):1397-1412.
- Narayan HK, French B, Khan AM, Plappert T, Hyman D, Bajulaiye A, Domchek S, DiMichele A, Clark A, Matro J, Bradbury A, Fox K, Carver JR, Ky B. Noninvasive Measures of Ventricular-Arterial Coupling and Circumferential Strain Predict Cancer Therapeutics-Related Cardiac Dysfunction. *JACC Cardiovasc Imaging*. 2016 Oct;9(10):1131-1141.

- Narayan HK, Wei W, Feng Z, Lenihan D, Plappert T, Englefield, V, Fisch M, Ky B. Cardiac Mechanics and Dysfunction with Anthracyclines in the Community: Results from the PREDICT Study. *Open Heart*. 2017 Jan 16;4(1):e000524.
- Ratnayaka K, Rogers T, Schenke WH, Mazal JR, Chen MY, Sonmez M, Hansen MS, Kocaturk O, Faranesh AZ, Lederman RJ. Magnetic Resonance Imaging-Guided Transcatheter Cavopulmonary Shunt. *JACC Cardiovasc Interv*. 2016 May 9;9(9):959-70.
- Richmond ME, Easterwood R, Singh RK, Gilmore L, Zuckerman WA, McFeely ED, Chen JM, Addonizio LJ. Low-Dose Donor Dopamine is Associated with a Decreased Risk of Right Heart Failure in Pediatric Heart Transplant Recipients. *Transplantation*. 2016 Dec;100(12):2729-2734.
- Rogers T, Mahapatra S, Kim S, Eckhaus MA, Schenke WH, Mazal JR, Campbell-Washburn A, Sonmez M, Faranesh AZ, Ratnayaka K, Lederman RJ. Transcatheter Myocardial Needle Chemoablation During Real-Time Magnetic Resonance Imaging: A New Approach to Ablation Therapy for Rhythm Disorders. *Circ Arrhythm Electrophysiol*. 2016 Apr;9(4):e003926.
- Rogers T, Ratnayaka K, Karmarkar P, Campbell-Washburn AE, Schenke WH, Mazal JR, Kocaturk O, Faranesh AZ, Lederman RJ. Real-time magnetic resonance imaging guidance improves the diagnostic yield of endomyocardial biopsy. *JACC Basic Transl Sci*. 2016 Aug;1(5):376-383.
- Sandeep N, Uchida Y, Ratnayaka K, McCarter R, Hanumanthaiah S, Bangoura A, Zhao Z, Oliver-Danna J, Leatherbury L, Kanter J, Mukoyama YS. Characterizing the angiogenic activity of patients with single ventricle physiology and aortopulmonary collateral vessels. *J Thorac Cardiovasc Surg*. 2016 Apr;151(4):1126-35.
- Shimizu C, Eleftherohorinou H, Wright VJ, Kim J, Alphonse MP, Perry JC, Cimaz R, Burgner D, Dahdah N, Hoang LT, Khor CC, Salgado A, Tremoulet AH, Davila S, Kuijpers TW, Hibberd ML, Johnson TA, Takahashi A, Tsunoda T, Kubo M, Tanaka T, Onouchi Y, Yeung RS, Coin LJ, Levin M, Burns JC. Genetic variation in the SLC8A1 calcium signaling pathway is associated with susceptibility to Kawasaki disease and aneurysm formation. *Circ Cardiovasc Genet*. 2016 Dec;9(6):559-568.
- Simpson KE, Pruitt E, Kirklin JK, Naftel DC, Singh RK, Edens RE, Barnes AP, Canter CE. Fontan patient survival after pediatric heart transplantation has improved in the current era. *Ann Thorac Surg*. 2017 Apr;103(4):1315-1320.
- Singh RK, Humlicek T, Jeewa A, Fester K. Pediatric Cardiac Intensive Care Society 2014 Consensus Statement: Pharmacotherapies in Cardiac Critical Care Immune Therapy. *Pediatr Crit Care Med*. 2016 Mar;17(3 Suppl 1):S69-76.
- Singh RK, Yeh JC, Price JF. Diagnosis and Treatment Strategies for Children with Myocarditis. *Progress in Pediatric Cardiology*, Volume 43, 2016, Pages 23-30.
- Stein ML, Dao DT, Doan LN, Reinhartz O, Maeda K, Hollander SA, Yeh J, Kaufman BD, Almond CS, Rosenthal DN. Ventricular assist devices in a contemporary pediatric cohort: morbidity, functional recovery, and survival. *The Journal of Heart and Lung Transplantation*, Volume 35, 2016, Pages 92-98.
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- Williams MR, Atkinson DB, Bezzerides VJ, Koichi Y, Franklin K, Casta A, Alexander ME. Pausing with the Gauze: Inhibition of Temporary Pacemaker by Radiofrequency Scan During Cardiac Surgery. *Anesth Analg*. 2016 Nov;123(5):1143-1148.