

Division Photo



Left to Right: First Row: T. Kimball, J. James, J. Cnota, L. Cripe, T. Kulik, C. Krawczeski, K. Hor, H. Ippisch, E. Urbina, W. Border, K. Uzark, S. Kirk, R. Hirsch

Left to Right: Second Row: T. Knilans, R. Spicer, B. Gottliebson, R. Hinton, E. Michelfelder, J. Morrison

Division Data Summary

Research and Training Details

Number of Faculty	23
Number of Joint Appointment Faculty	1
Number of Research Fellows	1
Number of Research Students	2
Number of Support Personnel	77
Direct Annual Grant Support	\$3,209,755
Direct Annual Industry Support	\$56,064
Peer Reviewed Publications	44

Clinical Activities and Training

Number of Clinical Staff	1
Number of Clinical Fellows	10
Inpatient Encounters	1,999
Outpatient Encounters	10,878

Faculty Members

Thomas Kulik, MD, Professor ; *Director, Division of Cardiology*

Research Interests: Pulmonary Hypertension

Robert Beekman, MD, Professor

Research Interests: Cardiac Catheterization & Intervention, Quality Improvement, Coarctation of the Aorta

D. Woodrow Benson, MD, PhD, Professor ; *Co-Director Fellowship Program; Director, Cardiovascular Genetics*

Research Interests: Cardiovascular Genetics

William Border, MD, Assistant Professor Clinical

Research Interests: Diastolic Function and Exercise Performance in Single Ventricle Patients.

Randal Claytor, PhD, Adjunct Associate Professor

James F. Cnota, MD, Associate Professor Clinical

Research Interests: Fetal Cardiology

Linda H. Cripe, MD, Associate Professor Clinical

Research Interests: Cardiomyopathies, Neuromuscular Disorders, Echocardiography

William Gottliebson, MD, Assistant Professor Clinical ; *Director, MRI Cardiology*

Research Interests: Cardiac MRI techniques to evaluate myocardial function, synchrony, and energetics.

Robert B. Hinton, MD, Assistant Professor

Research Interests: Cardiovascular Genetics & Developmental Biology

Russel Hirsch, MD, Associate Professor Clinical ; *Director, Cardiac Catheterization Lab*

Research Interests: Cardiac Catheterization & Intervention, Device Development

Kan Hor, MD, Assistant Professor Clinical

Research Interests: MRI technology to diagnose and follow heart disease, in particular DMD cardiomyopathy.

Holly M. Ippisch, MD, Instructor Clinical

Research Interests: Echocardiography, preventative cardiology and pediatric obesity.

Thomas R. Kimball, MD, Professor ; *Director, Cardiac Ultrasound; Director, Cardiovascular Imaging Core Research Lab*

Research Interests: Echocardiography, Ventricular function, Cardiovascular Effects of Obesity and Type II Diabetes.

Shelley Kirk, PhD, Assistant Professor Clinical

Research Interests: The efficacy, safety and feasibility of interventions for the management of pediatric obesity.

Timothy Knilans, MD, Associate Professor Clinical ; *Director, Electrophysiology & Pacing*

Research Interests: Identification and risk stratification of causes of sudden death.

Catherine Krawczeski, MD, Associate Professor Clinical ; *Director, CICU*

Research Interests: The effects of cardiopulmonary bypass and postoperative physiology on extra-cardiac organ systems in the pediatric cardiac surgical patient.

Angela Lorts, MD, Assistant Professor Clinical

Research Interests: Heart failure and myocardial remodeling

Bradley S. Marino, MD, Associate Professor

Research Interests: Outcomes Research

Richard A. Meyer, MD, Adjunct Professor

Research Interests: Adult Congenital Heart Disease and Marfan/EDS

Erik Michelfelder, MD, Associate Professor Clinical ; *Director, Fetal Cardiology*

Research Interests: Fetal Cardiology and Echocardiography

Robert Spicer, MD, Professor Clinical ; *Co-Director Fellowship Program; Medical Director, Cardiac Transplantation Program*

Research Interests: Heart Failure Transplant

Elaine Urbina, MD, Associate Professor

Research Interests: Relating non-invasive vascular measures of carotid ultrasound, arterial stiffness and endothelial function to conditions such as CV risk factors, obesity, diabetes, renal disease and sleep disorders.

Karen Uzark, PhD, Associate Professor Clinical ; *Director, Cardiac Process Improvement & Clinical Effectiveness*

Research Interests: Heart Transplant, Quality of Life, Outcomes in Children with Heart Disease

Joint Appointment Faculty Members

Jeanne James, MD, Research Associate Professor

Molecular Cardiovascular Biology

Molecular cardiology and animal models of cardiac disease.

Clinical Staff Members

- Lisa Lee, MD

Trainees

- **Jeff Anderson, MD**, PL6, UNC Hospital, Chapel Hill, NC
- **Allison Divanovic, MD**, PL6, Cincinnati Children's Hospital/University of Cincinnati
- **Haleh Heydarian, MD**, PL6, Columbus Children's, Columbus, OH
- **Michael Alice Moga, MD**, PL6, Massachusetts General Hospital, Boston, MA
- **Priya Sekar, MD**, PL6, Children's Hospital, Oakland, CA
- **Jamie Sutherland, MD**, PL6, Washington University/St. Louis Children's, MO
- **John Hambrook, MD**, PL5, Eastern Virginia Medical School, Norfolk, VA
- **David Crowley, MD**, PL4, Barbara Bush Children's Hospital, Portland, ME
- **Sean Hagenbuch, MD**, PL4, Baystate Medical Center, Springfield, MA
- **Steven Kindel, MD**, PL4, Children's Memorial Hospital, Chicago, IL

Significant Accomplishments in FY08

The Hybrid Cardiac Catheterization Suite at Cincinnati Children's Hospital Heart Institute.

Since the inception of the hybrid catheterization suite at Cincinnati Children's Hospital in February of 2007, 45 hybrid procedures have been completed successfully. These procedures have involved either the simultaneous use of both catheterization and surgery, or staged use, with surgery following on the catheterization procedure, or vice-versa. During the same period, 18 combination procedures, involving cardiac catheterization and an additional, non-cardiac surgery related procedures (such as bronchoscopy, etc.) have also been completed. Those procedures, in effect, have saved the risk of transporting infants or children to other sites in the hospital while under anesthetic, and in many cases, have saved patients undergoing additional general anesthetic procedures.

Highlights of the hybrid catheterization program at the Heart Institute have included the following:

Care of newborn infants with ante-natal diagnosis of congenital heart disease incompatible with sustained life after birth. On three separate occasions, Cesarean delivery was performed in one hybrid catheterization room, allowing immediate transfer to the other hybrid room where neonatal intervention could take place successfully.

Staged atrial septal defect closure. In those patients in whom the atrial level defect was deemed to be difficult to close percutaneously, and in fact was unsuccessful after multiple attempts, the cardio-thoracic surgery team performed immediate surgery to repair the defect. This family centered approach decreases the risk to the patient, precludes the need to undergo another general anesthetic, and greatly increases family convenience. No other center in the United States offer this service to families.

Neonatal hybrid interventions. The hybrid catheterization facility has allowed the Heart Institute to perform neonatal interventions which have combined both the diagnostic and therapeutic elements in the same setting for the highest risk patients. On seven occasions, neonates have had combined procedures, avoiding multiple staged procedures and transportation that would have been previously necessary. Three of those procedures involved cardio-pulmonary bypass, and one, extra-corporeal membrane oxygenation support.

Pacemaker and Automatic Internal Cardiac Defibrillator Placement: The hybrid catheterization suite has become the main location for surgical placement of these devices.

General diagnostic and interventional catheterization. For the academic year ending July 2007, 496 total cath lab procedures were completed with a procedural mortality of less than 1%. This is well below accepted national standards for catheterization associated mortality.

Local and international exposure of the hybrid catheterization suite has been as follows:

Pediatric Interventional Cardiac Catheterization Symposium (PICCS). In July of 2008, the hybrid suite was featured with three satellite transmissions of live cases to that symposium. The audience was an international body of more than two-hundred and fifty interventional pediatric cardiologists from around the world.

Channel 5 News Broadcast. A local broadcast featuring two children who have recently undergone successful procedures in the hybrid suite. One of those cases involved Cesarean delivery and immediate neonatal intervention as described above.

Publications: Two publications, one of which describes the planning, design prerogatives and the functionality of the hybrid catheterization suite, and the other the utility of the facility for immediate neonatal interventions, have been published in one of the major peer-reviewed interventional catheterization journals.

Quality of Life Assessment in the Pediatric Cardiac Population:

Primary Investigator: Bradley S. Marino, MD, MPP, MSCE

Co-investigators: Dennis Drotar, PhD, Richard Ittenbach, PhD, Peter Margolis, MD, PhD, Michael Seid, PhD, Robert Beekman, MD

Congenital heart disease (CHD) is the most common defect in children. Over the last several decades, new surgical techniques and advances in cardiopulmonary bypass (CPB), intensive care, cardiac catheterization, heart transplantation, imaging modalities, and medical therapies have improved survival and prolonged the lives of children and adolescents with CHD. Operative mortality for children with the most complex CHD is now less than 10%. This has changed the focus of clinical research on the pediatric cardiac population from short-term surgical survival to the assessment of short- and long-term morbidity. The hemodynamic effects of the specific heart defect and the medical and surgical therapy received by the child can result in significant morbidity. The child's neurodevelopmental, psychosocial, and physical functioning are impacted by these morbidities and may adversely affect the child's quality of life (QOL).

Quality of life refers to the impact of a specific illness or medical therapy on the ability of the child to function in situational contexts (e.g., family, school, peers) and to draw personal satisfaction from a physical, psychological, and social functioning perspective. In the past, quantitative assessment of QOL in the pediatric cardiac population has been limited due to the wide age range of children, varying and developing neurodevelopmental and psychosocial capabilities, the variety of underlying disease processes and treatment modalities, and the spectrum of outcomes. Disease specific QOL instruments are more comprehensive for a specific disease, more sensitive to change in condition over time and a better discriminator of differences in subgroups within a disease category. Existing disease-specific pediatric cardiac instruments were limited by lack of patient and parent reporting, narrow age range, inadequate generalizability data, and poor discrimination between subgroups in the pediatric cardiac population.

To address the limitations, our research team developed the Pediatric Cardiac Quality of Life Inventory (PCQLI) in 2004. The PCQLI is a self-administered, reliable and valid, disease-specific questionnaire that quantitatively assesses health-related QOL in children (age 8-12) and adolescents (age 13-18) with congenital and acquired heart disease. Over the last four years, this tool has undergone extensive reliability, validity, and generalizability testing in a multi-center, multi-national testing trial at 11 centers in the United States and 3 centers in the United Kingdom. To date, over 1,500 patients and their parents (>3,000 respondents) have participated in this study. This study is currently funded by an NICHD K23 award (PI: Brad Marino, MD) and by a local CCHRF grant award.

Data from the PCQLI Testing Trial has shown that higher disease complexity is associated with lower QOL score in the CHD population and that increasing medical care utilization is associated with a lower QOL. However, the analysis also showed that QOL score varied significantly within specific diagnostic sub-groups in the CHD population. Given the variability in QOL score, our team tested for demographic and medical predictors of QOL, and found that they account for only a small portion of the variability in QOL scores in these children. We hypothesize that neurodevelopmental, psychosocial, and physical functioning morbidity factors account for some of this unexplained variability in QOL score. Currently, we are conducting a study looking at how specific psychosocial morbidity factors (post-traumatic stress disorder symptomatology, trait anxiety, parental stress, and family functioning) mediate the association between CHD complexity and QOL score. In addition, we are initiating a study to assess the association between neurodevelopmental outcome (intelligence; academic achievement; neuropsychological functioning) and QOL. The overall, long term goal of our research team is to develop and test comprehensive biological (e.g. cardiovascular anatomic, hemodynamic, physical functioning, and surgical variables), neurodevelopmental, and psychosocial models that will reveal modifiable predictors of lower QOL in children with CHD, and to create new early opportunities for prevention and intervention to improve QOL for children and their families.

Significant Publications in FY08

Hinton RB, Jr., Martin LJ, Tabangin ME, Mazwi ML, Cripe LH, Benson DW. Hypoplastic left heart syndrome is heritable. *J Am Coll Cardiol.* 2007 Oct 16;50(16):1590-5.

This study demonstrated that HLHS is due almost entirely to genetic factors and is a severe form of valve malformation.

Michelfelder E, Gottliebson W, Border W, Kinsel M, Polzin W, Livingston J, et al. Early manifestations and spectrum of recipient twin cardiomyopathy in twin-twin transfusion syndrome: relation to Quintero stage.

Ultrasound Obstet Gynecol. 2007 Dec;30(7):965-71.

In this study, detailed fetal echocardiography revealed that significant fetal cardiovascular abnormalities can be present, even in the early stages of twin-twin transfusion syndrome. This data underscores the importance of cardiovascular pathophysiology in the natural history of twin-twin transfusion syndrome, and suggests an important role for fetal echocardiography in the diagnosis and serial evaluation of twin gestations complicated by twin-twin transfusion.

Marino BS, Shera D, Wernovsky G, Tomlinson RS, Aguirre A, Gallagher M, et al. The development of the pediatric cardiac quality of life inventory: a quality of life measure for children and adolescents with heart disease. *Qual Life Res.* 2008 Mar 18.

This manuscript described the development of the Pediatric Cardiac Quality of Life Inventory (PCQLI), a new disease specific quality of life (QOL) measure that quantitatively assesses QOL in children and adolescents with congenital and acquired heart disease. The questionnaire has a Child Form (Age 8-12 years) and an Adolescent Form (Age 13-18 years) with parent proxy reporting.

Urbina EM, Bean JA, Daniels SR, D'Alessio D, Dolan LM. Overweight and Hyperinsulinemia Provide Individual Contributions to Compromises in Brachial Artery Distensibility in Healthy Adolescents and Young Adults: Brachial Distensibility in Children. *J Am Soc Hypertens.* 2007 Jun;1(3):200-7.

In this paper, we explored the effect of obesity and insulin resistance on arterial stiffness in a healthy school aged cohort. We found that overweight led to a reduction in brachial artery distensibility which was further compromised by the addition of hyperinsulinemia. Therefore, development of obesity and pre-diabetes leads to vascular dysfunction well before the onset of overt type 2 diabetes.

Division Publications

1. Beekman RH, 3rd. [Most patients with a moderate ventricular septal defect will not require intervention](#) . *J Pediatr.* 2007; 151: 554-5.
2. Gruenstein DH, Beekman RH, 3rd, Spicer RL. [Ductal stent and cavo-atrial sac occlusion in an adult with profound cyanosis after palliated cyanotic congenital heart disease](#) . *J Invasive Cardiol.* 2008; 20: E41-3.
3. American Academy of Pediatrics Committee on Pediatric Emergency Medicine, American Academy of Pediatrics Section on Cardiology and Cardiac Surgery, Markenson D, Beekman RH, 3rd. [Ventricular fibrillation and the use of automated external defibrillators on children](#) . *Pediatrics.* 2007; 120: 1159-61.
4. Benson DW, Benson TH. (2008) [Stimulant medications in children and adolescents: A big problem for little people](#) . Dallas, TX, American Heart Association.
5. Beery TA, Shoener KA, Benson DW. [Neonatal long QT syndrome due to a de novo dominant negative hERG mutation](#) . *Am J Crit Care.* 2007; 16: 416, 412-5.
6. Rajagopal SK, Ma Q, Obler D, Shen J, Manichaikul A, Tomita-Mitchell A, Boardman K, Briggs C, Garg V, Srivastava D, Goldmuntz E, Broman KW, Benson DW, Smoot LB, Pu WT. [Spectrum of heart disease associated with murine and human GATA4 mutation](#) . *J Mol Cell Cardiol.* 2007; 43: 677-85.
7. Lehnart SE, Ackerman MJ, Benson DW, Jr., Brugada R, Clancy CE, Donahue JK, George AL, Jr., Grant AO, Groft SC, January CT, Lathrop DA, Lederer WJ, Makielski JC, Mohler PJ, Moss A, Nerbonne JM, Olson TM, Przywara DA, Towbin JA, Wang LH, Marks AR. [Inherited arrhythmias: a National Heart, Lung, and Blood Institute and Office of Rare Diseases workshop consensus report about the diagnosis, phenotyping, molecular mechanisms, and therapeutic approaches for primary cardiomyopathies of gene mutations affecting ion channel function](#) . *Circulation.* 2007; 116: 2325-45.
8. Markham LW, Kinnett K, Wong BL, Woodrow Benson D, Cripe LH. [Corticosteroid treatment retards development of ventricular dysfunction in Duchenne muscular dystrophy](#) . *Neuromuscul Disord.* 2008; 18: 365-70.
9. Cook AL, Cnota JF. [Fetal echocardiographic imaging of ventricular noncompaction](#) . *Cardiol Young.* 2008; 18: 351-2.
10. Tangren CM, Cripe L, Beekman RH, 3rd, Wilson K, Inge TH. [The combined effects of balloon valvuloplasty and surgical weight loss in treatment of aortic stenosis](#) . *J Pediatr Surg.* 2007; 42: 1443-5.
11. Sutherell J, Zarate Y, Tinkle BT, Markham LW, Cripe LH, Hyland JC, Witte D, Hopkin RJ, Hinton RB. [Novel fibrillin 1 mutation in a case of neonatal Marfan syndrome: the increasing importance of early recognition](#) . *Congenit Heart Dis.* 2007; 2: 342-6.
12. Portilla D, Dent C, Sugaya T, Nagothu KK, Kundi I, Moore P, Noiri E, Devarajan P. [Liver fatty acid-binding protein as a biomarker of acute kidney injury after cardiac surgery](#) . *Kidney Int.* 2008; 73: 465-72.
13. Bennett M, Dent CL, Ma Q, Dastrala S, Grenier F, Workman R, Syed H, Ali S, Barasch J, Devarajan P. [Urine NGAL](#)

- [predicts severity of acute kidney injury after cardiac surgery: a prospective study](#) . *Clin J Am Soc Nephrol*. 2008; 3: 665-73.
14. Dent CL, Ma Q, Dastrala S, Bennett M, Mitsnefes MM, Barasch J, Devarajan P. [Plasma neutrophil gelatinase-associated lipocalin predicts acute kidney injury, morbidity and mortality after pediatric cardiac surgery: a prospective uncontrolled cohort study](#) . *Crit Care*. 2007; 11: R127.
 15. Giuliano JS, Jr., Sekar P, Dent CL, Border WL, Hirsch R, Manning PB, Wheeler DS. [Unilateral pulmonary edema and acute rheumatic fever](#) . *Eur J Pediatr*. 2008; 167: 465-7.
 16. Han WK, Waikar SS, Johnson A, Betensky RA, Dent CL, Devarajan P, Bonventre JV. [Urinary biomarkers in the early diagnosis of acute kidney injury](#) . *Kidney Int*. 2008; 73: 863-9.
 17. Wheeler DS, Dent CL, Manning PB, Nelson DP. [Factors prolonging length of stay in the cardiac intensive care unit following the arterial switch operation](#) . *Cardiol Young*. 2008; 18: 41-50.
 18. Hinton RB, Jr.. [The family history: reemergence of an established tool](#) . *Crit Care Nurs Clin North Am*. 2008; 20: 149-58, v.
 19. Hinton RB, Jr., Alfieri CM, Witt SA, Glascock BJ, Khoury PR, Benson DW, Yutzey KE. [Mouse heart valve structure and function: echocardiographic and morphometric analyses from the fetus through the aged adult](#) . *Am J Physiol Heart Circ Physiol*. 2008; 294: H2480-8.
 20. Hinton RB, Jr., Martin LJ, Tabangin ME, Mazwi ML, Cripe LH, Benson DW. [Hypoplastic left heart syndrome is heritable](#) . *J Am Coll Cardiol*. 2007; 50: 1590-5.
 21. Hirsch R. [The hybrid cardiac catheterization laboratory for congenital heart disease: From conception to completion](#) . *Catheter Cardiovasc Interv*. 2008; 71: 418-28.
 22. Hirsch R, Dent C, Pfriem H, Allen J, Beekman RH, 3rd, Ma Q, Dastrala S, Bennett M, Mitsnefes M, Devarajan P. [NGAL is an early predictive biomarker of contrast-induced nephropathy in children](#) . *Pediatr Nephrol*. 2007; 22: 2089-95.
 23. Hao M, Ippisch HM, Cook RS, Perry DJ, Gottliebson WM, Hirsch R, Kimball TR. [Implementation of an objective testing system in noninvasive cardiac imaging for evaluation of pediatric cardiology fellows](#) . *J Am Soc Echocardiogr*. 2007; 20: 1211-8.
 24. Ippisch HM, Inge TH, Daniels SR, Wang B, Khoury PR, Witt SA, Glascock BJ, Garcia VF, Kimball TR. [Reversibility of cardiac abnormalities in morbidly obese adolescents](#) . *J Am Coll Cardiol*. 2008; 51: 1342-8.
 25. Pattison JS, Waggoner JR, James J, Martin L, Gulick J, Osinska H, Klevitsky R, Kranias EG, Robbins J. [Phospholamban overexpression in transgenic rabbits](#) . *Transgenic Res*. 2008; 17: 157-70.
 26. Amin R, Somers VK, McConnell K, Willging P, Myer C, Sherman M, McPhail G, Morgenthal A, Fenchel M, Bean J, Kimball T, Daniels S. [Activity-adjusted 24-hour ambulatory blood pressure and cardiac remodeling in children with sleep disordered breathing](#) . *Hypertension*. 2008; 51: 84-91.
 27. Bigham MT, Brady PW, Manning PB, Jacobs BR, Kimball TR, Wong HR. [Therapeutic application of intrapericardial tissue plasminogen activator in a 4-month-old child with complex fibropurulent pericarditis](#) . *Pediatr Crit Care Med*. 2008; 9: e1-4.
 28. Weaver DJ, Jr., Kimball TR, Knilans T, Mays W, Knecht SK, Gerdes YM, Witt S, Glascock BJ, Kartal J, Khoury P, Mitsnefes MM. [Decreased maximal aerobic capacity in pediatric chronic kidney disease](#) . *J Am Soc Nephrol*. 2008; 19: 624-30.
 29. Wisler J, Khoury PR, Kimball TR. [The effect of left ventricular size on right ventricular hemodynamics in pediatric survivors with hypoplastic left heart syndrome](#) . *J Am Soc Echocardiogr*. 2008; 21: 464-9.
 30. Surawicz B, Knilans TK, Chou T-C. [Chou's electrocardiography in clinical practice : adult and pediatric](#) . Philadelphia, PA; Saunders/Elsevier
 31. Knecht SK, Mays WA, Gerdes YM, Claytor RP, Knilans TK. [Exercise evaluation of upper- versus lower-extremity blood pressure gradients in pediatric and young-adult participants](#) . *Pediatr Exerc Sci*. 2007; 19: 344-8.
 32. Kanter RJ, Knilans TK. ["Specific arrhythmias in the young."](#) In: V Fuster, ed. *Hurst's the heart*. New York: McGraw-Hill Medical Publishing Division; 2007: 1130-1133.
 33. Ballweg JA, Dominguez TE, Ravishankar C, Kreutzer J, Marino BS, Bird GL, Gruber PJ, Wernovsky G, Gaynor JW, Nicolson SC, Spray TL, Tabbutt S. [A contemporary comparison of the effect of shunt type in hypoplastic left heart syndrome on the hemodynamics and outcome at stage 2 reconstruction](#) . *J Thorac Cardiovasc Surg*. 2007; 134: 297-303.
 34. Brothers JA, McBride MG, Seliem MA, Marino BS, Tomlinson RS, Pampaloni MH, Gaynor JW, Spray TL, Paridon SM. [Evaluation of myocardial ischemia after surgical repair of anomalous aortic origin of a coronary artery in a series of pediatric patients](#) . *J Am Coll Cardiol*. 2007; 50: 2078-82.
 35. Dorfman AT, Marino BS, Wernovsky G, Tabbutt S, Ravishankar C, Godinez RI, Priestley M, Dodds KM, Rychik

- J, Gruber PJ, Gaynor JW, Levy RJ, Nicolson SC, Montenegro LM, Spray TL, Dominguez TE. [Critical heart disease in the neonate: presentation and outcome at a tertiary care center](#). *Pediatr Crit Care Med*. 2008; 9: 193-202.
36. Marino BS, Pasquali SK, Wernovsky G, Pudusseri A, Rychik J, Montenegro L, Shera D, Spray TL, Cohen MS. [Accuracy of intraoperative transesophageal echocardiography in the prediction of future neo-aortic valve function after the Ross procedure in children and young adults](#). *Congenit Heart Dis*. 2008; 3: 39-46.
37. Pasquali SK, Marino BS, Kaltman JR, Schissler AJ, Wernovsky G, Cohen MS, Spray TL, Tanel RE. [Rhythm and conduction disturbances at midterm follow-up after the Ross procedure in infants, children, and young adults](#). *Ann Thorac Surg*. 2008; 85: 2072-8.
38. Pasquali SK, Marino BS, McBride MG, Wernovsky G, Paridon SM. [Coronary artery pattern and age impact exercise performance late after the arterial switch operation](#). *J Thorac Cardiovasc Surg*. 2007; 134: 1207-12.
39. Pinto NM, Marino BS, Wernovsky G, de Ferranti SD, Walsh AZ, Laronde M, Hyland K, Dunn SO, Jr., Cohen MS. [Obesity is a common comorbidity in children with congenital and acquired heart disease](#). *Pediatrics*. 2007; 120: e1157-64.
40. Wernovsky G, Kuijpers M, Van Rossem MC, Marino BS, Ravishankar C, Dominguez T, Godinez RI, Dodds KM, Ittenbach RF, Nicolson SC, Bird GL, Gaynor JW, Spray TL, Tabbutt S. [Postoperative course in the cardiac intensive care unit following the first stage of Norwood reconstruction](#). *Cardiol Young*. 2007; 17: 652-65.
41. Michelfelder E, Gottliebson W, Border W, Kinsel M, Polzin W, Livingston J, Khoury P, Crombleholme T. [Early manifestations and spectrum of recipient twin cardiomyopathy in twin-twin transfusion syndrome: relation to Quintero stage](#). *Ultrasound Obstet Gynecol*. 2007; 30: 965-71.
42. Uzark K, Jones K, Slusher J, Limbers CA, Burwinkle TM, Varni JW. [Quality of life in children with heart disease as perceived by children and parents](#). *Pediatrics*. 2008; 121: e1060-7.
43. Vetter VL, Elia J, Erickson C, Berger S, Blum N, Uzark K, Webb CL. [Cardiovascular monitoring of children and adolescents with heart disease receiving stimulant drugs: a scientific statement from the American Heart Association Council on Cardiovascular Disease in the Young Congenital Cardiac Defects Committee and the Council on Cardiovascular Nursing](#). *Circulation*. 2008; 117: 2407-23.
44. Ware SM, Quinn ME, Ballard ET, Miller E, Uzark K, Spicer RL. [Pediatric restrictive cardiomyopathy associated with a mutation in beta-myosin heavy chain](#). *Clin Genet*. 2008; 73: 165-70.

Grants, Contracts, and Industry Agreements

Grant and Contract Awards

Annual Direct / Project Period Direct

Benson, W

SCCOR in Pediatric Heart Development and Disease

National Institutes of Health

P50 HL 074728	02/15/04 - 01/31/09	\$1,825,143 / \$9,680,187
Benson, W	Project 1	438,949
Yutzey, K	Project 3	223,782
Robbins, J	Project 4	342,085
Benson, W	Core A	533,778
Kimball, T	Core B	282,955

Genetic Mechanisms of Cardiac Disease in the Young

National Institutes of Health

K24 HL 069712	06/01/06 - 05/31/11	\$161,893 / \$808,223
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Preoperative Therapy for Prevention of Postoperative Low Cardiac Output Syndrome

National Institutes of Health

U01 HL 085057	09/04/06 - 08/31/11	\$194,200 / \$1,000,000
Benson W	Trial of Beta Block Therapy vs Angiotensin II Receptor Blocker Therapy in Individuals with Marfan Syndrome	45,833
Border, W	Infant Single Ventricle Trial	46,016

Krawczeski, C	Single Ventricle Reconstruction Extension Study	25,703
Krawczeski, C	Single Ventricle Reconstruction Extension Study II	1,016

Hinton, R
Genetic and Developmental Basis of Pediatric Aortic Valve Disease Pathogenesis

National Institutes of Health

K23 HL 085122

08/03/06 - 04/30/11

\$122,886 / \$614,420

Khoury, P
Influence of Pregnancy on Risk Factors for CVD and Type 2 Diabetes

National Institutes of Health (Kaiser Foundation Research Institute)

K01 DK 059944

09/01/06 - 02/29/08

\$7,177 / \$7,177

Kimball, T
Chronic Renal Insufficiency in NAPRTCS Patients

National Institutes of Health (Children's Mercy Hospital-Kansas City)

U01 DK 066143

08/01/04 - 07/31/08

\$55,222 / \$107,898

CV Disease In Adolescents With Type 2 Diabetes

National Institutes of Health

R01 HL 076269

06/01/05 - 05/31/09

\$452,847 / \$1,920,386

Lipscomb, K
Regulation of EVC and LBN (EVC2) in Heart Development and Disease

American Heart Association - Ohio

0615186B

07/01/06 - 06/30/08

\$21,000 / \$42,000

Marino, B
Testing the Pediatric Cardiac Quality of Life Inventory

National Institutes of Health

K23 HD 048637

07/01/07 - 12/31/09

\$148,400 / \$469,205

Moga, M
Ventricular Myosin Isoforms - Pressure Overloaded Heart

American Academy of Pediatrics

07/01/07 - 06/30/08

\$35,000 / \$35,000

Schmidt, M
CALERIE Phase II Study

National Institutes of Health (Duke University)

U01 AG 022132

09/01/06 - 08/31/09

\$42,020 / \$122,554

Urbina, E
Vascular Dysfunction In Obesity And Metabolic Syndrome

National Institutes of Health

K23 HL 080447

06/01/06 - 05/31/11

\$124,883 / \$613,894

Modifying Dietary Behavior in Adolescents with Elevated Blood Pressure

National Institutes of Health (University of Cincinnati)

R01 HL 088567

02/01/08 - 01/31/13

\$19,084 / \$196,867

Current Year Direct
\$3,209,755

Industry Contracts
Cripe, L

MedImmune Inc.

\$ 35,779

Krawczeski, C

Asklepion Pharmaceuticals, LLC

\$ 8,936

Urbina, E

Sankyo Pharma Inc.

\$ 11,349

Current Year Direct Receipts

\$56,064

Total \$3,265,819
