

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

Cardiology Fellowship Training Program

ADVANCED IMAGING (AI) ROTATION

PROGRAM LETTER OF AGREEMENT (PLA) WITH CHARLESTON AREA MEDICAL CENTER, INC. CAMC CARDIAC IMAGING CENTER (ACGME COMMON PROGRAM REQUIREMENTS 1.B.2)

This letter will serve as a Program Letter of Agreement (PLA) between the sponsoring institution, Marshall University Joan C. Edwards School of Medicine (MUJCESOM) and Charleston Area Medical Center, Inc. ("CAMC") CAMC Cardiac Imaging Center ("Participating Site") for the training of residents/fellows in the program. This letter of agreement will be effective from May 1, 2021, and will remain in effect for five years, or until updated, changed or terminated by either party upon thirty (30) days advanced written notice to the other. This program is accredited by the Accreditation Council for Graduate Medical Education (ACGME) and requires a participating site agreement which ensures the following provisions:

All residents/fellows in the MUSJCEOM Cardiology Fellowship Training Program shall be assigned to the participating site (CAMC Cardiac Imaging Center) for a minimum period of two weeks or one month total of training during the academic year in Advanced Imaging (AI). All block rotations in the program are one month per year with the exception of clinics, conferences, or vacation; exact schedules will be individualized with each trainee participant.

During the rotation or training assignment at the Participating Site, the resident will report to and be supervised by Sarah Rinehart, MD, as the primary responsible faculty member as identified by the Program Director of the sponsoring institution. Other faculty appointed by the Program Director who may be involved for the education and supervision of the residents/fellows while rotating at the Participating Site have been designated below:

List all authorized faculty by name:

Sarah Rinehart, MD - Site Director
Ahmad Elashery, MD

The specific goals and objectives of the AI rotation are attached to this agreement. The general content of the educational experience includes:

Goals & Objectives:

The Fellow will be assigned to one or more attendings during the AI rotation and based on milestone progression models, will have increasing independence in performing or

interpreting various noninvasive imaging studies. The emphasis on this rotation will be Cardiac CT and MRI imaging to meet Level I exposure.

Specific topics/concepts to be covered include:

The primary focus of this rotation is Cardiac MRI and CT. The CVD fellow will gain experience with CT and MRI scanning protocols and imaging physics through direct interaction with attendings boarded in advanced imaging. Mentored experience with patient selection for specific imaging modalities, appropriate use criteria, imaging guidelines and image interpretation can also be expected.

The primary supervising faculty member listed above agrees to coordinate teaching and supervision of the residents/fellows during the AI rotation with other participating faculty as listed above. The primary supervising faculty will be required to evaluate resident performance in a timely manner during each rotation or similar educational assignment and document this evaluation at completion of the assignment. Such evaluation shall correspond to the achievement of the six core competencies or other requirements according to accreditation or program requirements.

Residents/Fellows are expected to evaluate the educational experience and supervising faculty as assigned to the Participating Site upon completion of the assignment.

Residents/Fellows will be under the general direction of the sponsoring institution (MUJCESOM) Policies and Procedures as well as (CAMC) Policies and Procedures which apply to the educational experience of the resident/fellow. The Program Director retains ultimate authority in the educational assignment of residents/fellows. Resident/fellow shall follow rules of governance and patient care policies and procedures while performing patient care services at participating site. Participating site shall have authority to limit or restrict patient care activities for assigned residents/fellows. Participating site shall have authority to prohibit or remove resident/fellow from assignment upon written notification to the Program Director. Ultimate responsibility for meeting educational requirements remains with the Program Director.

Participating Site shall ensure the following:

1. Each resident/fellow is engaged in provision of patient care services under the supervision of a physician duly licensed to practice in the State of West Virginia;
2. Guidelines established by the accreditation requirements shall be followed as applicable to the AI assignment as may be defined by the program director or the program requirements;
3. Compliance to applicable regulatory and legal requirements;
4. Appropriate levels of professional liability insurance are maintained;
5. Assignment of this Agreement or any duties of this Agreement are not assigned without consent of Charleston Area Medical Center, Inc. Such a request and other correspondence related to this agreement shall be directed to: Sharon A. Hall, 3200 MacCorkle Ave. S.E., Charleston, West Virginia 25304

MUJCESOM shall ensure the following:

1. MUJCESOM shall incur the cost of salary, fringe benefits and applicable travel/lodging expenses for residents/fellows assigned to participating site;
2. Maintain professional liability insurance or self-insurance for each resident/fellow in connection with his/her program requirements, including participation in the AI rotation. Such professional liability insurance or self-insurance will not extend to activities performed by resident/fellow outside the scope of the assignment at the participating site.

Both parties agree MUJCESOM and acknowledge that is incurring all or significantly all of the costs of the resident/fellow assignment at Participating Site.

This letter of agreement will be effective from May 1, 2021, and will remain in effect for five years, or until updated, changed or terminated by either party upon thirty (30) days advanced written notice to the other. This letter of agreement will be automatically terminated in the event either party is sanctioned by Medicare, Medicaid or any other governmental payer (including exclusion, suspension, debarment or other limitation).

We appreciate the graduate medical education opportunity you are providing to our interns and residents. If you have any questions at any time, please do not hesitate to contact the Office of Graduate Medical Education at 304-691-1824.

For Charleston Area Medical Center, Inc.:

Sharon A. Hall 5/4/21
Sharon A. Hall
It's Agent Date

Sarah Rinehart 5/3/21
Program Site Director
Sarah Rinehart, MD Date

Sarah Rinehart 5/3/21
CAMC Program Director
Cardiology Fellowship Program Date

Administrative Authority Date

For Marshall University Joan C. Edwards School of Medicine:

Paulette S. Wehner 4/22/21
Paulette S. Wehner, MD
DIO and Vice Dean, GME Date

Ellen Thompson 4/22/21
Ellen Thompson, MD. Date
Program Director, Cardiology Fellowship

Goals & Objectives

Advanced Imaging

CAMC Cardiovascular Disease Fellowship

*Goals & Objectives for the CVD Advanced Imaging (AI) Rotation
[Includes Cardiac MRI, CT, and TEE]*

Overview

The Advanced Imaging service is a hybrid inpatient and outpatient service that is responsible for various imaging and testing procedures for patients on the CAMC Cardiology team. The primary focus of this rotation is Cardiac MRI and CT. The CVD fellow will gain experience with CT and MRI scanning protocols and imaging physics through direct interaction with attendings boarded in advanced imaging. Mentored experience with patient selection for specific imaging modalities, appropriate use criteria, imaging guidelines and image interpretation can also be expected.

Rotation Structure

The Fellow will be assigned to one or more attendings during the AI rotation and based on milestone progression models will have increasing independence in performing or interpreting various noninvasive imaging studies. The emphasis on this rotation will be Cardiac CT and MRI imaging.

Fellow expectations

- The cardiovascular fellow will need to be available during all attending supervised imaging studies and image reviews.
- The fellow should be able to documentation of the reason for the imaging study based on available guidelines and appropriate use criteria.
- The fellow will need to obtain an appropriate history and perform a physical (H&P) examination to be certain the patient can safely undergo the planned testing.
- Oversee the performance of the stress test
- Review the ECG and MRI results of stress MRI studies and develop an impression of the results
- Communication to the patient the diagnosis and recommendation for additional testing and/or treatments.
- Communicate when appropriate test results to requesting physicians

Teaching Methods

- **Mentor-student method:** In regards to the interpretation of studies, the mentor–student relationship will be utilized as the main teaching method. The fellow is expected to utilize all available scientific research, published guidelines and expert opinion to assist with decision making and learning.
- **Experiential:** Performance of the nuclear stress testing. The fellows oversee the actual stress MRIs, monitoring the ECG for the development of ST abnormalities and arrhythmias, the patients' subjective state (chest pain/discomfort, dyspnea, fatigue, "dizziness") and hemodynamic parameters (blood pressure and heart rate).

Evaluation Methods

The attending cardiologist will utilize a standardized evaluation process to assess the performance of the fellow. A written evaluation of the cardiac fellows' performance on the AI service will be made each month by the cardiology attending on the service. The cardiology attending will evaluate each fellow according to the ACGME general competencies including: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and systems-based practice. Fellows are able to electronically view each completed evaluation in the New-Innovations system. These monthly evaluations will also be reviewed with the fellows during the semi-annual evaluation process.

Learning Goals and Milestones for the Advanced Imaging Service (ref. COCATS 4 Task Force 7: Training in Cardiovascular Computed Tomographic Imaging & Task Force 8: Training in Cardiovascular Magnetic Resonance Imaging)

The tables below delineate each of the 6 competency domains, as well as their associated curriculum milestones for training in CTT and MRI. The milestones are categorized into Levels I and II and indicate the stage of fellowship training (12, 24, or 36 months, and additional time points) by which the typical cardiovascular trainee should achieve the designated level. Please see COCATS 4 for further training requirements per level.

TABLE 1 Core Competency Components and Curricular Milestones for Training in Cardiovascular Computed Tomography

| Competency Component | | Milestones (Months) | | | |
|----------------------|---|---------------------|----|-----|-----|
| MEDICAL KNOWLEDGE | | 12 | 24 | 36 | Add |
| 1 | Know the principles of cardiovascular computed tomographic scanning and the scanning modes. | I | | | |
| 2 | Know the risks and safety measures for cardiovascular computed tomographic scanning, including radiation reduction strategies. | | | I | |
| 3 | Know the appropriate indications for cardiovascular computed tomography for screening or evaluating symptoms in patients with suspected cardiac disease. | | I | | |
| 4 | Know the indications, potential adverse effects, prevention, and treatment of complications of iodinated contrast agent use in cardiovascular computed tomographic studies. | | I | | |
| 5 | Know the indications and protocols for beta-adrenergic blocking drugs and nitroglycerin during cardiovascular computed tomographic studies. | | | II | |
| 6 | Know the principles of cardiovascular computed tomographic scan collimation, temporal resolution, table speed, field of view, and window and level view settings. | | | III | |
| 7 | Know the principles of postprocessing methods for cardiovascular computed tomographic scanning. | | | II | |
| 8 | Know the algorithms used for reconstruction, and recognize and isolate causes of artifacts. | | | II | |
| 9 | Know the principles of quantitative coronary artery calcium scoring. | | | II | |
| 10 | Know normal chest anatomy and common incidental extra cardiac findings. | | | II | |
| 11 | Know the characteristic cardiovascular computed tomographic images of normal cardiac chambers and great vessels, normal coronary arteries and veins, and normal variants. | | | I | |
| 12 | Know the characteristic cardiovascular computed tomographic findings of coronary atherosclerosis including plaque morphology and assessment of stenosis severity. | | | III | |
| 13 | Know the characteristic cardiovascular computed tomographic findings of anomalous coronary arteries and other common congenital anomalies. | | | III | |
| 14 | Know the characteristic cardiovascular computed tomographic findings in postoperative cardiac surgical patients including internal mammary artery and saphenous vein bypass grafts. | | | III | |
| 15 | Know the characteristic cardiovascular computed tomographic findings of acquired and congenital valvular disease. | | | III | |
| 16 | Know the characteristic cardiovascular computed tomographic findings of left atrial and pulmonary and coronary venous abnormalities. | | | III | |
| 17 | Know the characteristic cardiovascular computed tomographic findings of pericardial disease. | | | III | |
| 18 | Know the characteristic cardiovascular computed tomographic findings of cardiomyopathies and infiltrative myocardial diseases. | | | III | |
| 19 | Know the differential diagnosis of cardiac masses identified by cardiovascular computed tomography. | | | III | |
| 20 | Know the characteristic cardiovascular computed tomographic findings of common diseases of the aorta and great vessels. | | | III | |
| 21 | Know the characteristic cardiovascular computed tomographic findings of pulmonary embolism and primary and acquired pulmonary vascular diseases. | | | III | |
| 22 | Know when to request help with interpretation of difficult studies, such as patients with complex congenital heart disease. | | | I | |

EVALUATION TOOLS: conference presentation, direct observation, and in-training examination.

| PATIENT CARE AND PROCEDURAL SKILLS | | 12 | 24 | 36 | Add |
|------------------------------------|--|----|----|----|-----|
| 1 | Skill to appropriately utilize cardiovascular computed tomography in the evaluation and management of patients with known or suspected cardiovascular disease. | | | I | |
| 2 | Skill to integrate cardiovascular computed tomographic findings with other clinical information in patient evaluation and management. | | | I | |
| 3 | Skill to recognize and treat contrast-related adverse reactions. | I | | | |
| 4 | Skill to independently perform and interpret cardiovascular computed tomography. | | | II | |
| 5 | Skill to perform and interpret hybrid CT/SPECT and CT/PET imaging. | | | | III |

EVALUATION TOOLS: conference presentation, direct observation, and logbook.

| SYSTEMS-BASED PRACTICE | | 12 | 24 | 36 | Add |
|--|--|----|----|----|-----|
| 1 | Incorporate appropriate use criteria, risk/benefit, and cost considerations in the use of cardiovascular computed tomography and alternative imaging modalities. | | 1 | | |
| EVALUATION TOOLS: conference presentation, direct observation, and multisource evaluation. | | | | | |

| PRACTICE-BASED LEARNING AND IMPROVEMENT | | 12 | 24 | 36 | Add |
|--|---|----|----|----|-----|
| 1 | Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement. | | | 1 | |
| 2 | Utilize point-of-care educational resources (e.g., guidelines, appropriate use criteria, and clinical trial results). | | | 1 | |
| EVALUATION TOOLS: conference presentation, direct observation, and reflection and self-assessment. | | | | | |

| PROFESSOR RESPONSIBILITIES | | 12 | 24 | 36 | Add |
|--|--|----|----|----|-----|
| 1 | Work effectively in an interdisciplinary cardiovascular computed tomographic imaging environment. | | 1 | | |
| 2 | Reliably obtain patient informed consent, ensuring that patients understand the risks and benefits of, and alternatives to, cardiovascular computed tomographic testing. | | 1 | | |
| 3 | Know and promote adherence to clinical practice guidelines. | | 1 | | |
| EVALUATION TOOLS: conference presentation, direct observation, and multisource evaluation. | | | | | |

| INTERPERSONAL AND COMMUNICATION SKILLS | | 12 | 24 | 36 | Add |
|--|---|----|----|----|-----|
| 1 | Communicate testing results to physicians and patients in an effective and timely manner. | | 1 | | |
| EVALUATION TOOLS: direct observation and multisource evaluation. | | | | | |

TABLE 4 Core Competency Components and Curricular Milestones for Training in Cardiovascular Magnetic Resonance

| Competency Component | Milestones (Months) | | | |
|---|---------------------|----|----|-----|
| | 12 | 24 | 36 | Add |
| MEDICAL KNOWLEDGE | | | | |
| 1 Know the principles of cardiovascular magnetic resonance image acquisition. | I | | | |
| 2 Know the principles of safety and contraindications for cardiovascular magnetic resonance imaging. | I | | | |
| 3 Know the uses, potential side effects, and contraindications of using gadolinium-based contrast agents in cardiovascular magnetic resonance imaging. | I | | | |
| 4 Know the indications for cardiovascular magnetic resonance to assess left and right heart chamber sizes and function. | I | | | |
| 5 Know the cardiovascular magnetic resonance indications for assessment of myocardial viability. | I | | | |
| 6 Know the cardiovascular magnetic resonance indications and characteristic findings of myocardial ischemia. | I | | | |
| 7 Know the cardiovascular magnetic resonance indications and characteristic findings of acute myocardial infarction. | I | | | |
| 8 Know the cardiovascular magnetic resonance indications and characteristic findings of acute coronary syndromes and other causes of myocardial injury. | I | | | |
| 9 Know the cardiovascular magnetic resonance indications and differential findings in cardiomyopathies of uncertain cause. | I | | | |
| 10 Know the cardiovascular magnetic resonance indications to assess diseases of the pericardium. | I | | | |
| 11 Know the cardiovascular magnetic resonance indications to evaluate valvular heart disease. | I | | | |
| 12 Know the cardiovascular magnetic resonance indications and characteristic findings of myocardial masses and thrombi. | | | I | |
| 13 Know the cardiovascular magnetic resonance indications for left atrial and pulmonary vein mapping prior to ablation of atrial fibrillation. | | | I | |
| 14 Know the cardiovascular magnetic resonance indications for evaluation of adult congenital heart disease including identification of coronary artery anomalies. | | | I | |
| 15 Know the cardiovascular magnetic resonance indications to detect and evaluate diseases of the aorta and peripheral arteries. | | | I | |

EVALUATION TOOLS: conference presentation, direct observation, and in-training examination.

| Competency Component | Milestones (Months) | | | |
|---|---------------------|----|----|-----|
| | 12 | 24 | 36 | Add |
| PATIENT CARE AND PROCEDURAL SKILLS | | | | |
| 1 Skill to appropriately order and integrate the results of cardiovascular magnetic resonance testing with other clinical findings in the evaluation and management of patients. | | | I | |
| 2 Skill to interpret cardiovascular magnetic resonance tissue characterization (late gadolinium enhancement) to distinguish the etiology of cardiomyopathy and acute myocardial injury. | | | I | |
| 3 Skill to interpret regional and global left and right ventricular wall motion and ejection fraction. | | | II | |
| 4 Skill to interpret vascular diseases of the aorta (e.g., intramural hematoma, dissection, coarctation, and aneurysm). | | | II | |
| 5 Skill to identify and characterize myocardial masses. | | | II | |
| 6 Skill to identify and characterize pericardial disease. | | | II | |
| 7 Skill to identify and diagnose basic congenital heart disease in adults. | | | II | |
| 8 Skill to identify and diagnose complex adult congenital heart disease, including quantification of intracardiac shunting, and anomalous coronary arteries. | | | II | |
| 9 Skill to perform and interpret cardiovascular magnetic resonance stress testing. | | | II | |
| 10 Skill to interpret vascular diseases of the peripheral arteries. | | | | III |

EVALUATION TOOLS: conference presentation, direct observation, and logbook.

| Competency Component | Milestones (Months) | | | |
|---|---------------------|----|----|-----|
| | 12 | 24 | 36 | Add |
| SYSTEMS-BASED PRACTICE | | | | |
| 1 Incorporate risk/benefit and cost considerations in the use of cardiovascular magnetic resonance testing. | | I | | |
| 2 Participate in cardiovascular magnetic resonance quality monitoring and initiatives. | | | II | |

EVALUATION TOOLS: chart-stimulated recall, conference presentations, direct observation, and multicourse evaluation.

| PRACTICE-BASED LEARNING AND IMPROVEMENT | | 12 | 24 | 36 | Add |
|---|---|----|----|----|-----|
| 1 | Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement. EVALUATION TOOLS: chart-stimulated recall, conference presentations, direct observation, and reflection and self-assessment. | | | 1 | |
| PROFESSIONALISM | | 12 | 24 | 36 | Add |
| 1 | Practice within the scope of expertise and technical skills. | | | 1 | |
| 2 | Know and promote adherence to guidelines and appropriate use criteria. EVALUATION TOOLS: chart-stimulated recall, conference presentations, direct observation, and multisource evaluation. | | 1 | | |
| INTERPERSONAL AND COMMUNICATION SKILLS | | 12 | 24 | 36 | Add |
| 1 | Communicate testing results to physicians and patients in an effective and timely manner. EVALUATION TOOLS: direct observation and multisource evaluation. | | 1 | | |

Suggested reading:

- ACCF/ASNC Appropriateness Criteria for Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging (SPECT MPI) J Am Coll Cardiol 2005;46:1587–1605. Errata 2005:2148–50.
- ACC/AHA/ASNC Guidelines for the Clinical Use of Cardiac Radionuclide Imaging. *Circulation*. 2003;108
- American Society of Nuclear Cardiology. Imaging Guidelines for Nuclear Cardiology Procedures. A Report of The American Society of Nuclear Cardiology Quality Assurance Committee J Nucl Cardiol 2006;13:e22-171.
- Bax JJ (ed). Nuclear Cardiology Knowledge Self-Assessment Program. American Society of Nuclear Cardiology, Bethesda, MD, rev. 2005.
- Dilsizian V and Narula J, (eds). Atlas of Nuclear Cardiology, 2nd edition, Braunwald E (series ed), Current Medicine, Inc. Philadelphia, 2006.
- Heller GV, Hendel, RC. Nuclear Cardiology: Practical Applications. McGraw-Hill, New York, NY, 2003.
- Wackers FJTh, Bruni W, Zaret BL. Nuclear cardiology, the basics: how to set up and maintain a laboratory. Humana Press, Inc., Totowa, NJ, 2004.
- Zaret BL and Beller GA (eds). Nuclear Cardiology: State of the Art and Future Directions. 3rd edition, Mosby, St. Louis, MO, 2005.
- Ellestad MH. Stress Testing: Principles and Practice, 5th ed. Oxford University Press, New York, 2003
- Chandra R, Nuclear Medicine Physics: The Basics, 6th ed. Lippincott Williams & Wilkin. 2004.
- Cherry SR, Sorensen JA, Phelps MC. Physics in Nuclear Medicine, 3rd ed. Saunders. 2003

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