

**ROTATION MANUAL FOR CARDIOVASCULAR NUCLEAR MEDICINE ©
Cardiology Fellow Rotation
(Nuclear Cardiology 2 - SLEH)**

**ST. LUKE'S EPISCOPAL HOSPITAL
NUCLEAR MEDICINE SERVICE**

NUCLEAR MEDICINE DEPARTMENT OVERVIEW

Facilities and Personnel: The Nuclear Medicine Department (the Department) of St. Luke's Episcopal Hospital (SLEH, the Hospital) operates three imaging laboratories: General Nuclear Medicine on the 26th floor of the Hospital, Cardiovascular Nuclear Medicine (CVNM) on the 3rd floor of the Hospital, and Outpatient Nuclear Medicine (primarily cardiac) on the 11th floor of the O'Quinn Medical Tower (SLMT). The Department also serves the Texas Heart Institute (THI). The Department is staffed by nuclear medicine physicians and scientists who are members of the Nuclear Medicine Section of the Department of Radiology of Baylor College of Medicine (BCM, Baylor) and who make up the majority of the Hospital's Nuclear Medicine Service and by technologists and other support personnel who are Hospital employees. Members of the faculty also provide certain nuclear medicine services at St. Luke's Community Medical Center in the Woodlands (CMCW), Texas Children's Hospital (TCH), PET Imaging of Houston (PIH), and other facilities.

Members of the Nuclear Medicine Section faculty who are active at SLEH/THI include:

- Anupa Arora, M.D., MPH
Faculty nuclear medicine physician; Instructor of Radiology
- Ramesh Dhekne, M.D.
Associate Chief of the Nuclear Medicine Service and Director of General Nuclear Medicine; certified by ABNM; Associate Professor of Radiology.
- Patrick Ford, M.D.
Faculty nuclear medicine physician; certified by ABNM; Clinical Assistant Professor of Radiology.
- Ed Giles, M.S.
Assistant Radiation Safety Officer for SLEH/THI; certified by the ABR in Diagnostic Radiologic Physics and the American Board of Science in Nuclear Medicine; Instructor of Radiology.
- Warren Moore, M.D.
Chief of the Nuclear Medicine Service and Director of CVNM; certified by ABIM and ABNM; Associate Professor of Radiology.
- Paul Murphy, Ph.D., MBA
Radiation Safety Officer for SLEH/THI; certified by the American Board of Science in Nuclear Medicine; Professor of Radiology.

Other Department personnel you may encounter include technologists and clerical staff members, and particularly

- Leticia Alanis-Williams, B.S., RT(N); Nuclear Medicine Manager
- Randy Barker, B.S., RT(R), RT(N), CNMT; Technologist Supervisor for General Imaging
- Cindy Gentry, B.S., CNMT; Nuclear Medicine Quality Coordinator
- Marly Gonzalez, B.S., CNMT; Technologist Supervisor for CVNM
- Bryan Fritz, B.S.; Radiation Safety Technician
- Joe Knisel, M.S.; Nuclear Medicine Information Systems Manager
- Nayaka Shaw; Office Coordinator

Scope of Service: Routine diagnostic and therapeutic nuclear medicine services are available in the SLEH laboratories, 8 a.m. to 5 p.m., Monday–Friday except for official Hospital holidays. Myocardial perfusion studies for the Cardiac Observation Unit and for observation (POS) patients are usually available 8 a.m. to 10 p.m. Monday-Friday and 8 a.m. to 8 p.m. Saturday and Sunday, except for official Hospital holidays. Studies are performed in the SLMT on a variable schedule. Otherwise, most medically urgent nuclear medicine services are available 24 hours/day, 7 days/week on an on-call basis and can be arranged by contacting the Nuclear Medicine Department (832-355-3126 during regular hours) or the Nuclear Medicine technologist or physician on call through the Hospital page operator (832-355-4146) outside of regular hours. Certain nuclear medicine procedures can be performed at the patient's bedside in the ICUs, but there are significant regulatory and technological restrictions on some of these studies. Because the quality of the study is usually much better when performed with fixed-base cameras in one of the Department's laboratories, "portable" or "bedside" studies should only be ordered when it is really medically necessary that the patient not be moved from the ICU. If the order for the study does not specifically indicate that the study is to be performed in the ICU, the patient will be brought to the Nuclear Medicine laboratory. A summary of available tests, indications, physiologic mechanisms, and patient preparations is available in the publication, "Nuclear Medicine Department Reference Manual," online via the SLEH "Source."

Reports and Consultations: Interpretations of SLEH/SLMT nuclear medicine studies are available on the day the study is completed. Reports completed during regular business hours 8-5, M-F) are available through the Hospital information system as soon as they are read (except during computer downtime). During regular business hours, reports are also available in the Nuclear Medicine Department office (Y2614) or by calling 832-355-2270. Reports completed after regular

hours are usually sent as faxed preliminary reports to the patients' nursing units and are therefore usually not in the Hospital's computer system until the following work day. Any physician with a question regarding nuclear medicine services in general or regarding a particular patient or clinical problem is encouraged to contact a Nuclear Medicine physician.

NUCLEAR MEDICINE DEPARTMENT CONTACTS

Main number.....	832-355-3126	Y2601
General Nuclear Medicine (26 th fl, SLEH).....	832-355-2272	Y2626
Cardiovascular Nuclear Medicine (3 rd fl, SLEH).....	832-355-3732	P327
Outpatient Nuclear Medicine (11 th fl, SLMT).....	832-355-8201	
Radiation Safety Office.....	832-355-3141	Y2601
Reports (8-5, M-F).....	832-355-2270	Y2614
Leticia Alanis-Williams, B.S.....	832-355-2692	Y2601A
Anupa Arora, M.D.,MPH.....	832-355-5247	Y2618C
Randy Barker, B.S.....	832-355-8927	Y2660
Cindy Gentry, B.S.....	832-355-6448	Y2601D
Ramesh Dhekne, M.D.....	832-355-2608	Y2618E
Patrick Ford, M.D.....	832-355-2065	Y2618D
Ed Giles, M.S.....	832-355-4949	Y2621A
Marly Gonzalez, B.S.....	832-355-3806	P327
Bryan Fritz, B.S.....	832-355-4948	Y2611D
Joe Knisel, M.S.....	832-355-3884	Y2621B
Warren Moore, M.D.....	832-355-3126	Y2601B
Paul Murphy, Ph.D.,MBA.....	832-355-3440	Y2611C
Nayaka Shaw.....	832-355-4119	Y2601C

DEPARTMENT MISSION

The mission of the Nuclear Medicine Department of St. Luke's Episcopal Hospital is to provide high quality diagnostic, therapeutic, and consultative nuclear medicine services for patients and physicians at the Hospital and its Medical Tower and to promote the science and practice of nuclear medicine by providing educational opportunities for trainees in nuclear medicine and by participation in research involving the use of non-sealed sources of radioactive materials.

EDUCATIONAL SCOPE

The educational portion of the Department's mission specifically includes the education of health care providers and others in various aspects of nuclear medicine. In accomplishing this mission, members of the Service and the Department routinely participate in Baylor College of Medicine training programs for medical students, residents, and fellows and in the Houston Community College Nuclear Medicine Technology Program. From time to time, trainees from other institutions, private practitioners, commercial representatives, and members of the public may also be present in the Department and attend interpretation and other teaching sessions.

OVERVIEW OF CARDIAC NUCLEAR MEDICINE TRAINING

American Board of Internal Medicine (ABIM) certification in Cardiovascular Diseases (CD) requires "competence in the interpretation of radionuclide procedures." For SLEH/THI Cardiology fellows, this is achieved by a combination of didactic lectures and practical training and experience. Goals, objectives, and curricula have been developed for each monthly nuclear cardiology rotation and will be reviewed with the fellow at the beginning of each rotation.

Didactic Lectures: The Core Lecture Series includes a brief overview of the most commonly used techniques in cardiac nuclear medicine including perfusion and functional imaging. Additional topics are covered over a 2-year cycle in the Nuclear Cardiology portion of the Noninvasive Cardiology (noon) lecture series.

Nuclear Cardiology 1: All fellows in the SLEH/THI Cardiology program complete two one-month rotations in the CVNM Laboratory. These collectively constitute the "Nuclear Cardiology 1" (Nuc 1) rotation. The exact timing of the rotations varies from fellow to fellow and may occur in the first and/or second year of the fellowship. Faculty review sessions are scheduled weekly during the Nuc 1 rotation. A structured text reading and written quiz schedule over both months is required. Practical experience in procedure performance and interpretation is also obtained during the rotation. This clinical rotation, in conjunction with didactic lectures, allows the fellow to develop an understanding of the applications, advantages, and pitfalls of radioisotope imaging as they apply to patients with known or possible cardiac disease. Together, these activities meet the requirements of (a) the Accreditation Council for Graduate Medical Education – Residency Review Committee for Cardiovascular Disease (ACGME-RRC-CD) for training of cardiology fellows in nuclear cardiology, (b) the American College of Cardiology (ACC) "COCATS 2" (2/2006 revision) Level 1 training for nuclear cardiology ("Basic (General) training required of all trainees to be competent consultant cardiologists" (and) "conversant with the field of nuclear cardiology for application in general clinical management of cardiovascular patients"), and (c) the ABIM for eligibility for the Cardiovascular Disease subspecialty examination. This level of training will not meet the requirements for authorized user status or licensure to use radioactive materials and will not provide eligibility for the Certification Board of Nuclear Cardiology (CBNC) examination.

Nuclear Cardiology 2: Fellows seeking authorized user (AU) physician status on a radioactive materials (RAM) license and/or CBNC certification will require additional training after completion of the Nuc 1 rotation. The portion of this additional training performed at SLEH is designated collectively as the "Nuclear Cardiology 2" (Nuc 2) rotation and includes a minimum of 3 additional one-month clinical rotations in CVNM, a research project, and certain other tasks described in detail in the Nuc 2 rotation manual. A didactic training course in basic sciences is also required but is not provided as a part of the Cardiology fellowship.

Any fellow who wishes to become an authorized user for radioactive materials (RAM) must achieve at least ACC Level 2 training ("Additional (Specialized) training in (nuclear cardiology) that enables the cardiologist to perform (and/or) interpret...specific procedures at an intermediate skill level...") and the fellow should contact the Director of CVNM (Dr. Warren Moore, 832-355-3126) no later than the spring of the first year of fellowship to discuss the requirements for such licensure. Official regulations vary from state to state and will definitely change between now and April 2008. These are subject to additional changes at any time. Current minimum requirements for licensure in Texas include at least 80 hours of didactic training (not provided by SLEH/THI) in basic sciences related to the use of nonsealed radioactive materials and approximately 620 hours of clinical training in the Nuclear Medicine Department (for a minimum total of 700 hours). This additional training that is required for RAM licensure is not a required part of the fellowship, and acceptance for such training is not guaranteed (due to space, personal performance, and other considerations). Five 1-month CVNM clinical assignments (Nuc 1 plus Nuc 2), a research project, and other local requirements exist for ACC Level 2 training at SLEH. Depending on federal and state guidelines, local requirements, and the fellow's exact rotation schedule, limits exist on leave and absences during nuclear medicine rotations. (For example, fellows seeking to meet Level 2 criteria should not plan to exceed a total of 15 days of absence (for any reason except clinic and post-call periods) during the five clinical months and should not plan to take more than 1 week of vacation or other leave during the fifth month. Fellows exceeding these limits may require additional clinical months to meet licensure hour requirements, and the availability of this training at SLEH is not guaranteed.

Nuclear Cardiology 3: Any fellow who wishes to pursue ACC Level 3 training ("Advanced training (which enables) a cardiologist to perform, interpret, and train others to perform and interpret specific procedures at a high skill level" (and is) "sufficient to pursue an academic career or direct a nuclear cardiology laboratory") will be required to complete 12 months of training in cardiac nuclear medicine. Fellows interested in this option should contact Dr. Moore as early as possible in the course of the fellowship to discuss this matter in detail. A maximum of one Level 3 position is available, and requests may come from inside or outside of Baylor.

PURPOSES

PURPOSES: There are two purposes for the Nuc 2 rotation in the CVNM Laboratory at SLEH: fellow education and support of clinical functions.

1. The primary purpose for these rotations is education in cardiac nuclear medicine. For trainees seeking radioactive materials (RAM) licensure, the additional purpose is to develop advanced knowledge and skills in the performance of radioisotope procedures, procedure interpretation, and operation of a clinical cardiac nuclear medicine laboratory and to develop a more extensive theoretical and practical understanding of basic sciences and radiation safety pertinent to diagnostic use of nonsealed radiopharmaceuticals for cardiac diagnosis.
2. A secondary purpose of the rotation is assistance of the Nuc 1 fellow with clinical responsibilities. The Nuc 2 Cardiology fellow, as a representative of the Cardiology Section, will act as backup to the Nuc 1 fellow for activities related to the immediate medical safety of patients being examined in the CVNM Laboratory during regular hours. This applies primarily to patients undergoing stress tests, but includes all patients who may be seen in the laboratory.

GENERAL GOALS

ASSUMPTIONS: The goals of the Nuc 2 rotation are directed at the fulfillment of the purposes listed above. It is assumed that the Nuc 2 fellow's prior experience has satisfied any requirements in the area of stress testing and patient safety evaluation, and this will not be an educational focus of the nuclear medicine faculty during these rotations except as safety issues directly pertain to the conduct of radioisotope imaging procedures. It is further assumed that the fellow has already met the requirements of the residency accrediting agency (ACGME-RRC for Cardiovascular Disease) for training of cardiology fellows in "radionuclide procedures." Lastly, it is assumed that fellows participating in Nuc 2 rotation are seeking authorized user status for a RAM license.

It is NOT the goal of these clinical rotations to meet NRC or state requirements for didactic training in basic sciences. It is assumed that this didactic training will be or has been received in a separate course. It is a requirement of this program that all such formal didactic and laboratory basic science training be completed prior to beginning the final month of clinical training.

GENERAL GOALS: The overall goal of this training is that the fellow should gain the specialized practical and theoretical knowledge to properly supervise, perform, and interpret cardiac radioisotope procedures, including technical, clinical, logistical, and radiation safety considerations. While the specific educational goals and objectives for the Nuc 2 fellow on this rotation overlap Nuc 1 objectives in many areas, the general goal is that the Nuc 2 fellow will have significantly greater competence and confidence in decision making with respect to all areas of radionuclide cardiac studies.

It is specifically a goal of these rotations to train the fellow for authorized user status, for use limited to cardiovascular procedures, as defined by the Nuclear Regulatory Commission (NRC) and/or agreement states. The Nuc 1 and Nuc 2 rotations collectively are designed to provide approximately 650 hours of clinical and hands-on training related to radioisotope procedures, accomplished over 5 one-month clinical assignments in the CVNM Laboratory. It is therefore the goal of these clinical rotations to satisfy the letter and the spirit of the recommendations and guidelines of the American College of Cardiology (COCATS 2 (revised 2/2006) (Level 2)) and the Society of Nuclear Medicine (SNM) for clinical and hands-on radioactive materials training for cardiology fellows and to fulfill the clinical training and experience requirements of the NRC for authorized user physician status (10 CFR 35).

Toward fulfillment of these general goals, the Nuc 2 rotation will:

1. provide training and experience so that the fellow can organize and operate a clinical cardiac nuclear medicine laboratory with identification of the need for outside support as necessary
2. provide training and experience so that the fellow can adequately supervise and interpret radioisotope procedures including those performed as an adjunct to cardiac stress testing by various pharmacologic and exercise methods
3. meet the clinical training and experience requirements of the NRC and most agreement states for certification as an authorized (physician) user of radioactive materials for diagnostic cardiac nuclear medicine
4. provide training and experience necessary to be eligible for and to pass the Certification Board for Nuclear Cardiology (CBNC) examination
5. meet the recommendations developed by the ACC and SNM for training of cardiology fellows in radioisotope procedures.

SPECIFIC GOALS AND OBJECTIVES BY COMPETENCY

Prior to entering the Nuc 2 rotations, the fellow should have met all objective of the Nuc 1 rotations. are indicated for each of the six ACGME competencies in the tables below. The first column describes whether the objective reflects knowledge, skill, and/or attitude. The second column lists the specific rotational objective. The third column lists the most relevant learning activities for that objective, and the fourth column indicates the principle evaluation methods for that objective.

In addition, the following legends are used to describe Traits, Learning Activities, and Evaluation Methods:

Traits	
K - Knowledge S - Skills	A - Attitude

Learning Activities	
FS – Faculty Supervision CC – Core Curriculum & didactic conferences DPC – Direct Patient Care MM – Morbidity and Mortality Conference	JC – Journal Club LR – Reading Assignment/Independent Literature Review RC – Research Conference CAC – Cath Conference

Evaluation Methods	
AE – Attending Evaluations PDR – Program Director’s Review (twice annually)	360 – 360° Evaluation Q - Quiz

1. Patient Care

Goal: At the end of this rotation, the fellow shall be able to provide patient care that is compassionate, appropriate, and effective for the evaluation known or suspected cardiac disorders by radionuclide techniques.

Traits	Objectives – By the end of the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
K,S	A. Obtain a focused medical history and physical examination to determine the safety and suitability of a requested procedure for an individual patient referred to the CVNM Laboratory	DPC, LR, CC, FS	AE
K	B. Assess the advisability and selection of tests, and design and supervise specific modifications, if necessary, of the requested stress test and/or the requested radionuclide imaging procedure and/or protocol for an individual patient, incorporating both pre-procedural and intra-procedural findings	DPC, LR, CC, FS	AE, Q
K,S	C. Monitor patients during and following stress testing who are at high risk of procedural complications and/or who have complicated imaging requirements	DPC, FS, CC, LR	AE
K,S	D. Discuss planned stress testing and radionuclide procedures with the patient and obtain informed consent for routine or research testing	DPC, FS, LR, CC	AE, 360
K,S	E. Interpret results of radionuclide procedures with a high level of competence and provide specialized direction for advanced radionuclide imaging techniques for patients with unusual findings and/or clinical situations	DPC, AR/FS, LR, CC, JC	AE, Q

2. Medical Knowledge

Goal: At the end of this rotation, the fellow shall be able to demonstrate specialized knowledge of (i) basic sciences pertinent to cardiac radionuclide imaging, (ii) performance, quality control, and processing of clinical cardiac nuclear medicine procedures, (iii) interpretation of common cardiac nuclear medicine procedures, and (iv) appropriate clinical decision making using information obtained or likely to be obtained from most types of cardiac nuclear medicine procedures.

Traits	Objectives – By the end of the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
K	A. Discuss in detail the scientific principles of radiation, radionuclide imaging instrumentation and quality control, and clinical radiopharmacy	FS, CC, LR	AE, Q
K	B. Discuss in detail the mechanisms of action of available pharmacologic stress agents as well as the relative advantages and disadvantages of each agent in particular patient populations and any alteration in imaging procedures that may be related to these agents (compared to each other and to exercise testing).	FS, CC, LR	AE, Q
K	C. Describe details of pharmacologic, physiologic, and imaging mechanisms for radionuclide tracers used for cardiac imaging	FS, CC, LR	AE, Q
K	D. Discuss established clinical indications, contraindications, and appropriateness criteria for radionuclide procedures; including planar, SPECT, and PET techniques with particular attention to ACC/AHA/ASNC guidelines for imaging and clinical cardiology	FS, CC, DPC, LR	AE, Q
K	E. Describe, in detail, procedural and technical components of radionuclide procedures, including variations of imaging setup and patient preparation Which are necessary and appropriate in specific clinical settings	FS, CC, DPC, LR	AE, Q
K	F. Recognize and describe technical and clinical situations that may affect the validity of a cardiac nuclear medicine study, describe techniques to avoid and/or overcome these problems, and discuss the level of confidence that is appropriate after application of these changes.	FS, CC, DPC, LR	AE, Q
K	G. Discuss principles of radiation safety and make appropriate recommendations for alterations of standard procedures, considering radiation related concerns of patients, health care workers, and the public	FS, CC, DPC, LR	AE, Q
K	H. Process all common studies in a clinically acceptable manner and provide competent interpretations of radionuclide cardiac procedures; including multiple display formats, and correlate radionuclide results with those of other imaging modalities	FS, CC, DPC, LR	AE, Q

3. Interpersonal Skills and Communication

Goal: At the end of this rotation, the fellow shall be able to demonstrate the knowledge, skills and attitudes necessary to develop and maintain appropriate interpersonal relationships and to communicate effectively with patients, families, colleagues, and the public.

Traits	Objectives – During the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
S,A	A. Communicate sensitively and effectively with patients and their families	FS, DPC	AE
K,S	B. Train inexperienced nuclear medicine technologists in radiation safety, basic radiopharmacy techniques, and radiopharmaceutical quality control procedures.	FS, DPC	AE, 360
K,S	C. Synthesize clinical and laboratory information with radionuclide findings to form a clinically relevant interpretation for a total experience of at least 300 radionuclide studies	FS, CC,DPC, LR, CAC	AE
K,S	D. Dictate appropriate reports which consistently demonstrate accurate, clear, concise, informative wording which has correct format, spelling, and grammar	FS, CC, DPC	AE
S,A	E. Demonstrate effective face-to-face and telephone skills of listening and speaking to professional colleagues and support personnel	FS, DPC	AE, 360
K,A	F. Identify and routinely notify referring physicians of unexpected and/or urgent findings and document this communication in the patient's record	FS, DPC	AE

4. Professionalism

Goal: At the end of this rotation, the fellow shall be able to demonstrate the knowledge, skills, and attitudes necessary to practice professionally responsible, ethical, and compassionate care in the diagnostic imaging setting.

Traits	Objectives – During the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
S, A	A. Consistently interact professionally with patients, families, colleagues, and all members of the health care team, showing respect, compassion, and integrity	FS, DPC	AE, 360
A	B. Display an appreciation of the social context of illness and the difficulties of prolonged diagnostic testing for patients with heart disease	FS, DPC	AE, 360
S,A	C. Actively mentor and act as a role model for Nuc 1 fellows and other junior members of the nuclear medicine team	DPC	AE, 360
K,S,A	D. Relate and fulfill the regulatory and ethical requirements to assure the confidentiality of all the private health information	FS, DPC	AE,360
A	E. Prepare for and attend assigned conferences and presentations	FS	AE
S,A	F. Demonstrate positive work habits, including punctuality and professional appearance	FS	AE, 360
S,A	G. Demonstrate intellectual curiosity and dedication to excellence	FS, CC, DPC, LR	AE
K,A	H. Recognize and avoid conflicts of interest in research, education, clinical practice, and private life	FS, DPC, RC	AE, 360

5. Practice-Based Learning and Improvement

Goal: At the end of this rotation, the fellow shall be able to demonstrate the knowledge, skills, and attitudes necessary to initiate and sustain self-directed and independent learning with emphasis on current evidence-based practice and evolving techniques relevant to radionuclide cardiac imaging and its related fields.

Traits	Objectives – During the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
S,A	A. Demonstrate a consistent commitment to scholarship in radionuclide cardiac issues through the systematic and critical perusal of current print and electronic medical literature, including both imaging and clinical cardiology sources	DPC, FS, LR, JC, RC	AE
S	B. Routinely utilize the Internet and other electronic media to find solutions to current clinical problems and questions.	DPC, JC, LR, RC	AE
K,S	C. Prepare at least 2 interesting cases per month for presentation to colleagues to demonstrate typical or unique points of medical practice related to radionuclide imaging	FS, CC, DPC, LR	AE
K,S,A	D. Discuss in detail and interpret myocardial perfusion imaging studies including those performed with gated or ungated acquisitions, planar or tomographic techniques, thallium or technetium agents, and displayed in color or black-and-white formats.	FS, CC, DPC, JC, LR, RC	AE,Q
K,S,A	E. Demonstrate a commitment to learning through participation in research and producing formal presentations and/or publications	CC, JR, RC	AE
K	F. Design a camera quality control program for a typical cardiac nuclear medicine laboratory including both practical and theoretical considerations. Specific equipment and timing intervals for quality control must be a part of this plan	DPC, FS, CC, LR	AE, Q

6. Systems-Based Practice

Goal: At the end of this rotation, the fellow shall be able to demonstrate the knowledge, skills, and attitudes necessary to manage effectively in multiple, diverse, complex systems of care to provide effective service, supervision, and consultation for radionuclide cardiac imaging.

Traits	Objectives – By the end of the rotation, the fellow will be able to:	Learning Activities	Evaluation Methods
K,S	A. Propose an alternative policy, procedure, or method of operation for the CVNM Laboratory to improve the overall quality of the service provided by the Laboratory	DPC, FS	AE, 360
K,A	B. Discuss the role of governmental regulation at multiple levels in the operation of a nuclear cardiology laboratory	DPC, FS	AE, 360
K,S	C. Be able to perform cost analysis of imaging protocols to determine marketability and feasibility of various options.	DPC, FS	AE
K,A	D. Describe how technical imaging factors as well as nonscientific considerations influence the utilization of imaging modalities	DPC, FS	AE
K	E. Discuss the role of investigational radiopharmaceuticals and instrumentation in the development of clinical cardiology algorithms	DPC, FS, CAC, JC, LR,	AE

IMPLEMENTATION

In order to accomplish the above goals and objectives, the fellow will be expected to:

1. Participate in the performance (preparation, acquisition, and processing) of CVNM procedures performed at SLEH, specifically including myocardial perfusion and blood pool imaging.
2. Observe all patients undergoing bicycle stress (MUGA) imaging during the rotation and process all related data for interpretation.
3. Participate in daily reading sessions with the nuclear medicine physician.

Prior to the reading session, the fellow should review those studies that are available and enter an interpretation into the nuclear medicine report generation computer.

4. Obtain follow-up information on interesting or puzzling cases with emphasis on the role of the radionuclide study in the patient's overall management.

Any discrepancies between the scan findings and the clinical findings and diagnoses should be described and discussed. A minimum of 30 such cases must have written documentation of correlation with coronary angiography in addition to clinical followup. (Correlation form is attached.)

6. Participate in research related to cardiac nuclear medicine.

Each fellow is required to undertake a research project in cardiovascular nuclear medicine to be completed or well established prior to completion of clinical nuclear medicine training. The project may be a written literature review with an annotated bibliography, a case report and literature review submitted for publication, or a more substantive formal research endeavor. This project will be selected in consultation with the Director of CVNM, no later than the end of the start of the fourth month of the Nuc 2 rotation. One outcome of this project may be presentation of results in an abstract and/or published paper.

The fellow may make a 50-minute presentation in the Clinical Nuclear Medicine Conference of the Nuclear Medicine Service. If invited to present to this group, the fellow is reminded that this audience will consist primarily of experienced nuclear medicine practitioners and that the discussion should be conducted at that level. The topic of this conference may be the results of the fellow's CVNM research project and/or literature review. The date and exact topic will be assigned by the Director of CVNM.

The fellow may also be asked by the Chief Fellow or the CVNM Director to present one or more noon conferences to the Cardiology Section on a topic related to cardiovascular nuclear medicine. The fellow must ascertain the exact date of this presentation from the Chief Fellow. The topic of this conference must be approved by the Director of CVNM and should be discussed with him prior to initiating any major effort.

7. Complete and document a Radiation Safety Practicum.
8. Complete and document a Radiopharmacy Practicum.
9. Complete and document an Imaging Practicum and a Quality Control Practicum.

CLINICAL SUPERVISION

Trainees rotating at SLEH will be subject to all regulations of BCM and SLEH. The Chief of the Nuclear Medicine Service has overall responsibility for resident and fellow education and experience in the SLEH Nuclear Medicine Department and has delegated responsibility for Cardiology fellow training to the CVNM Director. Other faculty members of the Nuclear Medicine Service also participate on a daily basis as supervising physicians as assigned by the Chief of Service. Each trainee will be given progressive opportunity and responsibility, commensurate with his/her abilities as determined by the attending staff, for the operation of the daily activities of the CVNM laboratory. The trainee is encouraged to take responsibility for decisions, but should not exceed his/her level of competence. A member of the faculty will be available at all times to assist with decisions and make appropriate suggestions or to give direction as appropriate.

CLINICAL RESPONSIBILITIES

The following clinical responsibilities are an outgrowth of the purposes, goals, and objectives.

1. Except as noted below, the Nuc 2 fellow should be available during regular hours of operation of the CVNM Laboratory to assist the Nuc 1 fellow, technologists, nurses, and other Hospital personnel in the efficient operation of the Laboratory. When not actively involved in Laboratory operations, the fellow should focus his/her efforts on nuclear cardiology topics.
2. By the start of the fourth month of CVNM training, the fellow should be able to accomplish most tasks required of an authorized user under a RAM license. Thus, during the fourth and/or fifth months of training, the fellow will function (on a schedule assigned by the CVNM Director) as the laboratory physician supervisor, i.e. the initial contact for resolution of imaging issues. Generally the time as supervisor will be split into two two-week blocks distributed in the fourth and fifth months. (Supervisor duties can not begin until after all didactic and basic science training has been successfully completed, which should be no later than the start of the fifth clinical month.)

During the final month of CVNM training, the fellow's principal responsibility will be supervision of all aspects of CVNM Laboratory activity, in conjunction with the CVNM Technologist Supervisor. The fellow should attend Noninvasive Cardiology Conferences and Interpretation Sessions unless an immediate supervisory issue arises. Any operational questions or concerns which the fellow can not comfortably handle with assistance from the Technologist Supervisor should be discussed directly with the NM physician assigned to the CVNM Laboratory for the day.

3. The Nuc 2 fellow will be available to provide instructional and logistic support for the Nuc 1 fellow as necessary. The Nuc 2 fellow will also act as backup to the regularly assigned Nuc 1 fellow for temporary absences such as outpatient clinics, early departure from the Laboratory for evening on-call duties, post-call leave, illness, etc. When covering for the Nuc 1 fellow, the Nuc 2 fellow is expected to be physically present during the regular hours of operation of the CVNM Laboratory and to perform all functions usually assigned to the Nuc 1 fellow.
4. The Nuc 2 fellow will assist the Nuc 1 fellow in training residents and medical students on the cardiac nuclear medicine rotation in proper techniques of stress testing, imaging, and interpretation.
5. Questions related to imaging issues should be discussed with the nuclear medicine physician assigned to the CVNM Laboratory for the day.
6. Administrative difficulties or recommendations for administrative or medical policy or procedure changes should be reported to the Director of CVNM.

CLINICAL DOCUMENTATION

Documentation is required in Nuc 2 rotations for attendance, case participation/interpretation, case correlations, "hands-on" activities listed on the following forms, and research activities. All required documentation should be returned to the Director of CVNM at the end of the fellow's nuclear medicine rotations.

Attendance will be documented by the "Trainee Attendance Log" posted in the CVNM reading room. The fellow should indicate his/her hours of participation only in nuclear medicine activities at the end of each day. (Time spent in other activities such as personal activities; non-nuclear study, conferences, and review sessions; cath lab; clinic; and general call activities do not count for the purposes of this log.) In the case of absence or limited attendance, the reason for should be recorded on the day the fellow returns to duty. If the fellow fails to complete this log, he/she will be assumed not to have been present for the day.

EDUCATIONAL RESPONSIBILITY

While the faculty is responsible for coordinating and directing each trainee's experience and while faculty members may receive a "return" from this activity in various ways, it is the learner who will chiefly benefit from the rotation. Therefore, though the fellow can not be expected to master the entire field of cardiac nuclear medicine in the course of Nuc 1 and Nuc 2 rotations, each fellow must develop a strong fund of information and a solid working knowledge of the field. Fellows' activities will include completion of assigned projects and additional reading as necessary to gain a firm understanding of the principles and specifics of clinical cardiac nuclear medicine and related basic sciences. Each trainee's activities during the hours of the rotation should be intensely directed toward the study and practice of cardiac nuclear medicine. Initiative and active involvement on the trainee's part are expected.

READING

To assist the fellow in accomplishing the goals above, the fellow should be familiar with the optional reading material not covered in the Nuc 1 rotation reading assignments. (Nuc 2 fellows who have not previously satisfactorily completed the examinations for each reading assignment must do so during their first Nuc 2 rotation.) The Nuc 2 fellow should be conversant with radionuclide articles recently published in the major cardiology journals as well as the Journal of Nuclear Cardiology and the Journal of Nuclear Medicine. The fellow may be asked to present selected articles at the Nuclear Medicine Journal Club.

EVALUATION

At the end of each 1-month rotation, the fellow will be evaluated using standard forms provided by the Cardiology Section.

During the last week of the rotation, the fellow will meet with the Director of CVNM to verbally review the fellow's performance and the quality of the rotation. The fellow will also be asked to verbally evaluate the CVNM rotation for the purpose of improving the experience for future trainees. Comments regarding the rotation are welcome at any time and should be directed to the Director of CVNM or to the Cardiology Program Director. In evaluating the rotation formally or informally, specific remarks are more valuable than vague generalities.

If requested, the CVNM Director, as the trainee's RAM preceptor, will convey to the appropriate licensing authority a statement of the time and content of the fellow's training at SLEH. However, participation in or even completion of this training does not guarantee acceptance by the NRC or any agreement state for radioactive materials licensure. Meeting the specific requirements for licensure in the trainee's jurisdiction and the application for such licensure is the trainee's responsibility.

No educational evaluation, letter of recommendation, preceptor statement, or other verification will be sent until all of the required components of the training plan have been satisfactorily completed and accepted.

ADMINISTRATIVE ISSUES

In addition to the general regulations required by Baylor College of Medicine and those required by the Cardiology Program Director, the following rules shall apply.

Attendance: The trainee is expected to be in the CVNM Laboratory or the SLEH Treadmill Laboratory during the routine hours of operation of the assigned laboratory, as described below, unless the trainee has made previous arrangements with the SLEH Chief of Service or the Nuclear Medicine physician responsible for the laboratory for the time of absence. The fellow is automatically excused for the half-day associated with his/her continuity clinic.

Starting: Except as described above, trainees should report to the CVNM Laboratory no later than 0800 Monday-Friday with the exception of (a) official holidays of St. Luke's Episcopal Hospital when the Laboratory is closed and (b) Fridays when the fellow attends Basic Science Conference and is required in the CVNM Laboratory no later than 0845, or (c) days on which the trainee had official in-house night call the previous evening in which case he/she is excused for the day.

Absence During the Day: If, for whatever reason, the Nuc 2 fellow has assumed coverage responsibility for the Nuc 1 fellow, the Nuc 2 fellow is responsible for compliance with all guidelines for that coverage. In such a case, every effort will be made to adjust the laboratory's clinical schedule so that the fellow can attend noon conferences and other officially required Cardiology conferences. If there is a special consideration, such as a conference that the fellow is presenting, the CVNM Technologist Supervisor should be notified early in the day to optimize scheduling, and backup coverage, if necessary, must be arranged by the fellow. Backup coverage may be another Nuc II fellow, if available, but since that fellow may have conflicting commitments, coverage cannot be assumed without making specific arrangements.

Finishing: The CVNM Laboratory usually completes its daily work between 1700 and 1800 but may be earlier or later on any particular day. The fellow should be present until all cardiac procedures have been completed and interpreted unless (a) the fellow has continuity clinic, (b) the fellow has required night call for the evening, in which case he/she will be excused at 1700 if needed for call duties, (c) the fellow had required night call or other official in-house call (not moonlighting) the previous evening in which case he/she is excused for the day, (d) the fellow has made previous formal arrangements with the Program Director and Director of CVNM for other absence (leave), or (e) the fellow is excused by the Nuclear Medicine attending responsible for the Laboratory that day. In any case (including a-e above) in which the fellow is to be excused from the laboratory before the completion of the day's stress testing and patient recovery, if the Nuc 2 fellow has assumed coverage responsibility for the Nuc 1 fellow, the Nuc 2 fellow must arrange alternative coverage. The CVNM Supervisor must be informed of the coverage arrangement.

Leave and Absences: The Director of CVNM must approve all requests for leave or other substantial absence from the rotation. Any replacement coverage required for these absences must be arranged by the fellow and described in writing on the form provided by the Program Director. Ordinarily, 10 days absence (in addition to clinic and post-call absences) during the entire clinical training period (including all Nuc I and Nuc II rotations), for whatever reason(s) may be taken without adversely affecting licensure requirements. The fellow is responsible for seeing that overall training time has been adequate for licensure. **No planned extended leave for any purpose may be taken during the laboratory supervision period of the last month(s) of CVNM training.**

In the event of illness or other unavoidable urgent absence, the fellow should contact the Chief Fellow as soon as possible in order to arrange for alternative clinical coverage if necessary. In addition, the fellow should notify the CVNM Laboratory at 832-355-3732 of the situation and coverage.

Radiation Safety: Fellows will wear the Hospital-issued radiation detection badge at all times while in the CVNM or Treadmill Laboratory. Fellows administering or handling radiopharmaceuticals will wear ring badges as well.

QUESTIONS/COMMENTS

All questions regarding the curriculum and general or specific guidelines contained in this packet and any comments or suggestions regarding the operation of the CVNM Laboratory should be referred to the Director of CVNM, Warren H. Moore, M.D., at 832-355-3126 or wmoore@sleh.com (Room Y2601B, SLEH).

NUCLEAR CARDIOLOGY I (CVNM) READING ASSIGNMENTS

- Week 1: Introduction/Myocardial Perfusion Imaging 1
 -Gerson: Ch 6 & 4
 *Heller: Ch 1, 2, 9, 10, 14
- Week 2: Myocardial Perfusion Imaging 2
 -Gerson: Ch 1, 3, & 20
 *Heller: Ch 3, 11, 12, 13, 19
- Week 3: Myocardial Perfusion Imaging 3
 -Gerson: Ch 2, 5
 *Heller: Ch 4, 5, 6, 7
 *Chandra: pp160-167, 168-175
- Week 4: Basic Nuclear Medicine Physics & Instrumentation
 -Chandra: pp 1-30, 31-49, 110-127, 128-138, 139-157
 *Heller: Ch 21, 22
- Week 5: Gated Imaging: Resting and Exercise Studies
 -Gerson: Ch 10 & 11, 12-17
 *Heller: Ch 8, 23
- Week 6: Positron Imaging
 -Gerson: Ch 8 & 9
 -Chandra: pp 157-159
- Week 7: Infarct/Acute-Use Imaging
 -Gerson, Ch 18, 26
 *Berman, Ch 6
 *Heller: Ch 7
- Week 8: Other Clinical Applications
 *Heller: Ch 20 & 24
 *Gerson, Ch 22 & 25, 7, 21, 24, 27, 28, 29
 *Berman, Ch 12-16

References

1. Berman & Mason, Clinical Nuclear Cardiology, Grune & Stratton, 1981.
2. Chandra, Nuclear Medicine Physics-The Basics, 6th ed., Williams & Wilkins, 2004.
3. Gerson, Cardiac Nuclear Medicine, 3rd ed., McGraw-Hill, 1997.
4. Heller & Hendel, Nuclear Cardiology Practical Applications, McGraw-Hill, 2004.

Items marked with an asterisk () are optional for Nuc I fellows.

CARDIAC NUCLEAR MEDICINE TRAINING – DAILY SCHEDULE – NUC 2

Nuc 2 fellows are generally expected to pursue nuclear medicine activities from 0800 to 1800 each weekday except when actively participating in the following activities:

<u>Time</u>	<u>Day</u>	<u>Activity</u>
0730-0845	F	Basic Science Conference
1145-1315	M-F	Cardiology Noon Conference
a.m. or p.m.	varies	Continuity Clinic
1700-0700	varies	On-Call Duties
all day	varies	Post-Call Day

The presence of the Nuc 2 fellow may be necessary in the Laboratory during or outside of these times under certain circumstances as described in the curriculum manual. CVNM activities conducted on Hospital holidays and on weekends are not a part of the Nuc 2 rotation. Considering the allowances noted above, a typical daily schedule for Nuc 2 fellows may be:

Month 3**Month 3, Week 1****General Clinical Activities**

First day of rotation: assist and orient Nuc 1 fellow as needed and meet with CVNM Director

Mon	0800-1145	Assist and Orient Nuc I Fellow	Advanced Reading Assignments
	1145-1315	Cardiology Noon Conf.	Backup Nuc 1 Fellow
	1315-1800	Interpretations	Research Project Determination
Tu-W	0645-0800	Image QC Practicum	Interpretation Sessions
	0800-0900	Clinical	Case Correlations
	0900-1145	Imaging Practicum	
	1145-1315	Cardiology Noon Conf.	
	1315-1800	Interpretations	
Thur	0645-0800	Image QC Practicum	
	0900-1145	Imaging/Basic Processing Practicum	
	1145-1315	Cardiology Noon Conf.	
	1315-1800	Interpretations	
Fri	0730-0845	Basic Science Conf.	
	0845-1145	Imaging/ Basic Processing Practicum	
	1145-1315	Cardiology Grand Rounds	
	1315-1800	Interpretations	

Month 3, Week 2**General Clinical Activities**

M-Tu	0730-1145	Imaging/Basic Processing Practicum	Advanced Reading Assignments
	1145-1315	Cardiology Noon Conf.	Backup Nuc 1 Fellow
	1315-1800	Interpretations	Research Project Implementation
W	0800-0900	Clinical	Interpretation Sessions
	0900-1145	Basic Image Processing Practicum	Case Correlations
	1145-1315	Cardiology Noon Conf.	
	1315-1800	Interpretations	
Thur	0900-1145	Advanced Image Processing Practicum	
	1145-1315	Cardiology Noon Conf.	
	1315-1800	Interpretations	
Fri	0730-0845	Basic Science Conf.	
	0845-1145	Advanced Image Processing Practicum	
	1145-1315	Cardiology Grand Rounds	
	1315-1800	Interpretations	

Month 3, Week 3

Mon	0645-1000	Radiopharmacy Practicum
	1000-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Tu-W	0645-1000	Radiopharmacy Practicum
	1000-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Thur	0645-1000	Radiopharmacy Practicum
	1000-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Radiation Safety Practicum
	1145-1315	Cardiology Grand Rounds
	1315-1800	Interpretations

General Clinical Activities

Advanced Reading Assignments
Case Correlations
Backup Nuc 1 Fellow
Research Project Implementation
Interpretation Sessions

Month 3, Week 4

Mon	0800-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Tu-W	0645-0900	Radiopharmacy Practicum
	0900-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Thur	0645-0900	Radiopharmacy Practicum
	0900-1145	Research
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Radiation Safety Practicum
	1145-1315	Cardiology Grand Rounds
	1315-1800	Interpretations

General Clinical Activities

Advanced Reading Assignments
Backup Nuc 1 Fellow
Research Project Implementation
Interpretation Sessions
Case Correlations

Month 4 will resemble Month 3 with attention to any tasks not completed from all prior months. Depending on the status of the fellow's didactic basic science training, the fellow may be assigned supervisory responsibilities. Scheduling issues will be reviewed with the CVNM Director on the first day of the rotation.

Month 5, Week 1**First day of rotation: assist and orient Nuc 1 fellow as needed and meet with CVNM Director**

Mon	0800-1145	Assist and Orient Nuc 1 Fellow Meet with CVNM Director
	1145-1315	Cardiology Noon Conference
	1315-1800	Laboratory Supervision
M-W	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Thur	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Laboratory Supervision
	1145-1315	Cardiology Grand Rounds
	1315-1800	Lab Supervision/Interpretations

Month 5**General Clinical Activities**

Laboratory Supervision
Advanced Reading
Research Project Completion
Interpretation Sessions
Case Correlations

Month 5, Week 2

M-W	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Thur	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Laboratory Supervision
	1145-1315	Cardiology Grand Rounds
	1315-1800	Lab Supervision/Interpretations

General Clinical Activities

Laboratory Supervision
Advanced Reading
Research Project Completion
Interpretation Sessions
Case Correlations

Month 5, Week 3

M-W	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Interpretations
Thur	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Laboratory Supervision
	1145-1315	Cardiology Grand Rounds
	1315-1800	Lab Supervision/Interpretations

General Clinical Activities

Laboratory Supervision
Advanced Reading
Research Project Completion
Interpretation Sessions
Case Correlations

Month 5, Week 4

M-W	0730-1145	Laboratory Supervision
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Thur	0730-1000	Laboratory Supervision
	1000-1145	Research Presentation
	1145-1315	Cardiology Noon Conf.
	1315-1800	Lab Supervision/Interpretations
Fri	0730-0845	Basic Science Conf.
	0845-1145	Laboratory Supervision
	1145-1315	Cardiology Grand Rounds
	1315-1800	Lab Supervision/Interpretations

General Clinical Activities

Laboratory Supervision
Advanced Reading
Research Project Presentation
Interpretation Sessions
Case Correlations

**ST. LUKE’S EPISCOPAL HOSPITAL – NUCLEAR MEDICINE DEPARTMENT
 TRAINEE PARTICIPATION LOG for CARDIAC ACTIVITIES**

Trainee: _____

The following activities are required for Cardiology fellows during clinical Nuclear Medicine rotations. (These activities are optional for Diagnostic Radiology and Nuclear Medicine residents at SLEH.) Nuc 1 rotations include 2 mandatory 1-month rotations in CVNM for Cardiology fellows. Nuc 2 rotations include 3 elective 1-month rotations in CVNM. All Nuc 1 and Nuc 2 activities listed here (plus other requirements of CBNC) must be completed prior to obtaining a letter of eligibility from the Director of CVNM for the CBNC examination.

Cases listed in “observation” and/or “processing” categories may also be included in other categories such as Radiopharmacy or Imaging Practicum if all criteria are met for each category.

Lines under “NMT” must be initialed by the technologist supervising the activity. Lines under “NM MD” must be initialed by the supervising attending NM physician. All initials should be obtained on the day the task is completed.

NUC 1 ACTIVITIES (ACC Level 1)

These activities are required at SLEH for ACC Level 1 training. Performance of these activities is assumed prior to beginning ACC Level 2 training.

1. Procedure Observation/Participation

- A. During the first week of the first rotation, observe the entire study (including rest and stress radiopharmaceutical injection, stress test, rest and stress imaging, and processing) for 2 patients undergoing myocardial perfusion imaging with treadmill exercise (TMT/MPI). Review cases with NM MD.

	Date	Pt. ID#	R-Inj	R-Img	S-Inj	S-Img	Process	NM MD
1)	_____	_____	_____	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____	_____	_____	_____

- B. During the first week of the first rotation, observe the entire study (including rest and stress radiopharmaceutical injection, stress test, rest and stress imaging, and processing) for 2 patients undergoing dipyridamole/MPI or adenosine/MPI. Review cases with NM MD.

	Date	Pt. ID#	R-Inj	R-Img	S-Inj	S-Img	Process	NM MD
1)	_____	_____	_____	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____	_____	_____	_____

- C. Observe stress test, radiopharmaceutical administration, and post-stress imaging procedure for two patients undergoing dobutamine/MPI

NMT	Date	Pt ID#	Occurrences
1)	_____	_____	_____
2)	_____	_____	_____

2. B. Under direct supervision of a NM Technologist, perform basic image processing of 5 patients undergoing radionuclide angiography (MUGA) and review the quality of this processing with the NM attending at the daily reading session

MD	Date	Pt. ID#	Study Type	Occurrences	NMT	NM
1)	_____	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____	_____
3)	_____	_____	_____	_____	_____	_____
4)	_____	_____	_____	_____	_____	_____
5)	_____	_____	_____	_____	_____	_____

3. Radiation Safety Practicum

- A. Accompany Radiation Safety Officer and/or Radiation Safety Technician on rounds to monitor compliance with Radiation Protection Plan. Include QC check of survey meters. (2 days)

	Date	Occurrences	RS
1)	_____	_____	_____
2)	_____	_____	_____

4. Image Interpretation Log

(ACC requires that fellows maintain a log of at least 300 studies interpreted if seeking Level 2 training.)
Use patient stickers or write in information.

<u>Date</u>	<u>Patient ID</u> MD	<u>Test</u>	NM
1)	_____	MPI: Tc TI MUGA Other: _____	
2)	_____	MPI: Tc TI MUGA Other: _____	_____
3)	_____	MPI: Tc TI MUGA Other: _____	_____
4)	_____	MPI: Tc TI MUGA Other: _____	_____
5)	_____	MPI: Tc TI MUGA Other: _____	
6)	_____	MPI: Tc TI MUGA Other: _____	_____
7)	_____	MPI: Tc TI MUGA Other: _____	_____
8)	_____	MPI: Tc TI MUGA Other: _____	_____
9)	_____	MPI: Tc TI MUGA Other: _____	
10)	_____	MPI: Tc TI MUGA	

Other: _____

5. Procedure Monitoring Log

Documentation of the monitoring of stress tests is optional for Nuclear Medicine rotations. Such documentation is strongly recommended by the ACC. The form below is provided should the fellow wish to use it.

	Date	Pt ID#	Occurrences
A. Treadmill	1)	_____	_____
	2)	_____	_____
	3)	_____	_____
	4)	_____	_____
	5)	_____	_____
B. Dipyridamole	1)	_____	_____
	2)	_____	_____
	3)	_____	_____
	4)	_____	_____
	5)	_____	_____
	6)	_____	_____
	7)	_____	_____
	8)	_____	_____
	9)	_____	_____
	10)	_____	_____
<hr/>			
C. Dobutamine	1)	_____	_____
	2)	_____	_____
	3)	_____	_____
	4)	_____	_____
	5)	_____	_____

5.D. Adenosine 1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

E. First Pass 1) _____

2) _____

3) _____

4) _____

5) _____

F. Stress MUGA 1) _____

2) _____

3) _____

4) _____

5) _____

G. Misc. 1) _____

2) _____

3) _____

4) _____

5) _____

**ST. LUKE'S EPISCOPAL HOSPITAL – NUCLEAR MEDICINE DEPARTMENT
 TRAINEE PARTICIPATION LOG for CARDIAC ACTIVITIES**

Trainee: _____

“Nuc 2 Activities” are required at SLEH for ACC Level 2 certification. They can be accomplished within the clinical rotation time allotted for Nuc 2 rotations, but may be initiated during Nuc 1 rotations. Trainees not seeking Level 2 training may participate in Nuc 2 activities during their Nuc 1 rotations, but are not required to do so. All Nuc 1 and Nuc 2 activities listed here (plus other requirements of CBNC) must be completed prior to obtaining a letter of eligibility from the Director of CVNM for the CBNC examination.

These activities need not be performed in the order presented. However, trainees performing any activity are expected to understand the principles involved in addition to the technical tasks. Thus, some activities are more appropriately performed after the related didactic course section has been completed.

Cases listed in “observation” and/or “processing” categories may also be included in other categories such as Radiopharmacy or Imaging Practicum if all criteria are met for each category.

Lines under “NMT” must be initialed by the technologist supervising the activity. Lines under “NM MD” must be initialed by the supervising attending NM physician. All initials should be obtained on the day the task is completed.

NUC 2 ACTIVITIES (ACC Level 2)

In addition to Items 1-5 described in Level 1 documentation:

6. Radiopharmacy Practicum

- A. Prior to participation in items 6.B-H, review the Radiopharmacy Policy and Procedure Manual, with particular attention to the use of administrative controls and procedures for maintaining an ALARA radiation environment for patients, radiation workers, and the public and for preventing radiation-related medical events. Items 6.B-G will usually be performed in the 26th floor radiopharmacy; items 6.H-I may be performed in any of the Department’s laboratories.
- B. (26th floor radiopharmacy) Under the direct supervision of a NM Technologist, observe and participate in routine radiopharmacy procedures (minimum 5 days). In addition to the specific tasks listed below, radiopharmacy participation on Day 1 in the pharmacy must include discussion of administrative controls and techniques for preventing, containing, and decontaminating spills of unsealed radioactive materials.

	Date	Time	NMT		Date	Time	NMT
1)	_____	_____-_____	_____	6)	_____	_____-_____	
2)	_____	_____-_____	_____	7)	_____	_____-_____	
3)	_____	_____-_____	_____	8)	_____	_____-_____	
4)	_____	_____-_____	_____	9)	_____	_____-_____	
5)	_____	_____-_____	_____	10)	_____	_____-_____	

- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____

6. H. Using appropriate verifications and techniques, under direction supervision of a NM Technologist, calculate and prepare radiopharmaceutical doses from kits for patient administration. (5 doses)

	Date	Rph Type	Dosage	Occurrences	NMT
1)	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____
3)	_____	_____	_____	_____	_____
4)	_____	_____	_____	_____	_____
5)	_____	_____	_____	_____	_____

I. Radiopharmaceutical Injection: After reviewing the Radiopharmaceutical Administration Policy and using appropriate verifications and injection techniques (including syringe shields), under direction supervision of a NM Technologist, inject radiopharmaceutical (5 injections).

	Date	Patient ID#	Rph.	Dosage	Occurrences	NMT
1)	_____	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____	_____
3)	_____	_____	_____	_____	_____	_____
4)	_____	_____	_____	_____	_____	_____
5)	_____	_____	_____	_____	_____	_____

E. Participate in the entire study as described above (including cell labeling) for 10 patients undergoing first pass or equilibrium radionuclide angiography.

MD	Date	Pt. ID#	Cell Labeling	Injection	Imaging	Process	Report/NM
	1)	_____	_____	_____	_____	_____	
	2)	_____	_____	_____	_____	_____	
	3)	_____	_____	_____	_____	_____	
	4)	_____	_____	_____	_____	_____	
	5)	_____	_____	_____	_____	_____	
	6)	_____	_____	_____	_____	_____	_____
	7)	_____	_____	_____	_____	_____	
	8)	_____	_____	_____	_____	_____	
	9)	_____	_____	_____	_____	_____	
	10)	_____	_____	_____	_____	_____	

8. QC Practicum

A. Observe daily quality control acquisition and assessment for a SPECT camera (3 days)

	Date	Camera	Occurrences	NMT
1)	_____	_____	_____	_____
2)	_____	_____	_____	_____
3)	_____	_____	_____	_____

B. Observe acquisition and assessment of bar phantom image (2 days)

	Date	Camera	Occurrences	NMT
1)	_____	_____	_____	_____
2)	_____	_____	_____	_____

C. Observe acquisition and assessment of center of rotation determination (2 days)

	Date	Camera	Occurrences	NMT
1)	_____	_____	_____	_____
2)	_____	_____	_____	_____

D. Observe acquisition and assessment of SPECT phantom image (1 day)

	Date	Camera	Occurrences	NMT
1)	_____	_____	_____	_____

E. Observe daily quality control acquisition and assessment for a SPECT/CT camera (3 days)

	Date	Camera	Occurrences	NMT
1)	_____	_____	_____	_____
2)	_____	_____	_____	_____
3)	_____	_____	_____	_____

9. Radiation Safety Practicum

- A. Review the radioactive materials license of St. Luke's Episcopal Hospital.
- B. Review the Radiation Safety Manual of St. Luke's Episcopal Hospital.
- C. Review pertinent sections of 10 CFR 35 with respect to imaging procedures. (This may be accomplished during the didactic basic sciences instruction.)
- D. In addition to Item 3 above, accompany the Radiation Safety Officer and/or Radiation Safety Technician on rounds to monitor compliance with the Radiation Protection Plan (2 days)
 - 1. Assist in performance of wipe tests for assessment of removable contamination.
 - 2. Perform area surveys for contamination.
 - 3. Survey and review records of trash and waste stored for decay.
 - 4. Review records of the receipt and disposal of radiopharmaceutical doses.

Date	Occurrences	RS
_____	_____	_____
_____	_____	_____

10. Image Interpretation Log (Continuation from Nuc 1)

(ACC requires that fellows maintain a log of at least 300 studies interpreted if seeking Level 2 training.)
Use patient stickers or write in information.

<u>Date</u>	<u>Patient ID</u> MD	<u>Test</u>	NM
1)	_____	MPI: Tc Tl MUGA Other: _____	_____
2)	_____	MPI: Tc Tl MUGA Other: _____	_____
3)	_____	MPI: Tc Tl MUGA Other: _____	_____
4)	_____	MPI: Tc Tl MUGA Other: _____	_____
5)	_____	MPI: Tc Tl MUGA Other: _____	_____
6)	_____	MPI: Tc Tl MUGA Other: _____	_____
7)	_____	MPI: Tc Tl MUGA Other: _____	_____
8)	_____	MPI: Tc Tl MUGA Other: _____	_____
9)	_____	MPI: Tc Tl MUGA Other: _____	_____
10)	_____	MPI: Tc Tl MUGA	_____

Other: _____

NUCLEAR MEDICINE CASE CORRELATION (30 cases required for ACC Level 2 training)

PT. NAME: _____ MR#: _____ REF

MD: _____

PT. AGE: _____ SEX: _____ HT: _____ WT: _____ CHEST: _____

STUDY DATE: _____ NM MD: AKA RDD PVF WHM TRAINEE:

NM TEST TYPE: MPI/Tc MPI/TI MUGA PYP

Other _____

Rest-Only Rest/Redist. Rest/Reinjection Rest/Reinj/Redist. Stress-Only Rest/Stress Stress/Rest
STRESS TYPE: Bruce TM Other TM BIKE DIP ADEN DOB Other

STRESS DURATION: _____ METS: _____ EVENTS: _____

REASON FOR STOPPING: _____

RADIOPHARMACEUTICAL: TL-201 MIBI TETRO RBC PYP

Other _____

CATH DATE: _____ ECHO DATE: _____ MRI DATE: _____ CCT DATE:

Clinical History & Lab Results:

Pretest likelihood of CAD: _____ Reason for NM Test:

NM Study Quality: Good Fair Poor If not Good, why?:

NM Findings Summary (also attach NM report):

Echo Findings: LVEF: _____; _____

MRI Findings: LVEF: _____; _____

CCT Findings: _____

Cath Findings (also attach cath report/diagram):

CAD: Y N LVEF: _____ CMP: Y N L-Dom R-Dom Co-Dom Ramus

Stenosis: LMain _____% LAD _____% Ramus _____% LCX _____% OM1 _____% OM2 _____% RCA _____%
PDA _____%

Other Findings:

Did the NM results match the cath findings? YES NO If not, why not?

What effect did the NM test have on the patient's management?

**CARDIOVASCULAR DISEASE TRAINING PROGRAM
ST. LUKE'S EPISCOPAL HOSPITAL**

FELLOW: _____

MONTH(S)/YEAR: _____

SERVICE: **NUC 2**

The learning objectives for this teaching service have been provided to the trainee. The objectives and performance goals have been reviewed/discussed by the clinical teaching attending and the fellow.

_____ **Service Teaching Attending** **Date**

_____ **Cardiology Fellow** **Date**

This review and discussion should take place at the beginning of the new rotation. Fellows are requested to complete and return this form by the 10th day of a new rotation to:

**Cardiology Education Office (MC 1-133)
St. Luke's Episcopal Hospital
832-355-8374 Fax**

TO : Dr. _____

Adult Cardiology, MC1-102
St. Luke's Episcopal Hospital
6720 Bertner Avenue
Houston, TX 77030

RE: Nuclear Cardiology Rotation

Dear Dr. _____:

You are scheduled to rotate next month on the SLEH Nuclear Medicine Service ("Nuc 2" Rotation). The attached *Rotation Manual for Cardiovascular Nuclear Medicine (Nuc 2)* has been prepared to give you a thorough understanding of the goals and expectations of that rotation. Please review this guide prior to beginning your rotation.

Unless you hear otherwise from me directly, I will meet with you during the morning of the first day of the rotation to review the goals, objectives, and responsibilities for the rotation and to answer any questions that you have. Please bring any documentation you have for "hands-on" activities that you completed during your Nuc 1 rotations to our meeting on that day.

If you have any questions regarding the rotation or these materials prior to starting the rotation, you may contact me at 832-355-3126 or via the page operator (beeper 26432).

Sincerely,

Warren H. Moore, M.D., FACNP, FACC
Chief, Nuclear Medicine Service
Director, Cardiovascular Nuclear Medicine

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Chief, Nuclear Medicine Service
Director, Cardiovascular Nuclear Medicine

At the end of the third month of clinical CVNM training, the fellow will take an examination covering general topics in cardiac nuclear medicine, based on the reading assignments and daily discussions. The passing score for the examination is 75%. Failure to pass the examination will require a specific remedial program and a passing score on a follow-up examination prior to completing the last month of clinical nuclear medicine rotations. In addition, successful completion of the training program for radioisotope licensure will require passing a final examination which includes both written and oral components and covers all aspects of cardiac nuclear medicine such as basic sciences, technical issues, and clinical applications. The final examination may be taken a maximum of two times and may be taken any time during the last two months of clinical nuclear medicine, after the basic science program has been completed. Failure to pass the final written examination will automatically result in an "Unsatisfactory" score for the rotation. Acceptance for clinical training does not guarantee passing the examination.