THE STRENGTH IT TAKES

IU Health Cardiovascular

2012 Medical Outcomes Report
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Indiana University Health has been recognized in the top one percent of U.S. hospitals according to U.S. News & World Report’s prestigious 2013-14 National Honor Roll

U.S. News & World Report’s Top 50 Adult Cardiology & Heart Surgery Program: Indiana’s only nationally ranked cardiovascular program

U.S. News & World Report’s Top 50 Pediatric Cardiology & Heart Surgery Program: Indiana’s only nationally ranked cardiovascular program
A Commitment to Quality Outcomes

Indiana University Health Cardiovascular is pleased to provide this summary of key 2012 program highlights, including some of the patients impacted by them. IU Health hospitals and physicians have been leaders in cardiovascular care and innovation for over six decades, and remain committed to providing the most comprehensive cardiovascular care and the highest quality outcomes.

IU Health Cardiovascular is dedicated to advancing evidence-based medicine, and to providing preeminent care and service throughout Indiana. Our scope and resources permit us to care for the most acute and complex diseases, and we have specialized programs for acute myocardial infarction, shock, complex arrhythmia ablation, complex heart valve disorders, sudden cardiac death, acute vascular disease and advanced heart failure. But we also provide care across the spectrum—from disease prevention to early detection and chronic disease management in partnership with our primary care and other specialty colleagues.

IU Health provides unparalleled collaboration across the state. Comprehensive forums for physicians, support staff and administrators are held to share clinical expertise, research and translation of best practices. Quarterly case reviews, database management and national benchmarking, along with patient-centered care enable optimum therapy for each patient.

IU Health physicians are affiliated with Indiana University School of Medicine and are nationally and internationally recognized for their work in research, education and treatments. Over 80 percent of top specialists in their areas work with IU Health. IU Health Cardiovascular is ranked as one of the top 50 cardiology and heart surgery programs in the country by U.S. News & World Report. IU Health is proud to have been named to the U.S. News & World Report’s prestigious Honor Roll. The Honor Roll represents the top one percent of hospitals nationwide across a broad spectrum of patient care. IU Health is proud to be ranked as one of the 17 hospitals selected nationally and the only hospital in Indiana to receive this honor.

In the pages that follow, we describe some of our key programs and initiatives. We hope you will recognize and appreciate IU Health’s commitment to patient care, research and education detailed throughout this report.

Sincerely,

Eric S. Williams, MD, FACC
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Indiana University School of Medicine
Program Director Cardiovascular,
Indiana University Health

Mary L. Baker, RN, MSN, MHA
Vice President
Service Line Executive Cardiovascular,
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Invasive Cardiology Program

Timely percutaneous coronary revascularization can be crucial in patients with acute coronary syndromes. Likewise, patients with congenital heart lesions or acquired heart valvular disease require the same attention to detail to determine and carry out optimal treatment strategies. With an annual volume of more than 2,800 diagnostic catheterizations and 1,100 percutaneous coronary interventions (PCIs), IU Health Cardiovascular offers the highest level of patient care found only in a comprehensive heart program.

While acute and elective PCIs are fundamental to our work, we also manage the most complex non-coronary cardiac interventions, including atrial septum defect, patent foramen ovale closures and heart valve interventions in select patients. We use today’s most advanced technologies and a skilled interdisciplinary team to provide patients with the greatest efficacy, safety and highest quality of life. For increased safety, IU Health Cardiovascular physicians use intracardiac ultrasound and optical coherence tomography (OCT), among other techniques, to guide their procedures.

Our high proportion of outpatient discharge for elective procedures is possible through judicious use of femoral access with closure devices, and the increasing utilization of transradial PCI, which reduces complications and helps patients return to normal activities faster. Approximately 24.4 percent of PCIs in 2012 were performed using transradial access at IU Health Methodist Hospital. This percentage is higher than the national average of approximately 15.3 percent. IU Health’s comprehensive PCI program is available in the Indianapolis area at:

- IU Health Methodist Hospital
- IU Health North Hospital
- IU Health West Hospital
- IU Health Saxony Hospital

2012 PCI COMPLICATIONS

![Data Source: 2012 Q4 CathPCI Executive Summary](image-url)
2012 ACUTE MYOCARDIAL INFARCTION (AMI)

Data Source: "ACTION Registry – GWTG Database

AMI ALL CAUSE 30-DAY READMISSION
07/01/09 – 06/30/12

AMI ALL CAUSE 30-DAY MORTALITY
07/01/09 – 06/30/12

Data Source: Hospital Compare
Benchmark Source: Hospital Compare
IU Health Methodist Hospital is never on diversion for cardiac emergencies. Since implementing the Level One Heart Attack Program in October 2008, IU Health Methodist Hospital has treated over 1,400 patients using a streamlined system that coordinates EMS professionals, emergency department physicians and nurses, and an expert interventional team for patients experiencing a heart attack. Treatment times for patients presenting to IU Health Methodist ER with ST-elevation MI are more than one-third faster than the 90-minute national standard recommended by the ACC/AHA. IU Health Methodist Hospital has been accredited as a Chest Pain Center with PCI since 2008.

Cardiogenic Shock Emergencies
Cardiogenic shock is a major complication that occurs most commonly following a heart attack and is associated with very high morbidity and mortality. The IU Health Cardiopulmonary Support Team has developed a hospital-wide interdisciplinary team consisting of cardiothoracic surgeons, interventionalists, heart failure cardiologists and critical care pulmonologists. One of the objectives of the team is to mobilize institutional resources for early identification and rapid treatment of patients in cardiogenic shock.

### CONDITIONS ASSOCIATED WITH CARDIOGENIC SHOCK
- Myocardial infarction
- Dilated cardiomyopathy
- Myocarditis
- Severe right/left heart failure
- Severe valve disease

### TREATMENT OPTIONS FOR PATIENTS IN CARDIOGENIC SHOCK
- Percutaneous left ventricular support
- Surgical left ventricular support
- Bridge to decision/recover
- Bridge to transplant
- Destination therapy
- ECMO for refractory cardiogenic shock
- Aggressive medical treatment

### ST-elevation MI DOOR TO BALLOON TIME FOR TRANSFER-IN PATIENTS

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<tr>
<td>2012</td>
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IU Health Methodist Hospital
ACTION Registry-GWTGs Database
US Hospitals 90th Percentile

All data points include 12 months of rolling data
Data Source: ACTION Registry-GWTGs Database National Reports
Level One Vascular Emergency Program

When Life and Limb are at Stake
IU Health Methodist Hospital implemented the Level One Vascular Emergency Program in August 2009. Since the initiation of this program, time from diagnosis to treatment has decreased by 16 percent. This program was, and is still today, the only one of its kind in the state of Indiana. The high mortality rate of vascular emergency patients underscores the importance of timely treatment and intervention. Speed is the key in the preparation and treatment of vascular emergencies.

Our program has an integrated treatment approach with EMS, referring facilities, cardiothoracic and vascular surgeons and multiple departments and staff within IU Health Methodist. This collaboration reduces treatment delays and provides evidence-based therapies to all our cardiac and vascular patients. Our imaging technology enables the quick transfer of CT scan images via our secure Internet delivery system to plan treatment decisions prior to patient arrival.

The Level One Vascular Program is designed as a “one-call-does-it-all” system. By activating the system, the referring facility is assisted with the following:

- Access to the IU Health Transfer Center nurse liaison, who remains dedicated to the referring facility and IU Health Methodist treatment teams throughout the transfer process;
- Assistance with the most appropriate, closest ALS transportation, either by air or ground, to IU Health Methodist in Indianapolis;
- Connection to the appropriate surgeon and comprehensive treatment team within minutes;
- Facilitation of physician-to-physician communication and nursing report;
- Guaranteed bed placement for the patient.

The development of this program has created the opportunity to evaluate our treatment algorithms and processes in order to improve outcomes, quality and effectiveness. As a result, more than 80 referring facilities throughout Indiana, Kentucky and Illinois have utilized this process.

The Level One Vascular Emergency Program at IU Health Methodist Hospital is never on diversion for these critically ill patients.

Our Level One Vascular Emergency Program is equipped to handle every vascular emergency, including:

- Ascending thoracic aortic dissections/aneurysms
- Descending thoracic aortic dissections/aneurysms
- Abdominal aortic aneurysms (ruptured and symptomatic)
- Acute limb ischemia

INTEGRATED VASCULAR
Pulmonary embolism (PE) is a common medical condition, with an incidence of 23 – 69 new cases per 100,000 persons per year. PE is believed to be the third most common cause of death among hospitalized patients, and with an aging population, the number of people with PE is expected to increase. PE is traditionally treated in the hospital, utilizing antiquated treatment regimens. The IU Health Integrated Vascular service line has evaluated evidence suggesting the patient quality of life is substantially improved with a new paradigm of endovascular management consisting of catheter directed mechanical and pharmacological treatment combinations. For acute/critical scenarios, a level one program has been created to mirror this same service.
Level One Shock Emergency Program

WHEN LIFE AND LUNGS ARE AT STAKE
IU Health Methodist Hospital has the only Level One Shock Program of its kind in the state of Indiana. The high mortality of emergent shock patients underscores the importance of timely treatment and intervention. Speed is the key in the preparation and treatment of shock emergencies.

Our program has an integrated treatment approach with EMS, referring facilities, cardiothoracic transplant surgeons, pulmonologists and multiple departments and staff within IU Health Methodist. This collaboration reduces treatment delays and provides evidence-based therapies to all our shock patients.

The Level One Shock Emergency Program at Indiana University Health Methodist Hospital is never on diversion for these critically ill patients. We are equipped to handle every emergency, including:

- Profound hypoxemia despite exhaustion of lung rescue measures
- Cardiogenic shock with inability to oxygenate secondary to potentially reversible cardiovascular insult
- Potentially reversible lung insult
- Clinical condition consistent with ARDS

Key factors for recovery with the Level One Shock Emergency Program include:

- Duration of lung insult less than seven days
- Absence of acute non-reversible multi-organ failure

Our Level One Shock Emergency Program is designed as a “one-call-does-it-all” system. By activating the system, the referring facility is assisted with the following:

- Access to the IU Health Transfer Center nurse liaison, who remains dedicated to the referring facility and IU Health Methodist treatment teams throughout the transfer process;
- Assistance with the most appropriate, closest Advanced Life Support (ALS) transportation, either by air or ground, to IU Health Methodist in Indianapolis;
- Connection to the appropriate surgeon and comprehensive treatment team within minutes;
- Facilitation of physician-to-physician communication and nursing report;
- Guaranteed bed placement for the patient.

The development of this program has created the opportunity to evaluate our treatment algorithms and processes in order to improve outcomes, quality and effectiveness. As a result, more than 80 referring facilities throughout Indiana, Kentucky and Illinois that utilize our other emergency programs now have access to this important therapy.
Percutaneous Vascular Therapy Program: When Life and Limb are at Stake

IU Health’s integrated vascular team encompasses specialists in vascular surgery, interventional cardiology, interventional radiology and cardiovascular surgery working together to determine the optimal approach to this often underdiagnosed illness. Although vascular disease affects approximately 10 million people nationally, the majority of individuals do not experience any symptoms. With access to a full range of diagnostic techniques, IU Health partners with our referring physicians to offer free and low-cost patient and community screenings for appropriate patients.

IU Health’s integrated vascular team performs more than 1,300 interventional/surgical procedures each year. With a combination of management approaches and technologies, IU Health’s team treats the full range of vascular disease, from claudication to limb salvage and stroke. Cutting-edge research and therapies allow our team to successfully treat patients who have often undergone one or more procedures elsewhere. This unique collaboration with referring physicians results in improved quality of life for complex patients.

**RISK FACTORS FOR VASCULAR DISEASE INCLUDE:**
- Age 50 or over
- Hypertension
- Smoking
- Obesity
- Diabetes
- Hypercholesterolemia
- Physical inactivity

**TREATMENT OPTIONS AT IU HEALTH INCLUDE:**
- Comprehensive diagnostic services
- Catheter-based therapies, stenting and angioplasty
- Upper and lower extremity bypass procedures
- Percutaneous endovascular procedures
- Medical management

**RISK FACTORS FOR STROKE INCLUDE:**
- Age 50 or over
- Prior history of stroke or heart attack
- Family history
- More common in women
- More common in African-Americans

A full range of carotid treatments are available for routine and high-risk patients. IU Health’s integrated vascular team is a preeminent provider in the treatment of carotid stenosis. Our long-standing collaboration with physicians at our IU Health Neuroscience Center continues our goal of reducing the incidence of death and disability related to stroke.
Therapeutic Hypothermia improves survival and neurological recovery after sudden cardiac arrest (SCA).

Every year, more than 300,000 people in the U.S. die from SCA outside the hospital setting. Re-establishment of blood flow can cause an ischemic cascade in the brain, resulting in severe or even fatal neurological damage in patients who remain comatose after resuscitation. To avert this, IU Health Cardiovascular initiates its unique therapeutic hypothermia protocol, thus improving neurological recovery and increasing overall survival.

IU Health Methodist Hospital's emergency department, cardiac catheterization lab and LifeLine aeromedical staff are capable of starting this hypothermia protocol at the earliest indication. This process rapidly cools and maintains the patient's core temperature to 33°C for 24 hours, before slowly re-warming the body to normal temperature.

Since 2008, more than 700 patients at IU Health Methodist Hospital have benefited from this intervention. From 2008 – 2012, 32 percent of our initially comatose patients survived with good neurological outcome. What is most remarkable? The patients themselves. More than one-third who were treated using therapeutic hypothermia were transferred to IU Health Methodist Hospital from outlying facilities because their cases were so complex. Additionally, more than 75 percent of IU Health Methodist Hospital's surviving hypothermia patients recovered neurologically (GCS ≥ 14) to the point where they were discharged directly to home or a rehabilitation facility.

Our therapeutic hypothermia team is lead by physicians and clinicians who are leaders in the field of hypothermia. Members of our team speak and participate in local, regional and national groups that are furthering the quality of therapeutic hypothermia care.

**Benefits of Therapeutic Hypothermia**

- Slows cerebral metabolism and oxygen consumption
- Slows the neuroexcitatory process, thus stabilizing the influx of calcium and glutamate, resulting in less cell death
- Decreases cerebral edema
- Suppresses ischemia-induced inflammatory response

**IU Health Methodist Hospital • 2008 – 2012**

Survival with good neurological outcome in patients treated with hypothermia

Data Source: IU Health Methodist Hypothermia Database

The life of a healthy 41-year-old, whose only medical history had been reflux and sleep apnea, changed overnight. Shortly after midnight, his wife awoke to him making gurgling sounds and noted he was curled in a ball and unresponsive. After calling 911, she performed CPR on her husband for about 15 minutes until EMS arrived.

Once EMS arrived, the husband was shocked three times and ACLS guidelines for medications were followed. Thirty-four minutes after calling 911, the husband had a pulse and was transported to the nearest hospital. On the way, EMS started the cooling process by administering chilled saline.

At the suburban hospital, cooling was continued and the patient was transferred to IU Health Methodist Hospital critical care unit. The patient was kept cool for 24 hours and then rewarmed slowly over the next 24 hours. Six hours after completing the therapeutic hypothermia process, the patient was able to be extubated and responded appropriately to questions.

Over the next few days, the patient continued receiving treatment for aspiration pneumonia, was evaluated by cardiology, and had an ICD implanted. An amazing eight days after admission, the patient was discharged to home with his wife and three children.
Sudden Cardiac Death

In 2012, IU Health implanted over 1,200 ICDs and pacemakers. Of these, 28 percent were biventricular systems to support resynchronization in heart failure patients.

ICD GUIDELINES

An ischemic patient who:
- is 40 days post-myocardial infarction and
- has left ventricular ejection fraction (LVEF) < 40%

or

A non-ischemic patient who:
- is > nine months after diagnosis of heart disease and
- has left ventricular ejection fraction (LVEF) < 35%

Source: 2008 American College of Cardiology (ACC), American Heart Association (AHA), Heart Rhythm Society (HRS)

Leads may require extraction in a limited number of cases due to electrical malfunctions, infections and blood vessel blockages. These procedures require a specialized depth of team experience and expertise, which is uniquely available within IU Health.

IU Health has played a pivotal role in clinical trials, including AVID, MADIT and SCD-HeFT, which demonstrated that implantable cardioverter defibrillators (ICDs) save lives and are more effective than drug therapy. IU Health performs hundreds of procedures annually, providing treatment options that patients say provide them with reassurance.

IU Health is committed to preventing SCD for patients of all ages through community screening and educational programs. IU Health performs cardiology screening for elite athletes pursuing a professional career in football. In addition, our Echoes for Athletes program was implemented in 2009 and screens members of high school sports teams across the state. Since the launch of this program, IU Health has screened over 1,800 high school athletes. As a part of this initiative, IU Health has sponsored a national educational forum with the American College of Cardiology to develop practical approaches to identifying cardiovascular disease in athletes. We remain dedicated to providing screening programs that identify at-risk athletes and supporting the development of safe participation recommendations.

IU Health also has a long history of providing automatic external defibrillators and cardiopulmonary resuscitation devices to our community partners across the state. These important initiatives help to save lives throughout the communities we serve.
Atrial Fibrillation and Advanced Cardiac Rhythm Disorders

The electrophysiology team at IU Health Methodist Hospital is comprised of eight board certified electrophysiologists who collaborate with experts in the subspecialties of advanced imaging, heart failure and cardiovascular surgery. These specialists provide unparalleled consultative expertise throughout the state of Indiana. As a primary referral center within the Midwest, we offer a full range of treatments and interventions with specialized expertise in complex catheter ablations. Collaboration with our referring physicians is essential to identifying the type and significance of the arrhythmia, which ensures the optimal management plan for each patient.

IU Health electrophysiologists are committed to providing preeminent care utilizing the latest in modern technology and minimally invasive approaches. Our program includes three dedicated state-of-the-art electrophysiology laboratories, including stereotaxis navigation, 3-D mapping, intracardiac echocardiography and both radio frequency and cryoablation technologies. In 2012, IU Health performed over 1,900 electrophysiology procedures throughout the state.

An estimated 2.7 million Americans suffer from atrial fibrillation. Atrial fibrillation is associated with a four to five times higher risk of ischemic stroke.

The fundamental reason to consider ablation in patients with atrial fibrillation is drug-refractory symptoms that are due to the atrial fibrillation. Symptoms include:

- Palpitations
- Lightheadedness
- Exertional dyspnea
- Fatigue

![2012 IU Health Electrophysiology Volumes](chart)

Data Source: Siemens Statistical Manager
Advanced Heart and Lung Care Program

The IU Health Advanced Heart and Lung Care Program is on the forefront of clinical technology in heart and lung failure care, heart transplant, lung transplant and mechanical circulatory support, including ventricular assist device (VAD), extracorporeal membrane oxygenation (ECMO) and total artificial heart (TAH). Our program incorporates both inpatient and outpatient services and includes collaboration between pharmacists, psychologists, nurses, social workers, cardiologists, pulmonologists and surgeons.

The Advanced Heart and Lung Care Clinic, located at IU Health Methodist Hospital, is the heart of our outpatient program. We partner with primary care physicians, pulmonologists and cardiologists to complement the care the patient is receiving. Our team approach is especially valuable for patients with:

- Diuretic-resistant heart failure
- Hypertrophic cardiomyopathy
- Adult congenital heart disease
- Heart transplantation
- Pulmonary Arterial Hypertension
- Mechanical assist device therapy
- Chronic Obstructive Pulmonary Disease (COPD)
- Lung transplantation

HEART TRANSPLANT VOLUME AND DISTRIBUTION

LUNG TRANSPLANT VOLUME

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Lung Transplant Program: Innovative Lung Perfusion

Nationally, only 15 percent of solid organ donors are suitable lung donors. Of the remaining 85 percent, a significant number are potentially salvageable utilizing a new research technology called ex vivo lung perfusion (EVLP).

Ex vivo lung perfusion allows otherwise unusable lungs to be warmed to body temperature, perfused utilizing a specialized solution and ventilated outside of the human body. This allows up to six hours of additional time to assess marginal lungs and the opportunity to recondition them under optimal circumstances.

Indiana University Health is one of only seven centers in the nation participating in this cutting-edge research. Through these efforts, our Cardiothoracic Transplant Team will be able to offer lung transplants to a larger number of residents in Indiana and surrounding states.

Extracorporeal Membrane Oxygenation (ECMO) Program

ECMO provides cardiopulmonary bypass support for pediatric and adult patients with severe but potentially reversible forms of cardiovascular or respiratory failure. Initially introduced as a treatment for many childhood disorders, ECMO is also used to bridge adult patients with severe respiratory or cardiac failure to recovery or other surgical therapies. Unique to Indiana University Health, both the adult and pediatric ECMO programs are Extracorporeal Life Support Organization (ELSO) designated centers. Care and monitoring of the patient are performed by a team of surgeons, pulmonologists, perfusionists, respiratory therapists and specially trained nursing staff.

2012 IU HEALTH METHODIST HOSPITAL ADULT ECMO BY DIAGNOSIS

- **Primary Graft Dysfunction (PGD)** – 28%
- **Aspiration Pneumonia** – 11%
- **Viral Infection** – 5%
- **Transfusion-Related Acute Lung Injury** – 11%
- **Cardiogenic Shock** – 39%
- **Cardiac Failure (eCPR)** – 6%

IU Health is proud to be one of seven centers in the country and the only hospital in Indiana with ex vivo lung perfusion technology.
Total Artificial Heart Program

Our cardiothoracic surgeons at IU Health Methodist Hospital offer the current generation of the total artificial heart to end-stage heart failure patients needing assistance beyond that provided by most mechanical support options. Used only as a last resort when other medication and treatments fail, the SynCardia Total Artificial Heart is a mechanical device that has been approved by the Food and Drug Administration to serve as a temporary “Bridge to Transplant” for biventricular heart failure.

Similar to a heart transplant, the SynCardia Total Artificial Heart replaces both failing heart ventricles and the four heart valves, eliminating the symptoms and source of end-stage biventricular heart failure. Pneumatic drivers power the Total Artificial Heart with precisely calibrated pulses of air and vacuum. The Total Artificial Heart can provide blood flow of up to 9.5 liters per minute through each ventricle. This high volume of blood flow helps speed the recovery of vital organs, helping make the patient a better transplant candidate. The console driver technology continues to advance as well—the smaller and more convenient equipment allows patients to be more mobile and even discharged home with backpack-sized gear to enjoy a better quality of life while awaiting heart transplant.

Ventricular Assist Device (VAD) Program

In addition to our history of many transplant “firsts,” IU Health Cardiovascular continues to refine many transplant techniques, and cares for the most complex adult and pediatric heart failure patients. IU Health provides end-stage heart failure patients with access to lifesaving therapies not available in most institutions. These therapies include Bridge to Transplant (BTT), Bridge to Recovery (BTR) and Destination Therapy (DT).
Adult Congenital Heart Disease (ACHD) Program: A Lifetime of Caring

Thanks to advances in cardiovascular surgery and pediatric cardiology care, more than one million people born with congenital heart disease (CHD) are living as adults. Many CHD survivors suffer from complex heart disease. Early childhood repairs generally do not often cure the underlying disease, and result in very complex anatomy that requires regular cardiology follow-up at a center specializing in CHD. Because of the complexity of their heart condition, even their non-cardiac needs are best addressed by a facility and physicians well-versed in the challenges of congenital heart disease.

To meet this population’s ongoing medical needs, IU Health Cardiovascular developed a comprehensive Adult Congenital Heart Disease (ACHD) Program, including not just clinics, but also a multidisciplinary program encompassing the entire spectrum of care, including inpatient services, outpatient clinics and invasive procedures. The program is also able to provide world-class cross sectional imaging with cardiac MRI and multidetector gated CT.

The ACHD Program’s multidisciplinary team includes cardiology subspecialists, pulmonary hypertension specialists, high-risk obstetricians, anesthesiologists and cardiovascular surgeons.

Close collaboration between the ACHD Program and the pediatric cardiologists at Riley Hospital for Children at IU Health allows a seamless continuum of treatment throughout adolescence and into adulthood. In some cases, CHD is not diagnosed until later in life, and the ACHD program is well-suited to care for patients with a new diagnosis of ACHD.

Close collaboration between IU Health Maternal Fetal Medicine, Pediatric Cardiology and Adult Cardiology assures that women with CHD receive full support during pregnancy. Close cardiac follow-up is coordinated with visits for a fetal echocardiogram and plans for safe delivery are discussed with the patient and family.

The IU Health ACHD Program is uniquely positioned as the only program in Indiana recognized as an ACHD Program by the Adult Congenital Heart Association. We offer access to complex diagnostic cardiac catheterization and trans-catheter interventions, as well as the latest technologies in valve replacement and defect closure devices. Our patients who need surgical revisions to improve cardiac function have access to cardiovascular surgeons who are experts in both CHD and in adult cardiovascular surgery. Our world-renowned expert electrophysiology service assists in the management of arrhythmias resulting from scarring from prior surgeries.

The IU Health Cardiovascular team is experienced with management of patients with complex congenital heart defects, including:

- Single ventricle physiology
- Patients with history of Fontan surgery
- Transposition of great arteries
- Tetralogy of Fallot
- Endocardial cushion defect
- Coarctation of the aorta
- Conduits of all types
- Eisenmenger Syndrome
- All forms of cyanotic heart disease
Research and Innovation: Today’s Discoveries for Tomorrow’s Therapies

DOUG ZIPES, MD
ELECTROPHYSIOLOGIST

Dr. Zipes has been instrumental in advancing the field of cardiac electrophysiology not only in Indiana and throughout the U.S., but around the world.

After graduating from Dartmouth College and Harvard Medical School, both cum laude, Dr. Zipes trained at Duke University Medical Center. In 1970, he joined Indiana University and subsequently became professor of medicine, distinguished professor and director of cardiology at Krannert Institute.

He is the founding editor of the Journal of Cardiovascular Electrophysiology, Cardiology in Review, HeartRhythm, and PracticeUpdate/Cardiology. He has published over 800 articles and 25 textbooks.

In 2013, Dr. Zipes received two prestigious awards:

- The President’s Medal from the Heart Rhythm Society for his long and outstanding service.
- The Gold Medal from The European Society of Cardiology, which is their highest honor.

A preeminent cardiovascular center committed to patient care, research and education, the IU Health Cardiovascular program has a strong heritage of physician leaders in the areas of innovation and education, which include:

- The first practical application of echocardiography
- Pioneering the stress echo
- Developing innovative electrophysiology treatments
- Co-authoring national cardiology competency guidelines
- Multiple presidents and other leadership roles in the American College of Cardiology

Research defines IU Health’s goals and drives IU Health Cardiovascular to continuously pursue better, safer, more effective diagnostic and treatment options for our patients. Our comprehensive health system and seamless collaboration across specialties provide access to the latest clinical trials. Clinical trial research in progress includes:

- Taxus Liberte (IUHN) – Taxus Liberte stent with the FDA-mandated DAPT registry
- SAFE-PCI – First national trial for radial access in women
- Superb (IUHN) – Supera stent in SFA disease
- ISCHEMIA – NIH trial of medical management in advanced coronary disease
- Promus – Post-Intervention Registry of PROMUS Coronary Stent

IU Health’s relationship with the Indiana University School of Medicine creates an unparalleled approach to developing future advancements for cardiovascular disease. To further enhance this relationship, IU Health and the IU School of Medicine jointly established the Strategic Research Initiative, which includes an initial investment of $150 million over five years. The IU Health Cardiovascular research program, led by Dr. Peng-Sheng Chen, director of the IU School of Medicine Krannert Institute of Cardiology, is one key component of this initiative. Transformational research within the cardiovascular program includes:

- Comprehensive heart failure, including genetics and biorepositories
- Pharmacogenomics to promote drug efficacy and safety
- Data coordination center for cardiovascular outcomes research
The IU Health Cardiovascular Team

**CARDIOLOGY**
- Sami Aasar, MD
- Paul Battles, MD
- Deepak Bhakta, MD
- Islam Bolad, MD
- Patrick Bourdillon, MD
- Jeffrey Breall, MD
- M. Scott Byers, MD
- Marco Caccamo, DO
- Peng-Sheng Chen, MD
- Mithilesh Das, MD
- Noel Dasgupta, MD
- Yazid Fadl, MD
- Harvey Feigenbaum, MD
- Gary Fisch, MD
- Mark Fisch, MD
- Anne Ford, MD
- Matthew French, MD
- John Fry, MD
- William Gill, MD
- Irmina Gradus-Pizlo, MD
- William Groh, MD
- M. Azam Hadi, MD
- Makram Hajj, MD
- Edward Harlamert, MD
- Ziad Jaradat, MD
- W. Aaron Kay, MD
- Richard Kovacs, MD
- Rolf Kreutz, MD
- Nathan Lambert, MD
- Chao-wen Lee, MD
- Adnan Malik, MD
- Keith March, MD
- Ronald Mastouri, MD
- Paul McHenry, MD
- John Miller, MD
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- Jeffrey R. Mossler, MD
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