

# CMI 490: COMPREHENSIVE IMAGING MEDICAL CLINICAL EDUCATION

## Nuclear Medicine Program

University of Nevada, Las Vegas

Department of Health Physics and Diagnostic Sciences

**Instructor:** Nuclear Medicine Faculty

**Schedule:** Mondays and Wednesdays **or** Tuesdays and Thursdays: 16 hours per week for a total of 240 hours per semester

**Location:** Accredited Affiliate

**Credits:** 3 credits, to be repeated to a maximum of 12 credits

**Prerequisite:** Consent of Instructor

**Course Description:** Clinical applications of instrumentation, quality control, patient care and performance of diagnostic imaging procedures. Students will demonstrate competency in the following areas: all 4 patient care activities; all 5 quality control procedures; and 25 diagnostic and therapeutic procedures identified under Nuclear Medicine procedures. The following skills will be demonstrated, minimally, when performing the procedures: evaluation of the requisition; patient instructions; preparation, and care; selection, handling, and administration of the radiopharmaceutical (where allowed); equipment configuration and patient positioning; radiation safety; and image processing and evaluation.

Clinical competence means that the program director or designee has observed the candidate performing the procedure, and that the student performed the procedure independently, consistently, and effectively.

CATEGORY	PROCEDURE		
Patient Care Activity (may be simulated)	1. CPR 2. Vital Signs (BP, pulse, respiration, temperature) 3. Venipuncture 4. ECG (lead placement; recognition of common dysrhythmias)		
Quality Control Procedures	1. Gamma Camera or SPECT (uniformity, resolution, center of rotation, sensitivity) 2. Dose Calibrator (constancy, linearity, accuracy, geometric test) 3. Well Counter/Uptake Probe (energy calibration, Chi-square test) 4. Survey Meter (daily check) 5. PET or PET/CT (daily check)		
Nuclear Medicine Studies	Procedures	# Procedures in Category	# Procedures that must be performed
Abscess and Infection (procedures are elective)	Gallium WBC Imaging	2	0
Skeletal	Limited Three-Phase Whole Body	3	2
Cardiovascular	Gated Blood Pool Studies Myocardial Perfusion	3	2

	PET or PET/CT		
<b>Endocrine/Exocrine</b>	Thyroid Uptake Thyroid Scan Thyroid Metastatic Survey Parathyroid	4	2
<b>Gastrointestinal</b>	Hepatobiliary Gastroesophageal Reflux Gastric Emptying GI Bleeding Meckel's Diverticulum Liver	6	3
<b>Genitourinary</b>	Renal: Dynamic Perfusion Renal: Cortical Imaging	2	1
<b>Respiratory</b>	Perfusion Ventilation (gas or aerosol) Quantitative	3	2
<b>Tumor</b>	Gallium Peptide Receptor Lymphoscintigraphy (breast, melanoma, or sentinel node) PET or PET/CT	4	2
<b>SPECT</b>	Bone Brain Liver Tumor Cardiac Renal	6	3
<b>Therapeutic Procedures (all may be simulated)</b>	Thyroid: Ablation (may be simulated) Thyroid: Hyperthyroidism (may be simulated) Palliative Bone Non-Hodgkin's lymphoma	3	1
<b>Central Nervous System (all are elective)</b>	Brain: Planar Brain: Dynamic Brain: PET or PET/CT Cisternography: Routine Cisternography: CSF leak	5	0

**Teaching Methods:** practicum

**Course Evaluation Methods:**

The clinical courses are a "Pass/Fail" competency based grade. In order for a student to receive a passing grade (S) in clinicals he/she will need to:

1. Document the required hours. This is generally be 240 hour/semester minus the 2 allowed "sick days", but may vary from semester-to-semester. A daily time log as verified by the clinical supervisor or University faculty is required of each student.
2. Demonstrate an appropriate number of competencies as assigned by the clinical supervisor or University faculty. There is no set number of examinations the students must perform each semester, as this will be dependent upon the clinical site and the type of studies normally performed. In general, it is expected that

students complete competencies on procedures previously or concurrently discussed in lecture course. Since there are currently 33 competencies required by the ARRT (N), students should average approximately 11 procedures/semester. All procedures must be completed by the end of the third clinical semester or the student will receive an "incomplete" grade during the last semester.

- a. The student must pass all clinical competency evaluations with a minimum score of 90 percent as determined below:
  - 1). Each of the 11 categories to be evaluated, each worth 3 points for a total possible score of 33. A score of 33 = 100%; 32 = 95%, and 31 = 90%.
  - 2). A score of 0 or 1, corresponding to "incompetent" or "major deficiency," respectively, in any category is an automatic failure. The exam must be repeated following remedial training.
  - 3). Additionally, recording more than two "2's," corresponding to "minor deficiencies" will constitute a failure and the exam must be repeated.
  - 4). Three failures in the same semester for any one procedure will lead to an unsatisfactory grade in the class.
- b. The student will inform the clinical supervisor when he/she is ready to be tested on a specific procedure. The mandatory studies must be performed on real patients, no simulations. The supervisor will complete a "Clinical Competency Evaluation Form" for each procedure (below). If the student fails to meet minimum competency in a particular area, he/she must perform remedial training in that area and repeat the exam at a later date.

3. Demonstrate an acceptable level of professionalism in the clinical environment as assessed by the Personal Growth Assessment Forms (PGAF). This is typically completed twice during the Fall and Spring semesters and once in the summer term by the chief clinical instructor at each affiliate or by the UNLV faculty. If the average (or single value) of the PGAFs falls below 75% as determined below, the student will receive a failing grade for the clinical class.

- a. There are 9 professional qualities assessed with each one having a range from 5 (highest) to 1 (lowest), for a maximum of 45 points.

PGAF Value	Percent
45	100.0
44	97.8
43	95.6
42	93.3
41	91.1
40	88.9
39	86.7
38	84.4
37	82.2
36	80.0
35	77.8
34	75.6
33	73.3

- b. The lowest possible passing score a student can receive on the PGAFs is 33.6 (average of 2 evaluations) or 34.0 on a single evaluation.

4. Present appropriate film critiques as required by UNLV faculty.

5. The student may also receive a failing grade if he/she fails to abide by the policies established in the "Policy Manual" (refer to individual sections for specifics). Each student was given a copy of this manual at the beginning of the first clinical semester. All areas were reviewed and discussed by the UNLV faculty. Each student signed and submitted a statement that he/she read and understood the contents of the policy manual.
6. Pass one retention test per clinical semester as outlined below:
  - a. The affiliate clinical supervisor will choose the procedure to be retested from the list of competencies already completed by the student at that facility during the current semester. The regular competency testing form will be used but will be labeled as a "Retention Test" along with the procedure category.
  - b. If a student fails the retention test, additional training will be provided and the student will be retested. If the subsequent retention test (on the same procedure) results in a failing grade a remediation plan will be established by the student, the clinical supervisor and the UNLV faculty responsible for that clinical. Failure to follow the remediation plan with the outcome of demonstrating competency for that procedure can lead to a failing grade for that clinical.

**Incomplete:** In addition to receiving an incomplete for the reasons indicated in the "Clinical Examination" section above, an incomplete grade may be granted when a student has satisfactorily completed at least three-fourths of the semester, but for reasons beyond the student's control, and acceptable to the instructor, the student cannot complete the last portion of the course. A student who receives an "I" (incomplete) is responsible for completing the remaining work prior to the end of the next semester. If the course requirements are not completed within this time, a grade of "F" will be recorded. Students who are granted an incomplete are expected to meet with the instructor to determine the work that must be completed prior to the end of the next semester.

### **Clinical Competency Objectives**

To receive a "passing score" in each clinical area tested, the student will meet the following objectives relative to each category as identified on the "clinical competency evaluation form."

#### **1. Evaluation requisition and patient assessment:**

- a. verify patient identification
- b. check for written orders (requisition) and correctness of procedure
- c. discuss any contraindications or adverse reactions associated with the study
- d. obtain pertinent patient history and identify relevant data from records
- e. establish whether the patient has undergone the necessary pre-examination procedures when appropriate
- f. check patient clothing and linen for objects that may attenuate radiation

#### **2. Patient education**

- a. describe the test procedure to the patient and obtain written waivers, authorizations, consent, etc. as applicable to the study
- b. answer common patient questions in a manner understandable to the patient
- c. discuss any procedures and/or substances that may interfere with the performance of the test
- d. all patient care and recordkeeping procedures **MUST** be in accordance with HIPAA (Health Insurance Portability and Accountability Act)

### **3. Patient care and management**

- a. provide support of IVs, catheters, oxygen, drainage tubes, and suction devices
- b. be able to determine vital signs (pulse, respiration, blood pressure, and body temperature)
- c. recognize emergencies and discuss the appropriate patient care procedures for the following emergencies: nausea and vomiting; reactions to medications; fainting; seizures; hemorrhage; cardiorespiratory difficulties (or arrest)
- d. demonstrate proper methods of moving a patient by transferring the patient to and from a wheelchair, bed or stretcher
- e. monitor the disoriented, unconscious, sedated, or pediatric patient
- f. provide for patient comfort before, during and after the nuclear medicine procedure
- g. demonstrate the appropriate action(s) to take for the prevention, transmission and decontamination of communicable diseases
- h. demonstrate proper technique in the control of sepsis

### **4. Radiopharmaceutical handling**

- a. use radiation safety and sterile techniques throughout all steps of the radiopharmaceutical preparation and/or handling
- b. prepare the patient dose in a syringe using gloves
- c. attach vials and catheters to the correct input and output needles
- d. use lead shield on all vials, syringes, or tubing containing radioactivity
- e. assay unit doses or vials in the dose calibrator and record activity in appropriate log
- f. demonstrate the correct method for dispensing a gaseous radiopharmaceutical using a gaseous dispensing/collecting apparatus
- g. demonstrate the correct method for calculating doses

### **5. Radiopharmaceutical selection, dosage and quality control**

- a. describe the most commonly used radiopharmaceuticals used for each study, to include:
  - 1). identity
  - 2). physical characteristics
  - 3). dose
  - 4). mechanism of localization
  - 5). biodistribution
- b. where applicable, demonstrate proper quality control on the eluate and/or the radiopharmaceutical, to include:
  - 1). radiochemical, radionuclidic, and chemical purity checks
  - 2). pH, color, clarity, and particle sizing
  - 3). sterility and pyrogenicity testing
- c. record data for each radiopharmaceutical on appropriate data log

### **6. Radiopharmaceutical administration and recording**

- a. demonstrate the correct method for dispensing a gaseous radiopharmaceutical using a gaseous dispensing/collecting apparatus
- b. determine radiopharmaceutical administration time and the time at which imaging should be performed post administration
- c. demonstrate the correct method for administering radioactive capsules
- d. demonstrate the correct method of administering a radiopharmaceutical intravenously (as authorized by hospital policy) to include the following:
  - 1). assemble injection tray with all necessary materials for venipuncture
  - 2). position patient for radiopharmaceutical administration

- 3). select a suitable vein and attach a tourniquet
  - 4). select a suitable needle or angiocath
  - 5). communicate with and reassure the patient, as appropriate
  - 6). perform the venipuncture, but do not administer the dose (this should be performed by a registered technologist)
  - 7). dispose of waste in appropriate radioactive waste or non-radioactive waste, as appropriate
  - e. record patient and radiopharmaceutical data according to hospital policy
- 7. Equipment configuration and operation**
- a. list and/or describe equipment required for valid performance of the study, including camera, dose calibrator, and ancillary equipment
  - b. set up the camera and computer system for each planar procedure, including the parameters of: peak; energy; orientation; collimator; intensity; window; counts or time; static or dynamic
  - c. demonstrate ability to set up system for SPECT acquisition to include the parameters of: radius of rotation; type of orbit; number of projections per rotation; degrees between projections; time of projections
  - d. demonstrate the ability to use the "unit dose manager" software or equivalent on the dose calibrator for patient studies and quality control procedures
  - e. demonstrate the ability to properly utilize scintillation probes, survey instruments, and/or well counters where appropriate
- 8. Positioning skills**
- a. correctly position the patient for all views normally performed with the study, considering specific patient conditions
  - b. identify the most common views required for each procedure, when performing planar imaging
  - c. recognize those studies in which SPECT imaging is most beneficial and be able to position the patient for those studies
- 9. Radiation safety and protection**
- a. Personnel Monitoring Devices
    - 1). wear whole-body and ring badges at all times in the clinical area
    - 2). recognize and take appropriate measures to reduce exposure
    - 3). use appropriate protection techniques to keep exposure as low as reasonably achievable
  - b. Surveys
    - 1). perform area surveys of the hot lab and department
    - 2). check survey instruments for proper function and calibration
    - 3). perform wipe tests and decontamination procedures as appropriate
  - c. Decontamination Procedures (when appropriate)
    - 1). restrict access to area and confine spill
    - 2). use protective clothing
    - 3). store contaminated articles as appropriate
    - 4). decontaminate the area to acceptable level of activity
  - d. Radioactive Waste Disposal
 

demonstrate the correct waste disposal methods for syringes, vials, needles, contaminated articles, and radioactive waste
  - e. Licensing requirements
 

identify the location and parameters of the department's radioactive materials license
  - f. Radionuclide therapy procedures

- 1). dispose of and store all radioactive waste according to departmental protocol
- 2). observe as the supervisor administers the dose to the patient
- 3). monitor administration area to ensure there is no contamination
- 4). when a patient is hospitalized, monitor the patient and the room according to departmental protocol to determine when the patient can be released and when the room can be occupied by another patient
- 5). perform thyroid bioassays on personnel who have assisted with administration of therapeutic I-131 according to department protocol

**10. Image processing and evaluation**

- a. demonstrate the ability to reconstruct images through the proper use of smoothing, background subtraction, normalization, and contrast enhancement filters (software)
- b. perform any necessary data manipulation to achieve desired product during quantitative procedures
- c. process the films in accordance with department protocol and equipment
- d. visually inspect films and/or data for completeness
- e. identify artifacts, non-uniformities, non-linearities, and other abnormalities associated with equipment or technologist error
- f. correctly label all films
- g. report results to radiologist and/or supervisor
- h. discuss any technical pitfalls with the study
- i. identify normal and abnormal patterns of radiopharmaceutical distribution on typical studies
- j. discuss possible alterations in the routine procedure, including order of views, drug administration, and effect of delay post dose administration on radiopharmaceutical distribution as evidenced on the films

**11. Anatomy, physiology and pathophysiology related to study**

- a. discuss the normal anatomy associated with each study and its particular radiopharmaceutical
- b. discuss the normal physiology associated with each study and its particular radiopharmaceutical
- c. discuss various pathologies associated with each study
- d. identify the more common pathologic conditions as evidenced on the images
- e. identify the most common indication(s) for each study

## **UNIVERSITY POLICIES:**

**Academic Misconduct** – Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution.

An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: <http://studentconduct.unlv.edu/misconduct/policy.html>.

**Copyright** – The University requires all members of the University Community to familiarize themselves with and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws.

Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://www.unlv.edu/provost/copyright>.

**Disability Resource Center (DRC)** – The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu/>, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor before or after class to discuss your accommodation needs.

**Religious Holidays Policy** – Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor no later than the end of the first two weeks of classes, **September 22, 2015** of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

**Incomplete Grades** - The grade of I – Incomplete – can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student’s control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade. Please note – Students cannot enroll in other nursing courses if they have an incomplete (I) in a course that is designated as a prerequisite to that course. (Per School of Nursing Policy C-12).

**Tutoring** – The Academic Success Center (ASC) provides tutoring and academic assistance for all UNLV students taking UNLV courses. Students are encouraged to stop by the ASC to learn more about subjects offered, tutoring times and other academic resources. The ASC is located across from the Student Services Complex (SSC). Students may learn more about tutoring services by calling 702- 895-3177 or visiting the tutoring web site at: <http://academicsuccess.unlv.edu/tutoring/>.

**UNLV Writing Center** – One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student’s Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: <http://writingcenter.unlv.edu/>

**Rebelmail** – By policy, faculty and staff should e-mail students’ Rebelmail accounts only. Rebelmail is UNLV’s official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students’ e-mail prefixes are listed on class rosters. The suffix is always [@unlv.nevada.edu](mailto:@unlv.nevada.edu). Emailing within WebCampus is acceptable.

**Library Resources** –Students may consult with a librarian ([www.library.unlv.edu/](http://www.library.unlv.edu/) consultation) about research needs. For this class, the subject librarian is Xan Goodman. UNLV Libraries provides resources to support students’ access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at [www.library.unlv.edu/](http://www.library.unlv.edu/)