Advanced Heart Failure/Transplant Program Curriculum

Education Purpose

The primary purpose of the advanced training program in Advanced Heart Failure/Transplant and Pulmonary Hypertension is to provide subspecialty training for the individual who has completed a 3-year cardiology fellowship and wishes to specialize in advanced heart failure, cardiac transplant, and pulmonary hypertension medicine. The 12-month clinical training program will be divided into 50% inpatient care and 50% spent developing clinical skills in the ambulatory setting including outpatient evaluation of patients with heart failure, cardiomyopathies, pulmonary hypertension, post-transplant cardiac allograft, and adult congenital heart disease. During this ambulatory time, invasive laboratory skills will be developed focusing on endomyocardial biopsies and invasive hemodynamic assessment of the heart failure patients.

The primary purpose will be met by developing and enhancing the trainee's skills: 1) in the clinical assessment of the advanced heart failure patient (e.g. ACC/AHA clinical stages C and D) and assessing candidacy for advanced heart failure therapeutics (including inotrope support, intraaortic balloon pump (IABP), extracorporeal membrane oxygenation (ECMO), ventricular assist device (VAD), and cardiac transplantation); 2) in the clinical assessment of pulmonary hypertension and use of pulmonary vasodilator therapy; 3) in communicating findings and diagnostic/therapeutic plans to the patient and family as well as the patient's primary care physician; and 4) in leadership and teaching of residents and general cardiology fellows that are otherwise caring for the patient or rotating through the Advanced Heart Failure/Transplant service.

Organization of the Educational Experience

The **Advanced Heart Failure/Transplant Training Program** is a 12-month longitudinal clinical track that consists of four clinical experiences: 1) the **Advanced Heart Failure/Transplant Inpatient and Consult Experience**, 2) the **Ambulatory Care Experience**, 3) the **Transplant Clinic and Biopsy Lab Experience,** and the 4) **Pulmonary Hypertension Experience**, and the fifth **Research Experience**. (*The specific knowledge/skill that will be acquired in each of these experiences is included in the description of the experience at the end of this document*.) This training combines the pre-procedure, procedural and post-procedural periods of patient care in a manner that reflects the actual practice of Advanced Heart Failure/Transplant Cardiology and provides realistic training for this cardiac subspecialty.

The Advanced Heart Failure/Transplant (AHF/Tx) trainee will spend 2 weeks per month in the **Advanced Heart Failure/Transplant Inpatient and Consult Experience** and another 2 weeks per month rotating through clinic and cardiac catheterization lab rotations satisfying the **Transplant Clinic and Biopsy Lab Experience**, **Pulmonary Hypertension Experience**, and the **Research Experience**. At least one-half day per week of **Ambulatory Care Experience** will continue on a weekly basis throughout the year providing longitudinal care experience of the heart failure and pulmonary hypertension patients.

There is only a rare home call requirement for the AHF/Tx fellow. During routine business hours, the AHF/Tx fellow can expect to receive calls from the hospital floors with questions about admitted patients and consult patients. In each instance, the fellow is "first call" but has complete backup from the attending advanced heart failure/transplant cardiologist that is also on call. The attending heart failure/transplant cardiologist call schedule is published and is available from the hospital operator or the Web-based Physician Portal. The attending heart failure/transplant cardiologist is always available by pager or cell phone (if not physically present) to help the fellow with any questions. Weekend call duties will be required 1-2 times per month, and on Saturday and Sunday (and any holidays) of the call week, the fellow will "round" on the hospitalized patients, see new consultations and obtain **Inpatient/Consult Experience.**

The Learning Objectives for each of the Core Competencies are grouped for each competency into **General, Procedural** and **Management Learning Objectives** outlined in the table that follows below.

Learning Objectives and Competencies.

Competency	Learning Objective	Evaluation Methods

Advanced Heart Failure/Transplant Program Curriculum

Patient Care	**General** • Always introduces themselves to the patient • Communicates effectively with patients and their families • Communicates effectively with other health care professionals helping care for CHF/Tx patients • Documents all significant interactions with patients **Procedural** • Consistently performs proper physical assessment of the heart failure patient • Participates in pre-procedure and post-procedure assessment of patient • Actively participates in procedural activities assuming an increasing role as they acquire procedural experience • Actively participates in hemodynamic interpretation during the right heart catheterization procedure **Management** • Documents pre-procedural and post-procedural evaluations • Follows up on post procedure patients when needed noting expected outcomes/recovery and complications or unanticipated outcomes/events • Participates in daily assessment of patient	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews • Oral and written feedback (360 evaluation) from the CHF/Tx nurse practitioners and staff
Medical Knowledge (Includes procedural skills)	**General** • Attends and participates in weekly transplant conferences, and twice monthly pulmonary hypertension conferences • Presents regularly and participates in transplant selection committee meetings. • Performs Literature search on questions that arise during patient care **Procedural** • Understands the indications, contraindications and risks of transplant and VAD surgeries. • Understands the indications, protocols, and risks of immunosuppression. • Understands the indications, contraindications, and side effects of pulmonary vasodilators • Develops proficiency in performing invasive hemodynamics studies and biopsy procedures including sterile technique, local anesthesia, venous access, and catheter	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews • Log books • Proficiency checks

	placement. • Develops proficiency in the interpretation of the biopsy results and managing allograft rejection or post-transplant vasculopathy **Management** • Applies their understanding of the indications, contraindications and limitations of EP studies, rhythm management devices and antiarrhythmic drugs to formulate treatment plans (under the direction of the attending physician) • Monitors post procedure patients for evidence of expected outcomes/recovery and the development of complications or unanticipated outcomes/events • Participates in the interrogation, trouble-shooting and reprogramming rhythm management devices encountered during the Inpatient and Ambulatory Care experiences.	
Practice Based Learning	**General** • Utilizes the weekly Multidisciplinary Transplant Selection and Post-transplant management meetings to discuss diagnostic and management issues • Utilizes the bi-monthly Integrated Pulmonary Hypertension Case Conference to discuss diagnostic and management issues • Utilizes PubMed, heart failure textbooks and on-line sources (Up-to-Date) to identify the best "evidence based" approach to a specific clinical problem. • Utilizes on-line sources from ACC and HFSA for self-assessment. **Procedural** • Analyzes their procedural skills by comparison to that of the attending heart failure cardiologist performing the procedure with them. • Reviews cases that had less than perfect outcome to identify changes that might have improved outcome **Management** • Analyzes their management strategies by comparing their approach to that of the attending electrophysiologist • Attends quarterly transplant M&M conference	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews • Log books • Proficiency checks
Interpersonal Skills	**General** • Communicates respectfully and collegially with other fellows, medical students, and	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the

	attending physicians during the transplant and pulmonary hypertension conferences • Interacts respectfully and collegially with the CHF, PH, transplant coordinators, the CHF inpatient mid-level practitioners, residents, general cardiology fellows, and cath lab staff **Procedural** • Communicates respectfully with cath lab staff, during invasive hemodynamic and biopsy procedures **Management** • Communicates effectively with the team taking primary care of the patient in a collegial, respectful manner making sure they understand the recommendations and rationale	Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews
Professionalism	**General/Procedural/Management** • Demonstrates respect, compassion, integrity, and a commitment to ethical principles • Demonstrates sensitivity and responsiveness to the patient's culture, age, gender, and disabilities • Interacts collegially with their peer group • Treats others as they would like to be treated	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews
System Based Practice	**General** • Understands the role of heart failure/transplant and pulmonary hypertension as one component of the hospital-based patient's health care **Procedural** • Utilizes multidisciplinary transplant team to arrange transplant and VAD options for patients. • Utilizes outpatient coordinators to arrange ambulatory evaluation and treatment of pulmonary hypertension patients **Management** • Understands the hospital e-record system including STENTOR, MUSE, Mars and Cerner and how they function to facilitate patient care.	• Daily oral feedback from faculty during inpatient rounds, in the biopsy and cath lab, in the Ambulatory, Transplant, or Pulmonary Hypertension Clinics • Quarterly Global evaluation • Semiannual review of trainees' documentation of pre-procedure evaluation, procedural performance and post-procedure evaluation and overall progress with Program Director • Peer-to-Peer reviews

Methodology of Teaching Goals and Objectives

Principal teaching method

The principal method for teaching advanced heart failure/transplant cardiology utilizes a "one-on-one" interaction between the trainee and the individual faculty attending. The attending faculty serves as a role model for the trainee demonstrating the procedural and analytic skills (**Medical Knowledge**) required during patient evaluation and management, the **Interpersonal Skills** needed to interact with the patient, families and referring physicians, along with the **Professionalism** expected of a clinical CHF/Tx fellow providing excellent **Patient Care**.

The procedural and analytic skills (**Medical Knowledge**) required to evaluate and to treat advanced heart failure, transplant, and pulmonary hypertension patients will be developed with direct interaction and discussion between the clinical fellow and the attending faculty during patient assessment in the inpatient and outpatient setting. As the trainee's skill and knowledge increases, they will assume an ever-increasing role in performing the analysis and procedures (under the direct supervision of the attending physician) ultimately becoming the primary operator. This constant faculty interaction will allow the trainee to critically evaluate their own procedural techniques, analytic skills (**Medical Knowledge**), **Interpersonal Skills** and overall **Patient Care** in a **Practice-Based Learning** approach by comparison to an experienced attending advanced heart failure/transplant and pulmonary hypertension cardiologist.

The trainee's **Medical Knowledge** is further supplemented by the **Multidisciplinary Cardiac Transplant Selection, Post-transplant Management, Pulmonary Hypertension Clinical Case, and Heart Failure/Pulmonary Hypertension Research** conferences. The multidisciplinary transplant selection and post-transplant management conferences take place weekly on Monday and the Pulmonary Hypertension conference takes place on alternating Tuesdays. Additionally, at the Post-transplant patient management conference, the meeting is attended by the transplant nurse coordinators and the transplant pharmacist. The multidisciplinary transplant selection committee conference is also attended by the transplant cardiac surgeons, pre-transplant nurse coordinators, social worker, and case management. The monthly Heart Success Conference is a monthly case study, multi-disciplinary conference attended by heart failure cardiologists, CT surgeons, interventionalists and EP specialists.

The **core curriculum** of the Advanced Heart Failure/Transplant fellowship will cover core topics from the ACGME Program Requirements for GME in Advanced Heart Failure and Transplant cardiology (Section IV)[1], ACCF COCATS 3 Task force 8: Training in Heart Failure[2] level 3 training in heart failure, and ACCF/AHA/ACP/HFSA/ISHLT 2010 clinical competence statement on management of patients with advanced heart failure and cardiac transplant[3] (summarized below). Clinical fellows will use the Hosenpud[4] and Mann[5] textbooks as recommended reference material.

Core Curriculum Topics

The core curriculum topics are designed to satisfy the ACGME, ACCF COCATS 3 Task Force 8 – Level 3 training in heart failure, and the 2010 ACCF/AHA/ACP/HFSA/ISHLT clinical competence recommendations.

The core curriculum is grouped into sections addressing management of the advanced heart failure patient, evaluation of patients for advanced heart failure therapies (cardiac transplant and ventricular assist device or other mechanical circulatory support), management of patients post-transplant, management of patients post-VAD implant, pulmonary hypertension evaluation and management, and end-of-life issues.

Core curriculum topics	Competencies and Skills
1. Management of the advanced heart failure patient	1. Cognitive knowledge 2. Cardiovascular biology and physiology knowledge 3. Technical skills 4. Referral for cardiac intervention (percutaneous/surgical) 5. Understand the risks of non-cardiac surgery and demonstrate ability to perform perioperative risk assessment in the HF patient

2. Evaluation of patients for cardiac transplant or mechanical circulatory support	1. Understand indications/contraindications for transplant or mechanical circulatory support 2. Learn to evaluate the risks of transplant/mechanical support and to weight the risks with the patients' heart failure status to justify proceeding with transplant/mechanical support surgery 3. Demonstrate ability to evaluate sensitization and understand donor matching protocols 4. Recognize psychosocial factors that increase the risk of adverse transplant outcomes
3. Management of the post-cardiac transplant patient	1. Understand the immunologic principles of immunosuppression 2. Demonstrate the ability to recognize and manage side effects of immunosuppressive therapy 3. Recognize the risks of malignancy development in the long-term post-transplant patients 4. Know the protocol for managing immunosuppression and performing surveillance biopsies for acute rejection 5. Demonstrate understanding and appropriate use of non-invasive biomarker testing for acute cellular rejection 6. Demonstrate ability to perform surveillance endomyocardial biopsy 7. Know how to manage both acute cellular and humoral allograft rejection
4. Management of the post-VAD implant patient	1. Demonstrate understanding of the difference between pulsatile and continuous flow VAD pumps, as well as familiarity amongst different pumps 2. Understand the importance of proper anticoagulation and thromboembolic prophylaxis 3. Recognize the signs of VAD pump malfunction such as increasing pump power requirements or decreasing flow rates 4. Recognize when patients who are managed as bridge-to-transplant are stable for transplant waitlist activation
5. Evaluation and management of pulmonary hypertension	1. Demonstrate the ability to evaluate pulmonary hypertension and diagnose according to the World Health Organization classification scheme 2. Demonstrate the ability to use history, examination, and test data to appropriate risk stratify patients 3. Demonstrate the ability to treat patients with pulmonary vasodilator medications appropriate, and demonstrate recognition of side effects or evidence of drug intolerance and manage these symptoms appropriately 4. Recognize when PH symptoms are progressing and require either treatment changes or referral for lung transplant evaluation 5. Recognize and manage evidence of resultant right heart failure
6. End-of-life issues	1. Learn to assess the mortality risk factors and prognosis in advanced heart failure patients 2. Demonstrate ability to conduct end-of-life and palliative care discussions with the patient and the family 3. Demonstrates ability to incorporate patient/family wishes and end-of-life goals into the treatment plan

Educational Content

Mix of Disease

Approximately 60% of patients seen by the Advanced Heart Failure/Transplant and Pulmonary Hypertension service are referred for evaluation of advanced heart failure. Approximately ⅓ to ½ of the patients with systolic heart failure will undergo evaluation for advanced heart failure therapy (cardiac transplantation or mechanical circulatory support). Approximately 40% of patients will be evaluated for pulmonary hypertension. Heart failure with preserved ejection fraction is a diagnosis that will be recognized in both patient groups.

Patient Characteristics

The patients seen by the University of Pittsburgh Medical Center Advanced Heart Failure Service reflect the demographics and spectrum of heart disease seen in Pittsburgh. The majority of the patients (~60%) are 50 years of age or older and are being evaluated for ventricular arrhythmias, conduction disease, atrial fibrillation or risk stratification following myocardial infarction. The remaining patients are under the age of 60 and will largely have supraventricular arrhythmias, syncope, non-ischemic or congenital heart disease. The majority of these patients will be male (~60%) with an approximately 50% split between in-patients and out-patient/same day procedures.

Environment of teaching

The clinical training and teaching environment for the advanced heart failure/transplant fellowship includes both inpatient and ambulatory clinical settings. The inpatient environment includes cardiac step-down and intensive care units as well as provision of inpatient consultative services on medical/surgical inpatient units and non-cardiac intensive care units. The core ambulatory clinical setting includes the:

- The advanced heart failure/pulmonary hypertension clinics which provide longitudinal care experience under the supervision of an Advanced Heart Failure/Transplant and Pulmonary Hypertension attending.
- The post-transplant clinic involves multidisciplinary care with the transplant nurse coordinators and a transplant pharmacist.
- Cardiac catheterization lab where the AHF/Tx fellow will learn to perform surveillance endomyocardial biopsy in post-cardiac transplant patients, invasive hemodynamic testing for cardiac transplant and pulmonary hypertension evaluations and use of both vasodilator challenges and provocative exercise testing in these evaluation procedures.

The core ambulatory clinical setting is augmented by elective clinics in hypertrophic cardiomyopathy and ventricular assist device management clinics.

Procedures and Services

The Advanced Heart Failure/Transplant and Pulmonary Hypertension services utilize the full spectrum of diagnostic, interventional and therapeutic procedures performed in the UPMC Presbyterian laboratories (echocardiogram, cardiac catheterization, nuclear, and cardiopulmonary exercise). The clinical fellowship trainees are expected to have developed competency in interpretation of echocardiograms, stress tests, and coronary angiograms. While the AHF/Tx fellow is expected to be able to also perform these procedures after completion of the general cardiology fellowship, the procedural skill development during the Advanced Heart Failure/Transplant and Pulmonary Hypertension fellowship focuses on performing invasive hemodynamic testing (RHC) and endomyocardial biopsy procedures.

During the Advanced Heart Failure/Transplant and Pulmonary Hypertension fellowship at UPMC, the trainee will have the opportunity to perform at least **100 endomyocardial biopsy procedures** (based on prior trainee's procedure logs). During RHC and endomyocardial biopsy procedures, the AHF/Tx fellow will learn:

1) Indications for right heart catheterization
2) The protocol for routine surveillance endomyocardial biopsies
3) Normal hemodynamic values during right heart catheterization
4) How to interpret abnormal hemodynamic values and apply the results to the clinical scenario appropriately
5) How to prevent, monitor, and manage complications of the right heart catheterization (e.g., accidental arterial puncture, bleeding, arrhythmia)
6) How to use the bioptome for endomyocardial biopsy
7) Correct placement of the bioptome during the biopsy to minimize risk of myocardial injury or perforation
8) How to prevent, monitor, and manage complications of the endomyocardial biopsy

While the AHF/Tx fellow will not be required to perform or learn the technical aspects of implanting the implantable cardioverter defibrillator (ICD) or cardiac resynchronization therapy (CRT) devices, the AHF/Tx fellow will be required to evaluate candidates for these therapies (minimum 50). As part of this requirement, the fellow trainee will learn the indications for ICD and CRT therapy. They will also learn the role of non-invasive alternatives for ICD therapy pending evaluation of myocardial recovery after treatment for ischemic heart disease or heart failure is initiated (e.g., LifeVest). The AHF/Tx fellow should also be familiar with how to interrogate the ICD/CRT devices to pull recorded data (e.g. atrial or ventricular arrhythmia events, anti-tachycardic pacing therapies, defibrillation therapies) and to recognized when there is device malfunction.

All of this meets or exceeds the American College of Cardiology Foundation COCATS 3 recommendations for Level III training in Advanced Heart Failure and the ACGME Program Requirements for Fellowship Education in Advanced Heart Failure/Transplant Cardiology[1,2].

Pathological and Other Resources

The pathology, radiology and laboratory services are fully supportive of the Advanced Heart Failure and Cardiac Transplant service. This involves pathology review of biopsy and autopsy specimens. Complete radiological and laboratory services are available through a Web-based interface though out the hospital and selected outside locations via a secure, encrypted system.

Educational Materials

All the current standard cardiology texts are available in the fellow's library along with selected cardiology journals and computers that allow access to internet based medical information sources such as the American College of Cardiology (ACC), American Heart Associations (AHA), Heart Failure Society of America (HFSA), and International Society of Heart, Lung Transplantation (ISHLT) websites.

Frequently, specific questions will arise that are best addressed with articles from cardiology or heart failure or transplant specific journals. These may be recommended by the faculty – or found during a literature survey conducted by the trainee. The University of Pittsburgh Health Sciences Library provides electronic access to a tremendous list of all key medical journals allowing on-line access to journal articles. It also offers PubMed and Ovid databases so that the fellow trainee is able to perform literature search from any location on the medical center or medical school campus, as well as from home. The health sciences library also provides medical references on-line including various cardiovascular textbooks and internet based medical references such as Up-to-Date and Micromedex.

Suggested Readings:

Recommended texts for the Advanced Heart Failure/Transplant fellowship trainee:

- Hosenpud, Jeffrey D. and Greenberg, Barry H. *Congestive Heart Failure.* 3rd edition. Philadelphia:

Lippincott Williams & Wilkins, 2007.

- Mann, Douglas L. *Heart Failure: A Companion to Braunwald's Heart Disease.* 2nd edition. St. Louis: Elsevier health Sciences, 2011.

Other educational material recommended for the fellowship trainee:

- 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. **Circulation**. 2013; *128*:e240–327

- 2017 **ACC/AHA**/HFSA Focused Update of the 2013 ACCF/AHA **Guideline** for the Management of **Heart Failure**: A Report of the American College of Cardiology/American **Heart** Association Task Force on Clinical Practice **Guidelines** and the **Heart Failure** Society of America. Yancy CW et al. Circulation. (2017)

- 2013 ISHLT Guidelines for Mechanical Circulatory Support: Executive Summary (Consensus Document) *J Heart Lung Transplant. 2013 Feb;32(2):157-87.*

- American Association for Thoracic Surgery/International Society for Heart and Lung Transplantation guidelines on selected topics in mechanical circulatory support (Guidelines) *J Heart Lung Transplant. 2020 Mar; 39(3):187-219*

- The 2016 International Society for Heart Lung Transplantation listing criteria for heart transplantation: A 10-year update (Guidelines) *J Heart Lung Transplant. 2015 Jan;25(1):1-23.*
- 2015 ESC/ERS Guidelines for the diagnosis and treatment of Pulmonary Hypertension. Eur Heart J. 2016 Jan 1;37(1):67-119. doi: 10.1093/eurheartj/ehv317. Epub 2015 Aug 29.

Formal Conferences

The core conferences which the AHF/Tx fellows are expected to attend are listed below:

1. Multidisciplinary transplant selection conference
2. Post-transplant patient management conference
3. VAD and Transplant M & M
4. Heart Success Monthly Conference

The details of these conferences have been outlined above and help us meet our objectives for the Competencies of **Patient Care, Medical Knowledge, Interpersonal Communications, Professionalism** and **Practice-Based Learning.**

Methods of Fellow Evaluation

During the course of their clinical training, the fellow will be evaluated by a variety of methods including:

1. Daily faculty feedback
2. Quarterly global evaluations
3. Semiannual progress review
4. Log book review
5. 360 evaluation
6. Peer-to-peer review

The **"**One-on-One**"** teaching method employed in the Advanced Heart Failure/Transplant service, ambulatory clinics, and cardiac catheterization/biopsy labs leads to **Daily Feedback from the Faculty** regarding the trainee's progress in every aspect of their AHF/Tx training. This feedback occurs in the biopsy lab while the fellow is performing a procedure, during conferences when they are presenting patient cases, on ward rounds when they are developing a treatment plan or in the Ambulatory Clinic when they are evaluating new patients or following up on prior treatments. This frequent, close interaction allows the faculty to observe the trainee's procedural skills, **Medical Knowledge**, **Professionalism**, **Interpersonal Skills,** and ability to employ **Practice-Based Learning** in the overall context of Patient Care. This closeness also allows them the judge the trainee's progress in comparison to other fellows at a similar point in their training.

These observations provide the basis for the formal **Quarterly Global evaluation** completed by the faculty for each of the AHF/Tx fellows. These evaluations are provided for the trainee's review so that he may sign it if he concurs with the assessment or discuss any disagreement with the faculty at that time. These evaluations also provide input for the Program Director when he conducts the **Semiannual Review of Progress**.

The **Technical Skills** that separate the AHF/Tx from other Cardiologists are evaluated throughout the year. Biopsy and right heart catheterization procedures are performed together with the faculty attending and the AHF/Tx on a one-on-one basis which allows for direct discussion on proper patient evaluation, procedural technique, and review of data acquisition/interpretation continuously. Log book reviews will serve to document a sufficient number of performed procedures (as judged by COCATS 3) to provide proficiency.

The **Peer-to-Peer** and **360 Evaluations** from the associated professionals provide further input to determine both the **Interpersonal Skills** and **Professionalism** of the trainee as well as some aspects of their **Medical Knowledge, Practice-Based Learning** and **Patient Care**.

The **Longitudinal Patient Evaluations** are a means of evaluating the continuity of patient care by examining the initial evaluation, the procedural report and ambulatory clinic follow up visits - performed by the trainee - for a sample of patients. This allows an assessment of the competencies of **Patient Care, Medical Knowledge, Practice-Based Learning, Professionalism, Interpersonal and Communication Skills, System-Based Practice** and **Procedural Skills** as they are integrated into the continuity of patient care. These are provided to the Program Director and reviewed with the trainees at the semiannual reviews.

Fellow Evaluation Criteria

Patient Care: The trainee that is fully competent in **Patient Care** regularly integrates medical facts and clinical data, weighs alternatives, understands limitations of knowledge, and considers risks and benefits in patient care. Their presentations, records and progress notes are always accurate, responsive, explicit, and concise.

Medical Knowledge: The trainee that is fully competent in **Medical Knowledge** demonstrates extensive knowledge of Advanced Heart Failure and Transplant cardiology and is consistently up to date, applying that knowledge in appropriate circumstances.

Practice-Based Learning: The trainee that is fully competent in **Practice-Based Learning** constantly evaluates their own performance, incorporates feedback into improvement activities and effectively uses technology to manage information for patient care and self-improvement.

Communication and Interpersonal Skills: The trainee that is fully competent in **Communication and Interpersonal Skills** establishes an effective therapeutic relationship with patients and families. They demonstrate relationship building with patients, families, colleagues and other health care worker through their listening, narrative and nonverbal skills. They provide excellent education and counseling to patients, families, and colleagues - remaining interpersonally engaged with the object of their communication.

Professionalism: The trainee that is fully competent in **Professionalism** demonstrates respect, compassion, integrity, and honesty in their interactions with others. They teach responsible behavior and

serve as a role model remaining committed to self- assessment; willingly acknowledges errors and always consider the needs of patients, families, and colleagues.

System-Based Practice: The trainee that is fully competent in **System-Based Practice** accesses/ utilizes outside resources to improve patient care. They also use systematic approaches to reduce errors and improve patient care, taking the initiative and/or enthusiastically assisting in the development of systems to improve patient care.

Procedural Skills: The trainee that is fully competent in **Procedural Skills** is fully capable of independently performing procedures with an acceptable complication rate. They individualize the procedure based on the unique characteristics of each patient and readily ask others for help/guidance when appropriate.

Responsibilities of the Advanced Heart Failure/Transplant Fellows

The AHF/Tx fellow is responsible for the evaluation and treatment of the advanced heart failure or transplant patients in collaboration with the attending faculty. They must be available throughout the working day by pager and must notify the Program Director and supervising faculty if they are unexpectedly required to be absent.

All AHF/Tx fellows are expected to attend and actively participate in all **clinical and research conferences**, including the weekly post-transplant patient management conferences (Tuesdays 12 Noon to 1 PM), weekly multidisciplinary transplant selection committee (Mondays 4 PM to 5 PM), and monthly Heart Success conferences. This means the trainee should be prepared to participate in the conference discussions.

During the **Cardiac Catheterization Laboratory Experience**, it is expected that the AHF/Tx trainee will interview/examine patients *before the procedure*, performing an appropriate history/physical with review of the records. The fellow will demonstrate familiarity with the patients' medical history and the reason for either the endomyocardial biopsy or right heart catheterization procedure.

The AHF/Tx trainee will be involved in performing the procedure, with increasing degrees of involvement and independence as their experience and skill grows. They will be expected to check on the patients they performed procedures on – before leaving for the day and will be available during the regular workday to address any concerns that may arise during the post-procedure period.

During the **Inpatient/Consultation Experience**, the AHF/Tx fellow will be responsible for developing the treatment plan for hospitalized patients in collaboration with the attending physician. The fellow will also organize the AHF and VAD/Txp service with attention towards a fair distribution of patients between the other rotating cardiology fellows or internal medicine resident, and appropriate prioritization of patients in terms of the immediacy of consultation. The AHF/Tx fellow will also ensure that any involved internal medicine resident or mid-level practitioner/physician extender involved in the patients' medical care is updated on treatment and diagnostic plans after participating in the clinical (patient management) rounds with the faculty attending.

During the **Ambulatory Care Experience**, the fellow will attend the ambulatory clinic with one of the attending heart failure/transplant cardiologists one-half day each week. The heart failure/transplant cardiologists at UPMC have varying clinical focuses and their patient populations vary. In order to ensure an appropriate diversity of patient contact while maintaining continuity of longitudinal and follow-up care, the AHF/Tx fellows will rotate their ambulatory clinics every 4 months amongst three attending heart failure/transplant cardiologists. In this way, the AHF/Tx fellows also gain the additive value of experiencing different management patterns. The longitudinal ambulatory clinic experience is enhanced by regular attendance in the post-transplant clinic, pulmonary hypertension clinic, VAD clinic, Amyloid clinic, ACHD clinic and hypertrophic cardiomyopathy clinic.

The **Research Experience** will provide the fellow with one-half day each week (non-service weeks) to complete research efforts, prepare abstracts for presentation or complete manuscripts for peer review and publication.

Duty Hours
The duty hours for the AHF/Tx fellow conform to the guidelines issued by the Graduate Medical Education committee of the University of Pittsburgh and have the same restrictions regarding work or "moonlighting" outside of the Advanced Heart Failure/Transplant fellowship training program.

The AHF/Tx fellow does rarely takes home call. They are expected to conduct weekend rounding 1-2 times per month.

In order to comply with training guidelines, the fellow will be asked to track their time in the hospital and days off on a time sheet that will be returned to the program director at the end of each month.

Procedure Logs
Each AHF/Tx fellow trainee is responsible for maintaining a log of supervised procedures. The format of this log should conform to the procedure log contained in the UPMC Fellowship in Cardiovascular Disease program manual and should contain (at a minimum) entries for Patient, Date, Procedure Type, Indications, Diagnosis, Complications and Supervisor Signature. Copies of this log should be provided to the Advanced Heart Failure/Transplant Training Program Director a minimum of each quarter for inclusion in the trainee's file. If these logs are not provided, it will be impossible for the Program Director to certify that the trainee has fulfilled the requirements of the Advanced Heart Failure/Transplant Fellowship.

Expected Advanced Heart Failure/Transplant Fellow Accomplishments

Following the successful completion of this year of clinical electrophysiology training, the fellow will have achieved Level III training in Advanced Heart Failure/Transplant Cardiology with a wide range of experience and will be competent to act as a consultant and clinical care provider in cardiomyopathy, advanced heart failure, pulmonary hypertension, and post-transplant management with the invasive skills needed to perform right heart catheterization hemodynamic studies and endomyocardial biopsies. They will also be familiar with UNOS guidelines and transplant procedures including the criteria for cardiac transplantation.

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3. Francis GS, Breenberg BH, Shus DT, Jaski BE, Jessup M, LeWinter MM, Pagani FD, Piña IL, Semigran MJ, Walsh MN, Wiener DH, yancy CW, Jr. ACCF/AHA/ACP/HFSA/ISHLT 2010 Clinical competence statement on management of patients with advanced heart failure and cardiac transplant: a report of the ACCF/AHA/ACP task force on clinical competence and training. Curculation 2010;122:644-672.
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   2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. **Circulation**. 2013; *128*:e240–327

6. 2017 **ACC/AHA**/HFSA Focused Update of the 2013 ACCF/AHA **Guideline** for the Management of **Heart Failure**: A Report of the American College of Cardiology/American **Heart** Association Task Force on Clinical Practice **Guidelines** and the **Heart Failure** Society of America. Yancy CW et al. Circulation. (2017)

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