Echocardiography

One of the most important developments in the practice of cardiology in the past century has been the use of ultrasound to examine the heart or echocardiography. The first practical and widespread use of this technique was developed in 1963 by investigators at the Krannert Institute headed by Dr. Harvey Feigenbaum. With the numerous worldwide contributions to the field including papers, trainees, courses, lectures, books, and organizations by Dr. Feigenbaum and his coworkers, echocardiography has become by far the most frequently used cardiac imaging tool in the world. This group is still at the forefront in advances in this field. An example is the use of echocardiography with stress testing which again was developed at the Krannert Institute and continues to be advanced under the leadership of Dr. Stephen Sawada.

This fellowship offers a rare opportunity to train at one of the world’s leading echocardiography centers, work with the “Father of Echocardiography” and gain from the knowledge and perspective accumulated from 50 years of developing and advancing this essential cardiology imaging modality. One unique feature of this Israeli fellowship is that it offers the option of helping the IU echocardiographic program promote strain echocardiography, which is largely an Israeli development. This investigational effort is aimed at making strain echocardiography become an indispensable component of the routine, everyday echocardiographic examination. Strain studies are now being performed in three of the IU campus institutions. Orders have been placed for more instruments with strain capabilities. A modified, more practical approach to speckle strain has been developed. So far nearly 3,000 strain studies have been done. Convincing the world of the importance of strain echocardiography will require numerous investigations assessing the essential clinical information that strain data provides. Studies to gain this information will be ongoing for years to come. An Israeli fellow has the opportunity to be a vital part of this effort.
Indiana University School of Medicine
Krannert Institute of Cardiology
Clinical Cardiac Electrophysiology Fellowship Curriculum

Goals and Objectives:

The goal of the clinical cardiac electrophysiology fellowship is to provide education and experience in the broad range of activities undertaken by a clinical cardiac electrophysiologist, leading to proficiency in the consultative and primary care of patients with cardiac rhythm disturbances. It involves ambulatory, medical ward, telemetry, and intensive care unit settings, including invasive laboratory procedures used in the evaluation and treatment of arrhythmia patients (electrophysiology studies, cardiac ablation procedures, implantation and expert follow-up management of permanent pacemakers and defibrillators). It is recognized that achievement of this goal also requires experience in research and other scholarly activities, both to encourage continued participation in an academic environment and also to contribute to a pattern of lifetime self-education. The components of the program are designed to be in accordance with the Accreditation Council for Graduate Medical Education (ACGME) requirements.

These goals are accomplished by dedicated application of sound educational principles by a highly qualified faculty. In an era during which more time is occupied with doing procedures, our program strives to focus on the cognitive aspects of being an expert electrophysiologist, by didactic lectures, case conferences and hands on experience. Trainees are exposed to a rich variety of electrophysiologic experience very early in their training program. Expertise is gained in selection of appropriate implantable devices, implantation techniques, follow-up and troubleshooting as well as diagnostic electrophysiologic testing and catheter ablation of all types of complex and simple rhythm disturbances. Realizing that the fellowship program is only one phase of a continuous training process, the desire for lifelong learning is fostered during the fellowship training program as well.

The environment for training consists of three major teaching hospitals (Methodist Hospital, Roudebush Veterans Administration Medical Center and Wishard Memorial Hospital) at which invasive Intracardiac procedures and implantable device procedures are performed (or, in the case of Wishard, device implants only). These venues give a rich blend of different types of patient populations and illnesses for the trainee’s experience. Fellows are exposed to and gain proficiency in the full panoply of heart rhythm disorders and procedures. Training and mentoring by a world-renowned faculty (included among whom are Drs. Chen, Zipes and Miller, each of whom has been or is currently serving on the American Board of Internal Medicine [ABIM] examination committee for Clinical Cardiac Electrophysiology) forms an essential part of the educational process. Fellows spend about 85% of their time in clinical pursuits, including inpatient and outpatient consultations and follow-up of patients who have had procedures, device interrogation and troubleshooting, as well as (the bulk of their time) with procedures. Approximately 15% of the fellows’ schedule is dedicated to research, either in an animal laboratory or in clinical research. It is anticipated that at the end of their training, fellows will be poised to not only to excel in the ABIM Subspecialty Examination in Clinical Cardiac Electrophysiology, but be able to assume a position on an academic faculty if that is their desire (strongly encouraged).
Overview

The Advanced Heart Failure and Heart Transplant Fellowship at Indiana University provides inpatient and outpatient training in the management of patients with advanced heart failure from initial diagnosis to consideration of high-risk cardiac surgery, cardiac transplantation, mechanical circulatory support, and end-of-life care. This is a one-year fellowship, intended to follow 3 years of general cardiology training. A physician completing this fellowship at Indiana University would be eligible to pursue the Advanced Heart Failure Board Examination, as well as the UNOS designation of Heart Transplant Cardiologist, if desired.

Heart Failure and Transplant Fellowship Director
Irmina Gradus-Pizlo M.D.

Heart Failure and Transplant Cardiology Faculty
Jacqueline O’Donnell M.D.
Adnan Malik M.D.
M. Azam Hadi M.D.

Heart transplant and Mechanical Assist Device Surgeons:
Thomas Wozniak M.D., Surgical Director of Heart Transplant Program
I-wen Wang, M.D., PhD

Fellowship Objectives:
Upon completion of the Advanced Heart Failure and Transplant Fellowship, the Fellow will be well-versed in:

- Heart failure etiology and prevention
- Heart failure evaluation (including all diagnostic tests and modalities, serologic tests, etc.)
- Heart failure management (including novel drug therapies and the evaluation of patients for cardiac transplant or mechanical circulatory support)
- Heart failure procedures (including heart biopsies, right heart catheterization, management of diagnostic and therapeutic devices used for evaluation and management of heart failure in acute and chronic settings, and evaluation of device function)
- Heart failure disease management (including issues related to participation in multidisciplinary teams delivering clinical care in settings dedicated to heart failure)
- The care of the heart transplant patient (including immediate post-operative care and long-term maintenance and surveillance)
- The continuity care of the patient living with mechanical circulatory support (including anticoagulation, device infection diagnosis and management, and timing of relisting for transplantation)
- End-of-life care in heart failure and appropriate time for referral and patient guidance
- Basic mechanisms of heart failure (including cellular mechanisms, ventricular remodeling, hypertrophy, and inflammation)
- Clinical research issues (including ethical standards, design, and application and interpretation of trial results)
The fellow will complete Level 3 Training requirements for Advanced Heart Failure and Heart Transplant as proposed by COCATS Task Force 8: Training in Heart Failure, published in JACC 2008;51;383-389, including:

- Evaluation of at least 30 patients for cardiac transplant of mechanical assist devices
- The care of at least 30 patients who have undergone a heart transplant, of whom at least 5 are seen during the initial hospitalization
- The care of at least 5 patients supported on a mechanical device, of whom at least 2 are followed during initial hospitalization
- The evaluation of at least 50 patients for ICD and 50 patients for CRT
- Device interrogation and interpretation in patients with ICD or ICD-CRT in at least 100 patients
- Performance of at least 30 endomyocardial biopsies

The fellow will also fulfill UNOS requirements for certification that are as follows:

- Heart transplant physician must maintain board certification in Internal Medicine or Pediatrics, as well as complete a Cardiology Fellowship
- Must be involved in the care of 20 or more heart or heart/lung transplant recipients from the time of their transplant.
- Participate in the observation of 3 organ procurements and 3 heart transplants.
- Current working knowledge (within the last 2 years) of the care of heart transplant patients, including heart transplantation, donor selection, acute and chronic heart failure, mechanical assist devices, recipient selection, pre and post-operative care hemodynamic care, immunosuppressive therapy, interpretation and grading of myocardial biopsies, and long-term patient follow-up.
- A letter from the fellowship director sent directly to UNOS stating the above requirements have been met.

Curriculum
Faculty will clearly outline the specific expectations and learning objectives of the activities/rotations prior to each month and review them at the end of the activity/rotation. The fellow is expected to maintain a log of procedures, transplants and mechanical circulatory devices.

**Inpatient Activities:**
A minimum of 7 months will be spent on the Heart Failure/Transplant Inpatient service
Other inpatient electives:
1 month Adults with Congenital Heart Disease Service (Riley Hospital inpatient and outpatient)
Expectations and goals of each

**Outpatient Activities/Clinics:**
The fellow will participate in the equivalent of one half-day per week Advanced Heart Failure clinic alternating weekly with a one half-day per week Heart Transplant clinic. This one-half day clinic per week is mandatory and active throughout the academic year precepted by Drs. Gradus-Pizlo and O'Donnell.
Fellow will also participate in one-half day LVAD clinic during the non-Inpatient months working in concert with the LVAD clinic RN and NP. Preceptors; Drs. Malik and Hadi.

**Electives:**
The fellow will have 2 weeks rotation in the HLA lab and 2 weeks performing Cardiopulmonary testing.
In addition, another month (can be split into 2 week blocks) of elective will be reserved for the fellow to choose from the following:
- Abdominal (Liver and/or Kidney Transplant) or Lung Transplant
- Histopathology
- Cardiac Critical care
- HF/Mechanical Device/ Transplant Echocardiography with Dr Feigenbaum

**Procedures:**
Fellow will participate in performing endomyocardial biopsies, right heart catheterizations, and diagnostic left heart catheterizations two half days per week during the non-Inpatient months under the preceptorship of Drs. Malik and Hadi.

**Research Activities:**
2 months research, including possibility of clinical epidemiology
- Research can be interspersed with clinical activities throughout the year or in dedicated blocks
- Research focus should be planned and designed at the start of the academic year, and the planning stages should be complete prior to the dedicated months
- At least one abstract resulting in a manuscript submission by the end of the academic year will be expected
- Presenting at a national meeting will be highly encouraged
- Help with patient recruitment and consenting for ongoing clinical research projects
- Input data into the Heart Failure/Transplant clinical database

**CME:**
The fellow will be provided funds (for boarding, airfare and registration) to participate in one national meeting.
The fellow is expected to attend the Cardiology Grand Rounds and the Case conference. In addition, the fellow will be expected to present a bimonthly M&M conference and attend bimonthly Heart Failure and Transplant Journal club

**Vacation:**
Four weeks of total vacation time (excluding CME) are allotted but not more than 2 continuous weeks can be taken except for extraordinary circumstances and after approval by the program director.

**Appendix 1: Core competencies**
Clinical Experience (Inpatient and Outpatient) and Proficiencies to Be Required for Eligibility for Secondary Subspecialty Certification in Advanced Heart Failure and Transplant Cardiology (from Konstam et al, J Am Coll Cardiol, 2009; 53:834-836)

<table>
<thead>
<tr>
<th>Heart failure with dilated or nondilated LV</th>
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<tr>
<td>New-onset heart failure</td>
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<td>Acute decompensation of chronic heart failure</td>
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<td>Heart failure in a geriatric population</td>
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<td>Heart failure associated with cancer chemotherapy</td>
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<td>Heart failure patients who are pregnant or recently postpartum</td>
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<td>Topic</td>
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<tr>
<td>Heart failure and congenital heart disease</td>
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<td>Heart failure in patient from diverse ethnic groups, with attention to specific diagnostic and therapeutic issues within these groups</td>
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<td>Heart failure in men and women</td>
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<td>Pulmonary hypertension</td>
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<td>Heart failure pre- and post-cardiac and noncardiac surgery</td>
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<tr>
<td>Inherited forms of cardiomyopathy</td>
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<td>Hypertrophic cardiomyopathies</td>
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<tr>
<td>Infiltrative and inflammatory cardiomyopathies</td>
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<tr>
<td>Heart failure and arrhythmias</td>
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<tr>
<td>Heart failure in patients with other organs transplanted</td>
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<tr>
<td>Evaluation of patients for cardiac transplant or mechanical assist devices</td>
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<tr>
<td>Care of patients who have undergone cardiac transplant</td>
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<td>Care of patients with mechanical assist devices</td>
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<td>Evaluation of patients for ICDs and for CRT</td>
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<td>Device interrogation and interpretation in patients with implanted ICD or ICD-CRT devices</td>
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<td>Endomyocardial biopsies</td>
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**Appendix 2: Suggested Reading List**

### Guidelines and Policy Statements

**American College of Cardiology/American Heart Association**

- Prevention of Heart Failure: A Scientific Statement from the American Heart Association Councils on Epidemiology and Prevention, Clinical Cardiology, Cardiovascular Nursing, and High Blood Pressure Research; Quality of Care and Outcomes Research Interdisciplinary Working Group; and Functional Genomics and Translational Biology Interdisciplinary Working Group. Circ 2008;117:2544-2565 [http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.188965](http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.188965)
ACC/AHA and ESC

ACC/AHA and Heart Rhythm Society

Heart Failure Society of America
- Heart Failure Society of America (HFSA) 2006 Comprehensive Heart Failure Practice Guideline J Cardiac Fail 2006;12:e1-e122 http://www.heartfailureguideline.org/

International Society for Heart and Lung Transplantation

Key Articles

Acute Heart Failure
1. Emerging therapies for the management of decompensated heart failure: from bench to bedside.
Arrhythmias and Implantable Devices


Biomarkers

2. Rapid measurement of B-type natriuretic peptide in the emergency diagnosis of heart failure. 

**Cardiac Surgery in Heart Failure Patients**

http://circ.ahajournals.org/cgi/reprint/112/9_suppl/I-344.pdf

http://content.nejm.org/cgi/reprint/343/20/1445.pdf


http://content.nejm.org/cgi/reprint/343/20/1445.pdf

**Cardiac Transplantation (Also see ISHLT guidelines and articles under "Immunosuppression")**


**Disease Management and End-of-Life Care**

http://download.journals.elsevierhealth.com/pdfs/journals/1071-9164/PiIS1071916408010129.pdf

http://jama.ama-assn.org/cgi/content/full/301/14/1439


http://circ.ahajournals.org/cgi/content/extract/120/25/2597

Epidemiology and Risk Factors
http://circ.ahajournals.org/cgi/reprint/117/19/2544.pdf


Hypertrophic Cardiomyopathy
http://tinyurl.com/34koj6k

http://tinyurl.com/2vw45d9


Immunosuppression

**Mechanical Circulatory Support**


**Mechanical Circulatory Support: Post-operative Management**


**Other Causes of Cardiomyopathy**