



Department of Internal Medicine
Division of Cardiovascular Medicine
Clinical Cardiac Electrophysiology
Fellowship Training Program
Curriculum, Program Information

CLINICAL CARDIAC ELECTROPHYSIOLOGY FELLOWSHIP TRAINING PROGRAM

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GENERAL INFORMATION

Program Information

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Mission Statement

The Division of Cardiovascular Medicine was established in 1967. Since that time, its programs have been nationally recognized for their excellence in patient care, medical education, basic and clinical research, and service to the community. The mission statement of the Division closely reflects that of the UC Davis Health System.

To heal, to teach, to discover and to serve

Patient care: To provide access to the latest advances in electrophysiology and consistently deliver high-quality care with competence, respect, dignity and compassion.

Education: To provide current and future health care professionals with the knowledge and to provide exemplary patient care and to foster and support continued learning throughout their careers.

Research: To advance the understanding of cardiovascular medicine through basic and applied research and translation of these discoveries into effective approaches to disease prevention, diagnosis and treatment.

Service: To provide leadership and promote collaborative relationships with the public and private sectors to build a healthier community and region, with particular regard to cardiovascular medicine.

Eligibility Criteria

The Electrophysiology fellow must successfully complete a 3 year ACGME-accredited specialty program in cardiovascular disease prior to appointment in this fellowship.

PROGRAM GOALS AND OBJECTIVES

CCEP fellows will spend 24 months rotating on the Arrhythmia Services of the UCD Medical Center. This time will be distributed among well-defined experiences in specific rotations and clinical settings designed to ensure that all educational objectives are met.

Upon completion of training, the fellow is expected to be proficient in all ACGME and ABIM required and AHA/ACC/HRS task force training guideline recommended aspects of clinical cardiac electrophysiology. (see attached)

Overall Program Goals

The goals of our program are to train fellows who:

- Have a broad knowledge of the total spectrum of arrhythmias, both supraventricular and ventricular tachyarrhythmias, as well as bradyarrhythmias.
- Have an advanced knowledge base in CCEP and pharmacology.
- Are adept in interpreting complex electrocardiology and able to provide expert consultative care for patients with arrhythmias.
- Are familiar the indications for and proficient with the safe performance of invasive electrophysiology procedures.
- Are capable of performing and analyzing both noninvasive and invasive electrophysiologic tests without supervision.
- Have participated in and are able to critically analyze research pertaining to electrophysiology.
- Perform well as members of the CCEP healthcare team
- Provide compassionate and professional state-of-the-art care to their patients with arrhythmias.

Overall Program Objectives

Fellows will achieve the **Level 3** knowledge and skills delineated in the **ACCF 2008 COCATS 3, Task Force 6 Guidelines for Training** endorsed by the Heart Rhythm Society (HRS).

- Requirements of all three levels must be met.
- Candidates will have already fulfilled Level 1, and possibly Level 2 training in their three-year general cardiology fellowship.
- Prior procedure volume during Levels 1 and 2 training can be counted toward total Level 3 numbers.

A. Clinical Experience:

1. Evaluation and treatment of inpatients and outpatients with the following disorders:
 - a) Disorders of cardiac rhythm, including but not limited to:
 - sinus node dysfunction;
 - atrioventricular (AV) and intraventricular block; and
 - supraventricular including Wolff-Parkinson-White (WPW) syndrome
 - ventricular tachyarrhythmias including aborted sudden cardiac death
 - b) Unexplained syncope and palpitations
 - c) Primary Repolarization Abnormalities including Long and Short QT syndromes
 - d) J-Wave Syndromes, including Brugada syndrome, Arrhythmogenic Early Repolarization

- 50 pacemakers
 - 15 biventricular pacing systems
 - 3 Insertable Cardiac Monitor procedures
- b) Device programming, with a minimum of 100 interrogations
- defibrillation threshold testing
 - final prescription of anti-tachycardia pacing and defibrillation therapies.

Formal Instruction

1. Content Areas:

- a) Basic Cardiac Electrophysiology, including but not limited to:
- Genesis of Arrhythmias
 - Normal and Abnormal Electrophysiologic Responses
 - Autonomic Influences
 - Effects of Ischemia
 - Drugs and Other Interventions
- b) Clinical Cardiac Electrophysiology
- c) Arrhythmia Control Device Management
- d) Genetic Basis of Pathological Arrhythmias
- e) Epidemiology of Arrhythmias
- f) Clinical Trials of arrhythmia management and their impact on clinical practice

2. Knowledge will be gained through:

a) Educational Conferences

Teaching conferences are convened at the institutional, departmental and section level and all contribute to the educational experience of the cardiac electrophysiology trainee:

- Core Curriculum Lecture Series (**CCL**)
 - Department of Medicine Grand Rounds (**GR**)
 - Division of Cardiology Grand Rounds (**CGR**)
 - Electrophysiology Program Conference (**EPC**)
 - Electrophysiology Program Journal Club (**JC**)
 - Electrophysiology Program Case Conference (**CC**)
 - Invasive Cardiology Conference (**ICC**)
 - EKG Conference (**EKG**)
 - Continuous Quality Improvement Conference (**M&M**)
 - Research Conference (**RC**)
- b) Teaching Rounds
- c) Outpatient Longitudinal Clinic Experiences including arrhythmia, pacemaker and ICD clinics
- d) Outpatient and Inpatient Consultations
- e) Care of Patients before, during, and after electrophysiologic studies
- f) Preoperative and Postoperative Arrhythmia Management
- g) Performance and Analysis of Noninvasive and Invasive Tests, including
- diagnostic electrophysiologic studies
 - electrocardiography
 - therapeutic electrophysiologic procedures including
 - catheter ablation
 - pacemaker implantation
 - cardioverter-defibrillator implantation
 - arrhythmia surgery

Direct Patient Care

The collaborative relationship between attending physician and trainee in the delivery of patient care is at the core of this Program. The provision of high-quality patient care is the fundamental vehicle for teaching and learning of all required competencies. In the development of the CCEP fellowship's educational objectives direct patient care is divided into three loci of care where the particular skills required of the successful sub-specialist in cardiac electrophysiology differ:

- | | |
|--|--|
| 1. Outpatient Clinic (OP) | ICD & Pacemaker Clinic, Arrhythmia Clinic |
| 2. Consultation (H) | CCU, SICU, MICU, Inpatient Wards, Arrhythmia Clinic and Emergency Department |
| 3. Electrophysiology Laboratory (EPL) | |
| 4. Research (R) | |

The fellow will be required to formulate, perform, summarize and present a Clinical or Basic Electrophysiology **Research Project** prior to completion of training.

CORE COMPETENCIES

Competency

The Accreditation Council for Graduate Medical Education (ACGME) has defined six areas of competency, which residents must attain over the course of their postgraduate training. The Cardiac Electrophysiology Curriculum has been organized around these core competencies.

Internal and external methods of assessment have also been developed to address the success of the program in achieving adequate resident training in these defined competencies (See evaluation). The following activities within the fellowship program and locations within the institution provide the teaching, learning, and assessment opportunities for the trainee to obtain these core competencies in clinical cardiac electrophysiology:

The six ACGME core competencies, the principal educational goals of the Clinical Cardiac Electrophysiology program in each competency domain, and the learning activities through which these will be taught and assessed are described below:

1. Patient Care

Fellows are expected to provide patient care that is compassionate, appropriate and effective for the promotion of health, prevention of illness, treatment of disease and care at the end of life.

- Gather accurate, essential information from all sources, including medical interviews, physical examination, records, and diagnostic/therapeutic procedures.
- Make informed recommendations about preventive, diagnostic, and therapeutic options and interventions that are based on clinical judgment, scientific evidence, and patient preferences.
- Develop, negotiate and implement patient management plans.
- Perform competently the diagnostic and therapeutic procedures considered essential to the practice of Clinical Cardiac Electrophysiology.

Principal Educational Goals	Learning Activities
Interview and examine patients more skillfully	OP, H
Interpret noninvasive data more skillfully	OP, H, EPC, CC, EKG
Interpret invasive data more skillfully	EPL, EPC, CC, ICC
Successfully evaluate and manage implanted devices	OP, H, EPL, EPC, CC,
Generate and prioritize differential diagnoses	OP, H, EPL, EPC, CC, ICC
Develop rational, evidence-based management strategies	OP, H, EPL, EPC, CC, ICC

2. Medical Knowledge

Fellows are expected to demonstrate knowledge of established and evolving biomedical, clinical and social sciences, and demonstrate the application of their knowledge to patient care and education of others.

- Apply an open-minded and analytical approach to acquiring new knowledge.
- Develop clinically applicable knowledge of the basic and clinical sciences that underlie the practice of Clinical Cardiac Electrophysiology.
- Apply this knowledge in developing critical thinking, clinical and technical problem solving, and clinical decision-making skills.
- Access and critically evaluate current medical information and scientific evidence and modify knowledge base accordingly.

Principal Educational Goals	Learning
Expand clinically applicable knowledge base of the basic and clinical sciences underlying the care of patients with cardiac arrhythmias in accordance with Part 2 of the CCEP curriculum	OP, H, EPL, GR, CGR, EPC, JC, CC, ICC
Access and critically evaluate current medical information and scientific evidence relevant to care of the arrhythmia patient	DPC-OP, EPC, JC, CC

3. Practice-Based Learning and Improvement

Fellows are expected to be able to use scientific methods and evidence to investigate, evaluate, and improve their patient care practices.

- Identify areas for improvement and implement strategies to improve knowledge, skills, attitudes, and processes of care.
- Analyze and evaluate practice experiences and implement strategies to continually improve the quality of the practice of Clinical Cardiac Electrophysiology.
- Develop and maintain a willingness to learn from errors and use errors to improve the system or processes of care.
- Use information technology or other available methodologies to access and manage information and support patient care decisions and personal education.

Principal Educational Goals	Learning Activities
Identify and acknowledge gaps in personal knowledge and skills in the care of arrhythmia patients	OP, H, EPL, CC, EPC, ICC
Develop and implement strategies for filling gaps in knowledge and skills	JC, CC, EPC, CGR, GR, ICC

4. Interpersonal Skills and Communication

Fellows are expected to demonstrate interpersonal and communication skills that enable them to establish and maintain professional relationships with patients, families, and other members of health care teams.

- Provide effective and professional specialist consultation to other physicians and health care professionals and sustain therapeutic and ethically sound professional relationships with patients, their families, and colleagues.
- Use effective listening, nonverbal, questioning, and narrative skills to communicate with patients and families.
- Interact with consultants in a respectful and appropriate fashion.
- Maintain comprehensive, timely, and legible medical records.

Principal Educational Goals	Learning Activities
Communicate effectively with patients and families	H, OP, EPL
Communicate effectively with physician colleagues at all levels	H, OP, EPL, CCL
Communicate effectively with all non-physician members of the health care team to assure comprehensive and timely care of arrhythmia patients	H, OP, EPL
Present patient information concisely and clearly, verbally and in writing	OP, H, EPL, EPC, CC
Teach colleagues effectively	H, EPL, EPC, JC, CC, ICC

5. Professionalism

Fellows are expected to demonstrate behaviors that reflect a commitment to continuous professional development, ethical practice, an understanding and sensitivity to diversity and a responsible attitude toward their patients, their profession, and society.

- Demonstrate respect, compassion, integrity, and altruism in their relationships with patients, families, and colleagues.
- Demonstrate sensitivity and responsiveness to patients and colleagues, including gender, age, culture, religion, sexual preference, socioeconomic status, beliefs, behaviors and disabilities.
- Adhere to principles of confidentiality, scientific/academic integrity, and informed consent.
- Recognize and identify deficiencies in peer performance.
- Develop a clear understanding of the complex and challenging relationships in Clinical Cardiac Electrophysiology between clinician/providers, hospitals and industry; understand the inherent conflicts of interest in many relationships with industry and its representatives, and develop strategies to ensure clear boundaries that are designed to uncompromisingly prioritize high quality patient care.

Principal Educational Goals	Learning Activities
Behave professionally toward patients, families, colleagues, and all members of the health care team	All Activities
Recognize the substantial pressures in cardiac electrophysiology that create a potential for conflicts of interest and develop strategies for avoidance of impropriety	EPL, H, OP, RC

6. Systems-Based Practice

Fellows are expected to demonstrate an understanding of the contexts and systems in which health care is provided, and demonstrate the ability to apply this knowledge to improve and optimize health care.

- Understand, access, and utilize the resources and providers necessary to provide optimal care.
- Understand the limitations and opportunities inherent in various practice types and delivery systems, and develop strategies to optimize care for the individual patient.
- Given the high costs of many treatments, residents are expected to apply evidence based, cost-conscious strategies to prevention, diagnosis, and treatment selection in cardiac electrophysiology.
- Collaborate with other members of the health care team to assist patients in dealing effectively with complex systems and to improve systematic processes of care.

Principal Educational Goals	Learning Activities
Understand and utilize the multidisciplinary resources necessary to care optimally for patients with cardiac arrhythmias	H, CCL, M&M
Collaborate with other members of the health care team to assure comprehensive patient care	H, OP
Use evidence-based, cost-conscious strategies in the care of arrhythmia patients	H, OP, EPL, CCL, GR, EPC, JC, CC, ICC, CGR

CCEP FELLOWSHIP TRAINING PROGRAM ROTATIONS

Electrophysiology Laboratory

The electrophysiology laboratory experience will lead to mastery level knowledge of the accepted indications for invasive EP procedures, and performance of all technical aspects of diagnostic and therapeutic procedures in patients with cardiac arrhythmias and pre- and post-operative management. The fellow will care for a broad range of patients with major disorders including sinus node dysfunction, AV and intraventricular block, supraventricular and ventricular arrhythmias, WPW syndrome, unexplained syncope, sustained ventricular tachycardia and aborted sudden death, and palpitations.

The CCEP fellow is expected to master the techniques of:

- venous and arterial catheterization
- catheter placement
- evaluation of complex electrophysiologic phenomenon
- paced induction and termination and defibrillation of tachycardias
- recording and interpretation of catheter signals during ablation
- stimulation of the heart and interpretation of the effects of stimulation
- direct observation of the electrophysiologic effects of antiarrhythmic agents
- effective and safe performance of catheter ablation.

The CCEP fellow will achieve expertise in the evaluation of patients for:

- ICD implantation
- implantation of nonthoracotomy ICD systems
- defibrillation threshold testing
- anti-tachycardia pacing testing
- low energy cardioversion testing

The fellow will master ICD device:

- indications for placement
- programming
- post-operative management.
- Interpretation

The CCEP fellow will become fully skilled in permanent pacemaker:

- prescription
- implantation
- intraoperative testing
- post- operative management.

The CCEP fellow will master these skills in a progressive, educational experience through 3 EP Laboratory Rotation Levels. The CCEP EP Lab rotations are expected to provide training and experience in all six core competencies.

EP Lab I

Emphasis is placed on the fundamental requirements for diagnostic electrophysiology studies, including:

- catheter selection and placement
- programmed stimulation
- electropharmacology
- interpretation of EP tracings
- understanding basic arrhythmia mechanisms
- tilt testing
- sterile surgical techniques for placement

- testing of endocardial pacemaker and ICD leads and generators

EP Lab II

Emphasis is placed on:

- intra-cardiac mapping techniques
- understanding simple arrhythmia mechanisms
- pace mapping
- entrainment,
- fundamentals of catheter ablation
- implantation of pacemakers and ICDs
- advanced pacemaker programming
- ICD testing

EP Lab III

Emphasis is placed on:

- mapping and ablation techniques in complex arrhythmias with stereotaxis navigation
- continued experience implanting, programming and testing pacemakers and ICDs
- lead extractions

EP Consultation

The CCEP fellow will attain mastery of arrhythmia consultation on patients with the entire spectrum of arrhythmia disorders. The settings in which consultations will be performed include the CCU, SICU, MICU, Inpatient Wards, arrhythmia Clinic, and Emergency Department. The CCEP fellow will acquire the skills of arrhythmia management by actively participating in the care of critically ill patients having recurrent arrhythmias. This will include the selection and proper use of antiarrhythmic agents, pacing, defibrillation, cardiopulmonary resuscitation, evaluation for ischemia, and arrhythmia ablation.

Outpatient Clinic

A. ICD & Pacemaker Clinic (one 1/2 day per week)

The CCEP fellow will fully master the techniques of pacemaker follow-up, reprogramming, indications for device replacement, and evaluation of defective leads.

The CCEP fellow will fully master the techniques of outpatient management of patients with implanted arrhythmia devices (ICDs) including device interpretation and reprogramming, interpretation of delivered therapies, interpretation of stored intracardiac electrograms, and determination of the indications for device replacement

B. Arrhythmia Clinic (one 1/2 day per week)

The CCEP fellow will acquire mastery of the initial evaluation and longitudinal follow-up of patients with arrhythmic symptoms and diagnosis. This will include assessing patients for the efficacy and side effects of chronic drug or device therapy, and the diagnosis and management of concomitant conditions which might exacerbate arrhythmias.

The CCEP fellow will master the outpatient evaluation of patients referred for arrhythmia consultation.

EP Research

The CCEP fellow will formulate a research project related to clinical or translational electrophysiology, to be continued throughout the CCEP training. The CCEP fellow will be expected to discuss research options with the CCEP faculty, then provide the CCEP Training Director with a formal project outline including hypothesis, study design, power calculation and proposed funding sources. Upon program approval, the fellow will embark on obtaining IRB approval, followed by data collection, analysis and manuscript preparation. It is expected that each fellow will submit at least one peer-reviewed manuscript during his/her training, and present the results at a National Meeting.

Rotation Curricula and Rotation Specific Competencies

Patient Care (PC)

Medical Knowledge (MK)

Practice Based Learning and Improvement (PBLI)

Interpersonal Skills and Communications (IPC)

Professionalism (P)

Systems Based Practice (SBP)

EP Lab

At UC Davis Health pacemakers, ICDs, biventricular devices, and implantable loop recorders are implanted in a dedicated EP lab, which meets OR specifications. Lead extractions are also performed. Surgeons do not participate in the cases, but are available for backup. The EP fellow will participate in all of these cases.

Patients encompass a broad spectrum of ages and disease types, insurance types, and the gender mix is appropriate. Due to the large number of patients with congenital heart disease and cardiomyopathies who are followed at our institution, many of our device patients are very complex and have severe underlying heart disease. Prior to implant, patients have either been evaluated as an outpatient in the clinic or as an EP consult in the hospital. Hospital transfers may be worked up in our observation unit adjacent to the EP lab.

Goal

The purpose of this rotation is to train fellows to proficiently and safely implant devices in the appropriate patients.

EP Lab I

By the end of four months, the fellow will be able to:

Principal Educational Goals	Core Competencies
Interview patients skillfully	PC, MK, IPC, P
Perform Skillful physical examinations	PC, MK, P
Begin to interpret non-invasive EP data with close supervision	MK, PC
Begin to interpret invasive EP data with close supervision	MK, PC
Evaluate and manage implanted devices with direct supervision	PC, MK
Generate and prioritize differential diagnosis	PC, MK, PBL
Develop rational, evidence-based management strategies	PC, MK, PBL, SBP
Communicate effectively and professionally with EP lab team members	IPC, P
Communicate effectively and professionally with EP patients	IPC, P
Demonstrate understanding of the indications for implantation of ILRs (implantable loop recorders), pacemakers, ICDs and resynchronization devices.	PC, MK
Discuss with the patient the indication for their device, the procedure, risks and benefits.	PC, MK, ICS, P

Demonstrate knowledge of the co-morbid factors that increase the risk of the procedure planned.	PC, MK
Assist or perform, with supervision, an uncomplicated pacemaker or ICD implant, including pocket formation, vascular access, RA and RV lead placement and pocket closure.	PC, MK
Assist or perform, with supervision, an uncomplicated generator change.	PC, MK
Identify acceptable implant parameters, including pacing and sensing thresholds, and impedance.	PC, MK
Assist in defibrillation threshold testing and demonstrate understanding of what an acceptable threshold is.	PC, MK
Assist in the placement of a coronary sinus lead.	PC, MK
Perform, with supervision, the placement of an ILR.	PC, MK
Assist in the management of conscious sedation.	PC, MK, ICS

EP Lab II

By the end of eight months, the fellow will be able to:

Principal Educational Goals	Core Competencies
All of the learning objectives of EP Lab I (noted above)	
Interpret invasive data with moderate assistance from faculty	MK, PC
Evaluate and manage patients implanted devices with minimal assistance from faculty	MK, PC
Perform placement of simple catheter	MK, PC, PBL, IPC, P
Perform EP studies and ablations	PC, MK, PBL, IPC, P
Perform implantation of pacemakers, CRTD, and ICD with close supervision	PC, MK, PBL, IPC, P
Perform, with supervision, an uncomplicated pacemaker or ICD implant.	PC, MK
Assist or perform, with supervision, a pacemaker or ICD revision, including pocket revision and/or lead revision.	PC, MK
Perform, with supervision, the placement of a coronary sinus lead.	PC, MK
Oversee the management of conscious sedation.	PC, MK, ICS, P

EP Lab III

By the end of 24 months, the fellow should be able to independently perform:

*(*Independence here denotes skill level only. Supervision is always in place.)*

Principal Educational Goals	Core Competencies
All of the learning objectives of EP Lab I and II (noted above)	
Accurately interpret invasive data independently	MK, PC
Independent placement of devices,- pacemakers, ICD, CRTD, including coronary sinus lead placement	MK, PC, IPC, PBL, P
Acquire and demonstrate skills for advanced ablation	MK, PC, IPC, P
Acquire and demonstrate skills for lead extractions	MK, PC, IPC, P
Perform EP studies and ablations	PC, MK, PBL, IPC, P, SBP
Begin implantation of pacemakers, CRTD, and ICD	PC, MK, PBL, IPC, P, SBP
Perform lead or pocket revision	PC, MK
Demonstrates understanding of practice management issues relevant to the specialty, such as insurance, reimbursement, billing and coding	SBP
Incorporates considerations of cost awareness and risk/benefit analysis into patient care	SBP

Fellow Responsibilities/Duties

- Evaluate and obtain consent from all patients who will undergo a device implant (for cases which he/she will be participating).
- Review labs and other pertinent pre-op data and discuss the case with the EP attending prior to beginning the procedure.
- Participate as an assistant or primary operator, depending upon the complexity of the case and his/her stage of training.
- Place computer post-op orders and check post-op EKG and CxRs.
- Fill in data for computerized reports and review with the EP attending.
- Follow patients in recovery, monitoring for any potential complications.
- Keep a personal log of all his/her procedures that must include:
 - procedure description
 - indication
 - complications
 - supervising attending.

Faculty Supervision

- Qualified faculty is present for the entirety of every procedure.
- Fellows assume progressively increasing responsibility, according to their level of education, ability and experience.
- Before and after procedures, faculty can be reached easily and quickly.
- The fellow will review the case with the faculty member pre-op, and the attending and fellow will discuss the results of the case post-op.

Evaluation

The fellow is continuously evaluated by the attending during all interactions. Every procedure performed is overseen by the supervising faculty member. Device implants are done concurrently with the other fellowship assignments, throughout the 24-month training period.

The fellow receives written evaluations from each of the implanting EP attendings every three months and a semi-annual general evaluation, both based on the ACGME core competencies. The EP program director discusses these evaluations with the fellow semiannually.

The fellow also receives 360-degree evaluations from patients and staff, providing feedback on communication skills and his/her professionalism. The fellow performs a semiannual self-evaluation, which the program director reviews at the semiannual meeting. The fellow confidentially evaluates the attendings and EP program. The faculty evaluates the fellow anonymously with the cardiovascular fellows, thereby protecting his/her anonymity.

Teaching Methods

Didactic sessions

Conferences

The fellow scrubs as the 1st-degree operator on all his implant cases. The attending is also scrubbed and beside the fellow for the entire case.

EP Consultation

The CCEP fellow will attain mastery of arrhythmia consultation on patients with the entire spectrum of arrhythmia disorders. The settings in which consultations will be performed include the CCU, SICU, MICU, inpatient wards, outpatient clinics, and emergency room. In the ICU setting, the CCEP fellow will acquire the skills of arrhythmia management by actively participating in the care of critically ill patients having recurrent arrhythmias. This will include the proper use of antiarrhythmic agents, pacing, defibrillation, cardiopulmonary resuscitation, evaluation for ischemia, and arrhythmia ablation.

Goal

The purpose of this rotation is to train fellows to competently consult on patients with the entire spectrum of arrhythmia disorders.

Objectives

By the end of six months, the fellow should be able to:

- obtain a full history with a focus on the pertinent facts pertaining to the question posed to the EP consultation service. *(PC, MK, ICS)*
- independently develop a differential diagnosis and diagnostic plan for the evaluation of clinical problems encountered in the hospital setting including: syncope, cardiac arrest, wide complex tachycardia, narrow complex tachycardia and bradycardia. *(PC, MK, PBLI)*
- acutely manage clinical cardiac problems including cardiac arrest, wide complex tachycardia, atrial fibrillation with rapid ventricular response, and complete heart block, with minimal supervision. *(PC, MK)*
- place a temporary transvenous pacemaker, with minimal supervision. *(PC, MK)*
- perform, with supervision, the analysis and troubleshooting of pacemakers and ICDs. *(PC, MK)*
- independently evaluate telemetry strips and EKGs. *(PC, MK)*
- Use information technology or other available methodologies to access and manage information and support patient care decisions and personal education. *(PBLI)*
- interact with consulting healthcare team members in a respectful and appropriate fashion. *(ICS, P)*
- discuss clearly and professionally with other physicians, staff, patients and their family the findings, opinions, and recommendations of the EP service. *(PC, MK, PBLI, ICS, P, SBP)*
- Use effective listening, nonverbal, questioning, and narrative skills to communicate with patients and families. *(ICS, P)*
- demonstrate respect, compassion, integrity, and altruism in their relationships with patients, families, and colleagues. *(ICS, P)*
- demonstrate sensitivity and responsiveness to patients and colleagues, including gender, age, culture, religion, sexual preference, socioeconomic status, beliefs, behaviors and disabilities. *(PC, P)*
- adhere to principles of confidentiality, scientific/academic integrity, and informed consent. *(P)*
- maintain comprehensive, timely, and legible medical records. *(ICS, P)*

In addition to the above, by the end of 24 months, the fellow should demonstrate the ability to:

- independently provide inpatient EP consultation services. *(PC, MK, PBLI, ICS, P, SBP)*
- perform, without supervision, the analysis and troubleshooting of implantable devices. *(PC, MK, PBLI)*
- provide effective and professional specialist consultation to other physicians and health care professionals. *(PC, MK, ICS, P, SBP, PBLI)*

Fellow Responsibilities/Duties

The fellow will:

- see inpatient arrhythmia consults in a timely manner, and writing a consult note on the chart.
- present all consult cases to the EP consult attending, with whom an evaluation and treatment plan will be discussed.
- obtain consent for any invasive EP procedure planned.
- participate in any EP invasive procedures required for the consult patients he/she is following.

- write follow-up notes on the chart, as needed, to provide information on test results and revise recommendations.
- communicate with the primary team requesting the consult.
- interact professionally with the patient and family, providing education and answering questions. The fellow will assume gradually increased responsibility for this role.

Faculty Supervision

The fellow will present each consult patient case to the EP attending at the bedside, at which time the evaluation and treatment plan will be discussed.

All EP procedures will be conducted with the EP attending present. In the case of an urgent or emergent consult, the EP attending will be in attendance with the fellow for the initial evaluation and to stabilize the patient.

Procedures/Patient Characteristics/Disease Mix/Types of Encounters

The EP consult team is asked to see inpatients with both “tachy” and “brady” arrhythmia problems. Patients are seen in the emergency department, medical and surgical ICUs, floor and telemetry units, and labor and delivery. The disease mix is both complex and varied, including patients who are pregnant, post heart or liver transplant, have congenital heart disease, or being treated in our cancer center. There is an appropriate gender mix, and wide span of ages seen. Patients seen in consultation may need electrical or chemical cardioversion, temporary or permanent pacing, or an EP study with possible ablation. A variety of noninvasive tests are also employed to aid in arrhythmia diagnosis.

Evaluations

EP consults are performed concurrently with the other fellowship assignments throughout the 24-month training period. The EP attendings cover the EP consult service on a rotating basis and are able to directly assess the fellow’s progress over time. The fellow’s consultative skills are evaluated and discussed with the fellow quarterly by the EP attendings.

The fellow also receives 360-degree evaluations from peers and staff, providing feedback on communication skills and his/her professionalism. The fellow performs a semiannual self-evaluation, which the program director reviews at the semiannual meeting. The fellow confidentially evaluates the attendings and EP program. The faculty evaluates the faculty anonymously with the cardiovascular fellows, thereby protecting his/her anonymity.

Teaching Methods

The primary teaching method employed is the interaction between the EP faculty and fellow in the process of patient care. The fellow also learns through the performance of the consultation and instructing cardiovascular fellows, residents, and medical students, as well as the patient and their family.

Outpatient Clinics

Device Clinic

Goal

Fellows will develop the knowledge and skills necessary to competently follow pacemakers, ICDs, biventricular devices and implantable loop recorders. Additionally, he/she will learn to interpret and troubleshoot abnormal device data, and program the appropriate prescription changes.

Objectives

- By the end of six months, the fellow will be able to:
 - Discuss the normal wound healing process after device implant *(PC, MK)*
 - Discern when wounds are abnormal due to infection or hematoma *(PC, MK)*
 - Interrogate all commonly used pacemakers and defibrillators *(PC, MK, PBLI)*
 - Perform simple reprogramming on all commonly used pacemakers and defibrillators *(PC, MK, PBLI)*
 - Interpret telemetry data, independently *(PC, MK)*
 - Measure pacemaker pacing and sensing thresholds, independently *(PC, MK)*
 - Discuss the indications for device replacement *(PC, MK)*
 - Evaluate for lead malfunction, with supervision *(PC, MK)*
 - Interpret stored intracardiac electrograms and delivered therapies, with supervision *(PC, MK)*
 - Troubleshoot and make appropriate prescription changes to pacemakers and ICDs, with supervision *(PC, MK)*

- By the end of 24 months, the fellow will be able to:
 - Program appropriate prescription changes to devices based on patient symptoms, or abnormal telemetered/measured data, independently *(PC, MK)*
 - Demonstrate mastery of: *(PC, MK)*
 - the techniques of device follow-up
 - reprogramming
 - indications for device replacement
 - evaluation of defective leads
 - Demonstrate understanding of practice management issues relevant to the specialty, such as insurance, reimbursement, billing and coding *(SBP)*
 - Incorporate considerations of cost awareness and risk/benefit analysis into patient care. *(SBP)*

Fellow Responsibilities/Duties

The fellow will

- Attend device clinic ½ day per week.
- Work with technicians initially, and as their expertise improves, have a more independent role in device checks and reprogramming.
- Discuss new findings with the patient.

- Evaluate wound healing post device implantation.
- Discuss findings with the EP attending when a new arrhythmia, device abnormality or end of life parameter is found.
- Help manage acute device reprogramming issues at times other than their assigned clinic.

Faculty Supervision

An EP attending is present for direct supervision and later indirect supervision at all times. Acute problems found in device clinic will be managed by the fellow and attending together.

Procedures/Patient Characteristics/Disease Mix/Types of Encounters

The majority of patients with devices implanted at UC Davis Medical Center are followed in our hospital-based device clinic. Follow-up of pacemakers, ICDs, biventricular devices and implantable loop recorders is based here at our facility. Devices manufactured by the major pacemaker companies are represented. Adults of all ages are followed, many with complex cardiac problems and arrhythmias. Most patients seen are there for a routine follow-up, but patients with acute problems are also seen. The fellow may also see some of these patients in the emergency department, as an inpatient, or in the operating room. Troubleshooting of acute problems and reprogramming of devices is frequently required.

Evaluations

The clinic is overseen by all EP attendings who implant devices. Since all device problems and changes in device therapy/prescriptions are discussed with an EP attending, the fellow's progress in device clinic is easily monitored. The fellow is provided with immediate feedback during each case discussion with the attending. Additionally, the fellow receives written quarterly evaluations from each of the EP device attending. The fellow also receives 360-degree evaluations from patients and device clinic staff, providing feedback on communication skills and his/her professionalism. The fellow performs a semiannual self-evaluation, which the program director reviews at the semiannual meeting. The fellow confidentially evaluates the attendings and EP program. The faculty evaluates the faculty anonymously with the cardiovascular fellows, thereby protecting his/her anonymity.

Teaching Methods

The fellow will acquire extensive experience observing wound healing in follow-up of device patients and using pacemaker programming to evaluate and reprogram devices. He/she will be working alongside and learning from the device technician and nurses. The fellow will learn much technical expertise regarding pacemaker programmers from the technicians.

The EP attending will provide clinical guidance in evaluation of measured data and stored/intracardiac electrograms. The fellow learns by instructing the general cardiology fellows in device evaluation and reprogramming. The fellow also learns by educating patients and their families about changes in their device and heart rhythm status.

OUTPATIENT CLINICS

Arrhythmia Clinic

Goal

The purpose of this rotation is to train fellows to skillfully approach patients referred for EP evaluation. He/she will be able to develop an appropriate assessment and plan for the new patients, and understand the appropriate follow-up for those with devices or needing antiarrhythmic drug therapy.

Objectives

- By the end of six months, the fellow will be able to:
 - Obtain a full history, focusing on the pertinent facts relating to the EP question. *(PC, MK, ICS, P)*
 - Develop a differential diagnosis plan, independently. *(PC, MK)*
 - Evaluate the results of outpatient monitoring and tilt table testing, independently. *(PC, MK)*
 - Deliberately elicit and address patients' concerns, priorities, and perspectives as a foundation for providing guidance and recommendations for care. *(PC, MK, ICS, P)*
 - Discussing, clearly and professionally, the nature of the EP problem, as well as findings and recommendations, with the patient and referring physician. *(PC, MK, ICS, P, SBP)*
 - Provide clear and professional documentation of patient office visits, results and plans in the medical records. *(PC, MK, ICS, P)*
 - Develop doctor-patient relationships through which longitudinal case management is provided. *(PC, ICS, P, SBP)*

- By the end of 24 months, the fellow will be able to:
 - independently perform the continuing outpatient care of the EP patient, and adjusting their care as needed. *(PC, MK, P, SBP)*

Fellow Responsibilities/Duties

The fellow will:

- Attend continuity clinic 1/2 day a week.
- Independently obtain the appropriate history, physician examination, interpret the EKG and other pertinent tests, and formulate an assessment and plan for patients in the clinic.
- Discuss the risks and benefits of planned electrophysiologic procedures with patients.
- Dictate letters documenting the office visit to the referring physician.
- See the patient in clinic for follow-up post procedure, to provide continuity of care.
- See patients with chronic arrhythmia problems and participate in the decision-making regarding anti-arrhythmic drug therapy, as well as noninvasive testing.
- Discuss each patient seen with the attending electrophysiologist.

Faculty Supervision

The fellow will discuss each patient he/she sees in the clinic with the EP attending. The attending will see each patient to confirm and help explain the findings and recommendations of the fellow.

Procedures/Patient Characteristics/Disease Mix/Types of Encounters

The fellow will be assigned to outpatient continuity clinic at the Lawrence Ellison Ambulatory Care Center. At this site, a wide range of noninvasive cardiac testing is available. Patients are referred and followed from a wide geographic region. The full spectrum of electrophysiological disorders are represented. There is an appropriate gender mix and adults of all ages are represented. Patients may be referred for anti-arrhythmic drug therapy, ablation or device implant. Additionally, evaluation of syncope and palpitations is a common reason for referral.

Evaluations

The fellow's clinical progress is observed on a weekly basis by the EP attending. The fellow is provided with immediate feedback during each case discussion with the attending. The attending reviews and edits the fellow's letters to referring physicians and provides feedback to the fellow. Additionally, the fellow receives written quarterly evaluation from their clinic attending. The fellow also receives 360-degree evaluations from patients and clinic staff, providing feedback on communication skills and his/her professionalism. The fellow performs a semiannual self-evaluation, which the program director reviews at the semiannual meeting. The fellow confidentially evaluates the attendings and EP program. The faculty evaluates the faculty anonymously with the cardiovascular fellows, thereby protecting his/her anonymity.

Teaching Methods

The primary teaching method employed occurs through the interaction between the EP clinic attending and fellow during patient care. The fellow also learns through educating patients and their families.

EP Research

Goal

The purpose of this experience is to provide the fellow with a meaningful EP research experience and enable the fellow to critically assess medical literature with regard to new therapies and techniques.

Objectives

By the end of six months, the fellow will:

- Have presented multiple journal articles at EP conferences, critically appraising the data and recommendations, with the assistance of the EP faculty. *(MK, PBLI, ICS)*
- Be familiar with the significance of ongoing EP-related multicenter trials our faculty is participating in. *(PC, MK, PBLI)*
- Have identified an EP attending as a research mentor and selected a suitable EP-related clinical research project. *(PBLI, ICS, P)*
- Demonstrate knowledge of the steps required for IRB approval, if required for their project. *(PBLI)*
- Have presented a research project proposal at EP research conference, with the help of their mentor. *(MK, PBLI, ICS, P)*

- By the end of 24 months, the fellow will:
 - Have completed their research project and analyzed the data. *(MK, PBLI, ICS, P)*
 - Have presented findings of the project at EP research conference and received input from the remainder of the EP faculty and fellows. *(MK, PBLI, ICS, P)*
 - Have an abstract written and planned for submission to a major scientific meeting the following year. It is expected that a manuscript will be prepared for publication in a peer reviewed journal the following year. *(MK, PBLI, ICS, P)*
 - Be able to independently analyze and critique scientific published EP literature to decide whether the information should change their clinical practice. *(PC, MK, PBLI, P)*

Fellow Responsibilities/Duties

The fellow will:

- Discuss potential research projects with EP faculty, and with his/her chosen mentor, pick a project that best suit his/her needs
- The fellow will perform the required literature search.
- With the help of his/her EP mentor, the fellow will design a protocol.
- Obtaining the necessary IRB approval, and preparation of consent forms.
- Present the proposed research protocol at EP research conference.
- Take the lead in recruiting patients, obtaining consent, collecting and analyzing data.
- Discuss findings or problems with their EP research mentor.
- Present findings of their research project at an EP research conference.
- Prepare an abstract, using their data, to submit to a major scientific meeting.
- Write a manuscript for publication based on their acquired data.
- Identify potential patients for multicenter clinical trials, from the patients they encounter in the inpatient and outpatient settings.
- Compile a portfolio of written material produced during their training period.

Faculty Supervision

The fellows chosen research mentor will guide and advise them throughout the project. All EP faculty will provide instruction in the analysis and critical appraisal of scientific papers presented at EP conference. They will also provide input in the preparation of abstracts and manuscripts.

Procedures/Patient Characteristics/Disease Mix/Types of Encounters

The chosen clinical research project can pertain to any of our EP (invasive or noninvasive) procedures or a wide range of arrhythmia problems encountered. Although in most cases a clinical project will be chosen, the fellow may elect to work with one of our basic scientists in the cardiology department who study the autonomic nervous system. Our patients represent adults of all ages and there is an appropriate gender mix.

Our multicenter trials mainly pertain to implantable devices or antiarrhythmic drug therapy. The fellow will contact the attending Principal Investigator or research nurse coordinator when it is appropriate to enroll one of their patients in a trial. Eligible patients for research studies may come from the inpatient or outpatient setting.

Evaluations

The fellow's research mentor is his/her primary evaluator in this area. However, all the EP attendings will evaluate the fellow's progress in analyzing assigned scientific articles for EP conference. Immediate feedback is given by the faculty regarding research presentations, abstracts and manuscripts. The fellow receives a written quarterly evaluation from all the EP faculty.

Teaching Methods

The primary teaching method employed is interaction with EP faculty during research activities and during conferences and conference preparation.

Educational Conferences

Core Curriculum Conference

Goal

To provide the fellow with a solid knowledge base in the subspecialty of Clinical Cardiac Electrophysiology.

Objectives

The fellow will gain and demonstrate knowledge of all the major topics in CCEP, including basic science. (PC, MK, PBLI, ICS, P, SBP)

Fellow Responsibilities/Duties

The fellow will

- consistently attend this conference; attendance is mandatory
- actively participate in the discussion.

Faculty Supervision

At least one EP attending will be present at the bi-weekly core conference to help teach and answer questions. Faculty will also be available at other times to discuss questions when they arise.

Teaching Methods

The primary teaching method employed is tutorial between the fellow, their peers and the EP faculty.

EP Journal Club

Goal

To provide the fellow exposure to recent and classic important EP literature. Fellows will gain expertise in critical appraisal of the literature and apply the findings to patient care.

Objectives

- By the end of six months the fellow will be able to:
 - Critically appraise current medical information and scientific evidence relevant to care of the arrhythmia patient. (PC, MK, PBLI)
- By the end of 24 months the fellow will:
 - have knowledge of the major classic and recent EP articles. (PC, MK, PBLI)

Fellow Responsibilities/Duties

- Present and critically appraise assigned articles.
- Distribute the selected journal article(s) to EP faculty prior to presentation.
- Be available for questions from faculty immediately following presentation.

Faculty Supervision

EP Journal Club is attended by all EP faculty. The CCEP fellow chooses the article(s) to discuss. All faculty are provided with a copy of the article several days prior to the conference. After the fellow's presentation, the EP attendings will provide instruction and insight regarding the subject matter. This should prompt the fellow to study further and review related articles.

Teaching Methods

The primary teaching method employed is tutorial between the fellows and the EP faculty.

EP Quality Improvement Conference (M&M)

Goal

To train fellows to identify potential problems in patient care and find ways to improve patient safety. Fellows will gain competency in quality improvement and patient safety processes.

Objectives

- By the end of six months, the fellow should be able to:
 - be able to identify system problems in patient care *(PC, PBLI, P, SBP)*
 - propose a plan to prevent future problems, with guidance from an EP attending. *(PC, PBLI, P, SBP)*
- By the end of 24months, the fellow should be able to:
 - independently identify system problems and implement changes to improve the safety of their patients. *(PC, PBLI, P, SBP)*

Fellow Responsibilities/Duties

The fellow will:

- attend all monthly QI conferences and participate in the discussions to provide solutions to system problems.
- present cases at QI conference, with the help of an attending involved in the case.
- will include in the presentation system problems identified and potential solutions to improve patient safety.
- The presenting fellow will do a literature search to identify the scope of the problem and best practice data with guidelines.

Faculty Supervision

The EP QI conference is attended by all EP faculty. An EP attending will help the fellow chose a case (or problem) to present, and be available to discuss the case with the fellow prior to the conference. The EP faculty will provide constructive input regarding the potential system problem and ways to correct the problem.

Clinical Case Conference

Goal

To train fellows in the clinical and technical concepts required of a practicing CCEP physician.

Objectives

- By the end of six months, the fellow be able to:
 - Discuss with faculty and staff the EP maneuvers required to diagnose arrhythmias. *(PC, MK)*

- Choose the appropriate catheter for each case, after consultation with faculty. *(PC, MK)*
 - Diagnose arrhythmias based on intracardiac electrograms. *(PC, MK)*
 - Demonstrate a basic understanding of the imaging and mapping modalities used in the EP lab. *(PC, MK)*
- By the end of 24 months, the fellow will be able to:
 - Demonstrate knowledge of the major classic and recent EP articles. *(MK, PBLI)*
 - Lead a discussion regarding the diagnostic maneuvers used in each case. *(PC, MK, ICS)*
 - Independently choose the diagnostic catheters needed for each case. *(PC, MK)*
 - Teach colleagues how to interpret intracardiac electrogram. *(PC, MK, ICS, PBLI)*
 - Independently apply information obtained from imaging and mapping modalities used in the EP lab. *(PC, MK)*

Fellow Responsibilities/Duties

The fellow will

- Present complex cases at monthly conference for open discussion with EP faculty and cardiology fellows.
- Ask questions about concepts that are not clear to him/her.

Faculty Supervision

The EP faculty will attend the conference and be available for discussion relating to the case being presented.

Procedures/Patient Characteristics/Disease Mix/Types of Encounters

Cases discussed in this conference involve EP studies and ablations of all types of arrhythmias. . Many patients have very complex cardiac problems, due to congenital heart diseases or cardiomyopathy. Both adult and pediatric cases are reviewed, with an appropriate gender mix.

Teaching Methods

The primary teaching method employed is the interaction between the fellows and the EP faculty.

POLICY: DUTY HOURS

We are committed to compliance with the ACGME and California State duty hour guidelines. Duty hours are defined as all clinical and academic activities related to the program, i.e. patient care (inpatient and outpatient), administrative duties relative to patient care, the provision for transfer of patient care; time spent in-house during call activities, and scheduled activities, such as conferences. Duty hours do *not* include reading and preparation time spent away from the duty site.

1. Residents and Fellows are responsible for accurately reporting their duty hours, **including all time spent moonlighting**, per program requirements.
2. The Program Director is responsible for monitoring and enforcing compliance with duty hour guidelines.
3. If specialty/subspecialty-specific program duty hour requirements as defined by an individual RRC for that specialty/subspecialty are more restrictive than the CA State and ACGME Common requirements, then the duty hour requirements of that RRC will be included in the policy of that specialty/subspecialty program and will supersede the institutional requirements.
4. Concerns regarding duty hours may be reported to the Associate Dean for GME via email, telephone at 916-734-4066, or Anonymous Reporting via MedHub.

5. *At-Home Call*

At-home call, or “pager call,” is defined as call taken from outside the assigned site.

When residents/fellows are called into the hospital from home, they may care for new or established patients and the hours spent in-house, exclusive of travel time, are counted toward the eighty-hour limit. Such episodes will not initiate a new “off-duty period”, and are not counted toward the time between scheduled shifts.

At-home call must not be so frequent or taxing as to preclude rest or reasonable personal time for each resident.

At-home call may not be scheduled on the resident’s one free day per week.

6. Fellow Duty Hours Standards table defining the ACGME and CA State requirements is attached.

Resident and Fellow Duty Hours Standards

Note: If you have any questions or concerns regarding Duty Hour compliance, call the GME Office at 916-734-7797. All calls will be kept confidential.

Component	Standard
Weekly Hour Limits	80 hours, <u>averaged by rotation</u> over a 4 week (or less, if a short rotation) <u>Inclusive of all in-house clinical and required educational activities, clinical work done from home, and all moonlighting.</u> <i>(Reading done in preparation for the following day's cases, studying, research done from home, and travel time do not count)</i>
Consecutive hour limitation	24 hours (+ up to 4 hours as noted below) <i>Up to four hours of additional time may be used for activities related to patient safety, such as providing effective transitions of care, and/or resident education.</i> <i>Additional patient care responsibilities must not be assigned to a resident during this time</i>
Nonworking period between assignments	14 hours after a 24-hour in-house call 8 hours, minimum, must be <u>scheduled</u> between shifts (not required)
Nonworking periods per week	24-hour period per week free from clinical work and required education (averaged over 4 weeks, by rotation) <u>At-home call must not be assigned on these free days</u> <i>Many Review Committees have recommended that this day off should ideally be a calendar day (i.e., the resident/fellow wakes up in his or her home and has a whole day available).</i> <i>This may be the first day of one week and the last day of the following week</i>
Moonlighting	<u>All moonlighting hours count</u> towards the limitations <i>PGY-1 Residents are not permitted to moonlight</i>
Exceptions	<u>In rare circumstances, after handing off all other responsibilities, a resident, on their own initiative, may elect to remain or return to the clinical site in the following circumstances:</u> <ul style="list-style-type: none"> • <i>to continue to provide care to a single severely ill or unstable patient</i> • <i>humanistic attention to the needs of a patient or family</i> • <i>to attend unique educational events</i> <i>These additional hours of care or education will be counted toward the 80-hour weekly limit</i>
ACGME Enforcement/penalties	Evaluated as component of ACGME Site Visits and via Resident Surveys. Penalties include RRC citation, Institutional citation and/or withdrawal of accreditation

EVALUATION

Methods and Tools for Evaluating Core Competencies in Clinical Cardiac

Patient Care:

Current evaluation forms contain an assessment of the fellow's patient care abilities, including compassionate, appropriate and effective treatment of health problems and the promotion of health. This competency is formally evaluated during each clinical experience by direct observation of the fellow by the faculty during history taking, physical examination, order and note writing, and during presentation to the attending of the patient's history and physical finding and discussion of treatment plans and follow-up.

Procedural skills require faculty observation and testing to determine resident competency. The determination of procedural competencies has been traditionally evaluated on an ongoing basis during procedures performed by the resident with the assistance of the CCEP faculty or under the direct/indirect observation, based on the fellow's level of knowledge and skill. Specific skills that the resident is expected to acquire for each type of procedure during his/her training have been defined, and proficiency is reviewed and documented by the Program Director at the semiannual meeting with the fellow.

This approach will provide a reliable assessment of the skills that each resident is competent or deficient in, which will allow the director and faculty to delegate the appropriate level of supervision required for each procedure. This process will identify additional training needed achieve the desired level competency in all required skills.

Medical Knowledge:

Medical knowledge is evaluated on a daily basis by the faculty during routine interactions with the fellow. Evaluations are based on observation of the fellow during case presentations and discussion of treatment plans, procedures, lectures, teaching activities, research etc.

In order to objectively assess his/her CCEP knowledge base, the fellow will take a written examination developed by the Heart Rhythm Society at the end of each academic year.

Practice-Based Learning and Improvement:

Fellows will review their cases with the attending regarding their workup, treatment plan, procedures and follow-up plan. The fellows will be required to review the current scientific literature regarding their patient's specific medical conditions, and then re-evaluate their approach to this patient's care to determine if there could have been any improvement. The fellows will then present these cases for review by the faculty at regularly scheduled case presentation conferences held Thursday mornings throughout the year. The faculty will evaluate the critical components of the fellows care of these patients, review and discuss the known scientific literature as it pertains to these cases, and discuss areas where there could have been improvement in care if any. Attendance and presentation of cases at the regularly held case presentation conferences is mandatory and will be documented on sign-in sheets.

Interpersonal and Communication Skills:

This is evaluated during each rotation by the faculty and is documented in the evaluation forms completed by the faculty at least quarterly. The fellow will be observed directly by the faculty during interactions with healthcare team members, staff, patients, and family. The faculty will observe the resident during initial contact with the patient to determine skills in history taking, physical examination, communication of the conclusions regarding the patient's medical condition and the proposed plan of treatment, during the informed consent, during communication of the results and follow-up plans with the patient and family, and any other interpersonal interactions. IPC skills will be

documented by the faculty member on rotation/activity evaluations. The faculty member will discuss with the fellow his/her proficiencies and any deficiencies and means for improvement after each observation.

Interaction with peers, other health professionals, and patients will be assessed by those groups using 360 evaluation forms.

Professionalism:

Faculty will observe the residents throughout their training for their commitment to professional behavior, adhering to ethical principles, and their sensitivity to others regardless of economic or ethnic background or social beliefs. Any incidents of unprofessional or unethical conduct, or disregard or lack of sensitivity for diversity among patients, staff or colleagues, observed by the faculty will be brought to the immediate attention of the program director, who will then take appropriate corrective action.

Interaction with peers, other health professionals, and patients will be assessed by those groups using 360 evaluation forms.

Systems-Based Practice:

The Fellow's utilization of the hospital system, including care coordination, system error, insurance and reimbursement issues, cost considerations are observed on a daily basis by the faculty during routine interactions. These actions include awareness and the capability of working within the context of the global health care system in order to coordinate and implement the treatment plan for their patients. The ability of the resident to function in this capacity will be evaluated on an ongoing basis during the course of each rotation and this ability and any recommendations for improvement will be documented in the evaluation provided by each faculty member at the end of each rotation. Any deficiencies in this capacity will be discussed with each resident during each rotation so that they are allowed time for improvement, and again at the end of each rotation during discussion of the final evaluation.

CERTIFICATION OF TRAINING

The Clinical Competence Committee will determine if the fellow is competent in each Core Competency area:

1) Patient Care and Procedural skills, 2) Medical knowledge, 3) Practice-Based Learning and Improvement, 4) Interpersonal and Communication Skills, 5) Professionalism, and 6) Systems-Based Practice. The fellow will receive full credit with ratings of satisfactory or superior. Successful completion of this program will fulfil the certification training requirements of the American Board of Internal Medicine in the subspecialty of Clinical Cardiac Electrophysiology.

CCEP Fellowship Program

Criteria for Procedural Competency

Nondevice Therapies

Antiarrhythmic Medications

Demonstrates knowledge and understanding of:

- **Basic concepts for therapeutic drug delivery** of antiarrhythmic medications including pharmacokinetic and pharmacodynamic properties.
- **Indications, contraindications, and dosages of commonly used antiarrhythmic medications**, including
 - drug–drug and drug–device interactions
 - how drug effects and toxicities can differ in specific populations of patients depending on their age, sex, renal function, and drug metabolism
- **how to follow patients for development of drug side effects and toxicities**

Catheter Ablation

Demonstrates thorough knowledge and understanding of:

- **Basic biophysics of radiofrequency, cryoablation, and other ablative energy sources**
- **Factors that influence how to modify variables that affect ablation lesion size and safety**
- **how to recognize and prevent complications from catheter ablation**

Implantable Devices

Pacemakers

Demonstrates thorough knowledge and understanding of:

- the indications for implantation, such as the appropriate device type (single versus dual chamber versus CRT)
- the biophysics of pacing and of the technology of pacing leads and generators.

Demonstrates proficiency in:

- implanting permanent pacemakers
- manage patients with permanent pacemakers
- pacemaker programming both at the time of implant and at follow-up, including:
 - choice of pacing modes
 - understanding of timing intervals (including AV delay, blanking, and refractory periods)
 - management of rate response algorithms and sensors

- mode switching algorithms
- use of auto capture
- programming skills to maintain battery longevity and minimize ventricular pacing for non–CRT pacing systems
- troubleshooting pacemaker performance and devising an appropriate management plan, including the ability to:
 - diagnose and determine the root cause for problems such as loss of capture and inappropriate sensing,
 - recognize the potential for a pacemaker malfunction or inappropriate lead position based on ECG
 - identify pseudo-malfunction due to vendor-specific pacing algorithms (e.g., algorithms that switch between AAI and DDD modes)
 - identify other problems such as distinguishing electromagnetic interference from lead fracture or malfunction.

Implantable Cardioverter-Defibrillators

Demonstrates thorough knowledge and understanding of:

- how to interpret and apply the results from clinical trials and registry data
- how to incorporate professional guidelines with patient-specific factors (including comorbidities and anticipated psychosocial impact of ICDs) to select appropriate ICD candidates
- DFT Testing:
 - the role of DFT testing
 - when not to perform DFT testing
 - how to use alternate lead configurations and/or device programming to manage patients with a high DFT
- ICD-related complications, including:
 - how to prevent, identify, and manage these complications both intraoperatively and long term
 - drug–device and environment–device (electromagnetic) interactions.

Demonstrates proficiency in:

- selecting the appropriate ICD device, including lead selection and evaluation for subcutaneous ICDs.
- interrogating and programming ICDs from various manufacturers, both in-person and remotely, including
 - reviewing diagnostic data
 - analyzing intracardiac electrograms
 - distinguishing SVTs from Vas
 - designing long-term follow-up programs
 - minimizing ventricular pacing if appropriate
 - performing noninvasive programmed stimulation
 - troubleshooting

- optimally programming ventricular tachyarrhythmia detection, discrimination, and termination algorithms (to minimize inappropriate shocks and favor antitachycardia pacing over shocks for VT termination)

Demonstrates technical proficiency in:

- device implantation, including
 - laboratory safety (including proper use of diagnostic radiation and electrosurgical instruments)
 - surgical asepsis
 - sedation strategies
 - anticoagulation strategies
 - surgical site/pocket management
 - vascular entry (including situations with limited or anomalous venous access)
 - lead implantation
 - lead evaluation (including sensing assessment, threshold testing, and anatomic location by fluoroscopy)
 - defibrillation testing (including understanding defibrillation waveforms and defibrillation probability curves)

Resynchronization Therapy

Demonstrates thorough knowledge and understanding of:

- how to interpret and apply the results from clinical trials and registry data as well as the recommendations from professional societies; this includes awareness of variables that potentially modify the anticipated response to CRT to reduce the probability of selecting nonresponders
- CRT-related complications, including how to prevent, identify, and manage these complications both intraoperatively and long term.

Demonstrates proficiency in:

- managing patients with heart failure and understand how to evaluate, follow-up, and optimize device programming including:
 - AV and interventricular timing) using ECG analysis
 - device-based algorithms
 - echocardiography
 - alternative imaging modalities.

Demonstrates technical proficiency in:

- CIED implantation, with specific additional skills for CRT, including detailed knowledge of cardiac venous anatomy and expertise in lead placement in the coronary sinus system.
- When anatomy precludes transvenous left ventricular lead placement, the trainee should be familiar with alternative left ventricular lead placement, including the epicardial approach.

Implantable Loop Recorders

Demonstrates thorough knowledge and understanding of:

- the indications for and considerations in recommending an ILR

Demonstrates proficiency in:

- interrogating and programming ILRs in-person and remotely; this includes correct electrogram analysis and rhythm determination.

Demonstrates technical proficiency in:

- implanting and explanting ILRs, including monitoring and managing potential complications

Lead Management

Demonstrates thorough knowledge and understanding of:

- the basic design of leads
- strategies to prevent lead- and device-related complications, including during CIED implantation, revision, and generator replacement
- how to track the performance of a wide variety of leads from different manufacturers
- how to monitor individuals with leads under advisory
- the indications for lead extraction
- potential complications of lead extraction
- how to prevent, identify, and manage lead extraction complications as part of a multidisciplinary team

Demonstrates proficiency in:

- the diagnosis and management of lead failure
- the management of patients undergoing extraction perioperatively, including those with device infection and/or requiring subsequent CIED therapy

Demonstrates technical proficiency in:

- transvenous lead extraction, including exposure as the primary operator to various venous entry sites, extraction tools, and techniques.