

# CARDIAC MRI

## **Mission Statement:**

The mission of the Cardiac MR Center is to advance the diagnosis of cardiovascular disorders, and provide functional and anatomic cardiovascular information utilizing Magnetic Resonance Imaging.

## **Statement of Educational Goals:**

The goal of this rotation is to provide the fellow with in depth exposure to cardiac MR (CMR) studies on both ambulatory and hospitalized patients to promote an understanding of the applications and limitations of CMR imaging. Fellows completing the rotation should have a basic understanding of MRI physics, as well as the pulse sequences used, and should become familiar with the clinical indications for CMR in cardiovascular patients. In addition, fellows should gain an appreciation for the challenges and contraindications to CMR testing, and learn about general MR safety.

## **The Curriculum is designed to promote six broad goals based on the ACGME Core Competencies:**

### **1. Medical Knowledge:**

- a) Fellows will gain exposure to the acquisition and interpretation of diagnostic CMR.
- b) Fellows will be provided with reading materials, and should be prepared to discuss the content with the CMR attending.
- c) The ACC CMR-SAP CD should be obtained from the Cardiovascular Fellowship office and reviewed during the rotation.
- d) Fellows will be expected to attend mini-didactic sessions on CMR by the attending.
- e) Fellows will be expected to complete and document 50 case interpretations (combination of live and teaching file cases) to satisfy COCATS Level I training in CMR.

### **2. Patient Care:**

A pre-study evaluation of the patient should be performed by the fellow (when possible) to tailor each study to the specific clinical problem. Accurate and precise interpretation of CMR studies will be performed in conjunction with the CMR attending.

### **3. Professionalism:**

Effective, mutual communication and respect are expected with the patient, referring physician, attending physician, other physicians in training, and the MR Technicians.

**4. Interpersonal & Communication Skills:**

The fellow is expected to participate in an active way with other members of the team. Clear and concise communication will be expected with referring physicians and when providing interpretations of the exam findings.

**5. Practice based learning:**

Fellows will use information technology, literature sources, and other available resources to practice accurate and state-of-the-art CMR studies and interpretation. Fellows will be expected to apply their knowledge to think of potential research applications for CMR technology.

**6. Systems based learning:**

During interaction with other medical services and providers, fellows will gain an appreciation of their role as an imaging consultant. It will be important for the fellow to learn how the health care delivery systems work, and the role of diagnostic imaging in providing health care.

**Statement of Educational Objectives:**

The goals of this service will be achieved by participation in MRI studies devoted to the evaluation of known or suspected cardiovascular problems on hospitalized and ambulatory patients. Fellows will be expected to play an active role in all aspects of patient care in the CMR Center, and interact directly with the faculty members and referring health care professionals. Fellows may be expected to communicate the findings and clinical significance of the findings of the CMR exam to the referring physician. Review of the provided reading material, ACC-SAP CMR CD, and additional review of selected references listed below are necessary for the fellow to meet the goals of the rotation.

**Core Concepts:**

Fellows should attain a basic understanding of the Cartesian coordinate system, and how it applies to MRI. Fellows should understand the concept of magnetization vectors, radiofrequency pulses, and flip angles, and learn the difference between T1, T2, and T2\* relaxation. Fellows should learn the fundamental difference between gradient and spin echo sequences, and should become familiar with balanced Steady State Free Precession (b-SSFP aka. FIESTA), Spoiled Gradient Echo, and velocity encoding (VENC) sequences and their uses. Fellows should understand the concept of k space, and how it is filled. Fellows should gain an appreciation for cardiac anatomy, and learn the basic views obtained during the CMR examination. Fellows should become familiar with delayed enhancement imaging, and its clinical importance and significance in the identification of myocardial scar and the assessment of viability.

### **Detailed Expectations for Fellows:**

The MR Center is located at G-3400. Elective exams are typically scheduled at 8:00AM, 10:00AM, 12:00Noon, and 2:00PM on Thursdays for elective outpatients. Urgent/emergent exams are scheduled as indicated. CMR studies are performed on the 1.5 Telsa GE Twinspeed MR Scanner (Front Scanner, G-4505). Interpretation is performed at the ReportCard workstation in the MR center. Scans will also occasionally be performed on the Philips Panorama 1.0 Tesla open MRI system.

Fellows are expected to be present at the time the cardiac MR exams are performed. Active participation in providing pre-study consultation, as well as interpretation and appropriate post exam consultation with communication of findings and recommendations to the referring physician will be expected.

Fellows will be expected to review and interpret the 16 “unknown” case files, and submit and review their findings with the CMR attending.

Fellows will also be asked to prepare a case presentation for Cardiology Morning Report or the Imaging Case Conference.

### **Selected list of References:**

1. Higgins, CB. Cardiovascular MRI & MRA. Lippincott Williams. 2003.
2. Higgins, CB. Cardiac MR Imaging. Lippincott Williams. CD ROM.
3. Maning, Warren J. Cardiovascular Magnetic Resonance. Elsevier. 2002.
4. Woods, P. Pocket Atlas of Cardiac MRI. Lippincott Williams.
5. Weissman. Cardiac MRI Secrets. Elsevier. 2003.
6. ACC-SAP CMR CD.
7. Duke Cardiovascular Magnetic Resonance Center MRI Physics Course DVD (upon request from Dr. Fong)
8. Cardiovascular MRI Teaching File: 8 cases (upon request from Dr. Fong)

**Credentials of the Cardiac MR Staff:**

David A. Dombroski, M.D.  
Director, Cardiac MRI  
University of Notre Dame, B.S.  
SUNY Upstate Medical University, M.D.  
Internal Medicine Residency, University of Rochester Medical Center  
Radiology Residency, University of Rochester Medical Center  
Body Imaging Fellowship, University of Rochester

Michael W. Fong, M.D.  
Assistant Director, Cardiac MRI  
Assistant Professor of Medicine  
University of Toronto, B.S.  
University of Cincinnati College of Medicine, M.D.  
Categorical Internal Medicine Residency, Case Western Reserve University  
Cardiovascular Disease Fellowship, University of Rochester Medical Center  
CMR Training, Duke Cardiovascular Magnetic Resonance Center

David Lee, M.D.  
Associate Professor of Radiology  
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Internal Medicine Internship, Thomas Jefferson University Hospital  
Radiology Residency, University of Rochester Medical Center  
Interventional Radiology Fellowship, University of Rochester Medical Center

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