Nuclear Medicine Technology Education Program

Clinical Handbook

2026-2027

Reviewed: 6/2026
Revised: 6/2026

West Virginia University Hospitals
PO Box 8062
Morgantown, WV 26506
(304) 598-4251

Imaging Science Education Programs
Nuclear Medicine

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Imaging Science Education Programs
Nuclear Medicine

NMT 401: Applied Procedures: Clinical Experience I

Semester I
2025-2026
660 Clock Hours (approx.)

Instructor(s):	Tiffany D. Davis, M.A., R.T.(R)(N), CNMT Various staff technologists
Prerequisites:	NMT 301: Introduction to Nuclear Medicine
Room:	WVUH (Ruby Memorial Hospital) Nuclear Medicine Department WVUH (Ruby Memorial Hospital) PET/CT Department WVUH (Ruby Memorial Hospital, HVI) Nuclear Cardiology Department WVU (Health Sciences Center) Radiation Safety Department WVUH (Ruby Memorial Hospital) Nuclear Medicine and PET/CT Reading Room
Time:	Monday-Friday, day shift. Hours vary: 6:30am-3:00pm or 7:00am-3:30pm. See clinical and didactic schedules/calendars for more specific information.
Textbook:	N/A
Supporting Documents:	Clinical Handbook and Trajecsys Report System

Course Description:

This course is conducted within West Virginia University Hospital and affiliate(s). Direct and indirect supervision will develop clinical skills through observation and participation in in-vivo, in-vitro, and therapeutic nuclear medicine procedures. Clinical rotations consist of ample experience in general nuclear medicine, PET/CT, cardiac imaging, radiation safety, and reading room. Clinical comprehension is evaluated through weekly performance evaluations and the performance of clinical competency evaluations.

Course Objectives:

The student will:

1. Perform diagnostic and therapeutic in-vivo and in-vitro nuclear medicine and molecular imaging procedures.
2. Identify indications and verify physician order for performing imaging and physiologic quantitation.
3. Evaluate patient health status, patient preparation requirements for procedures, and provide appropriate patient education prior to and during the procedure.
4. Facilitate or obtain informed consent, as appropriate.
5. Comply with current federal, regional, and institutional regulations regarding ionizing radiation.
6. Prepare all equipment according to the guidelines for each procedure.
7. Calculate dosage of adjunctive medications according to the guidelines for each procedure and follow institutional protocol for administration.
8. Prepare, measure, and administer radiopharmaceutical(s) in accordance with department guidelines.
9. Follow institutional protocols for blood withdrawal and radioactive labeling.
10. Select appropriate instrument and parameters for the procedure.
11. Position the patient appropriately for the procedure and acquire imaging view(s) and/or non-imaging data for complete procedure.
12. Process and analyze the data for physician interpretation, noting normal and abnormal bio-distribution of the radiopharmaceutical.
13. Evaluate image quality and inspect for artifact.
14. Describe the importance of adhering to a research protocol in imaging and non-imaging procedures.
15. Utilize up-to-date scientific evidence, clinical judgment, and patient information to make informed decision in performing diagnostic and therapeutic procedures.
16. Complete all clinical competencies outlined below:

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General Patient Care:

CPR Certification (complete by second Friday in September (Semester I))
Vital Signs – Blood Pressure (complete by second Friday in September (Semester I))
Vital Signs – Pulse (complete by second Friday in September (Semester I))
Vital Signs – Respiration (complete by second Friday in September (Semester I))
Assisted Patient Transfer (slider, mechanical lift) (complete by second Friday in September (Semester I))
Maintain patient ancillary equipment (IV pump, collection bag, O2) (complete by end of Semester I)
ECG (lead placement, recognition of common dysrhythmias) (complete by end of Semester I)
*Venipuncture (complete by second Friday in September (Semester I)

Quality Control Procedures – Semester I:

SPECT Gamma Camera (Uniformity/Resolution) (complete by second Friday in September (Semester I))
Dose Calibrator (Constancy) (complete by end of Semester I)
Well Counter/Uptake Probe (Energy Calibration) (complete by end of Semester I)
Survey Meter (Battery Check/Constancy) (complete by end of Semester I)
*I-Stat Patient Testing and QC (complete by end of second week of PET rotation)
*Glucometer Patient Testing and QC (complete by end of second week of PET rotation)

Nuclear Medicine and PET/CT Procedures (Diagnostic and Therapeutic)

(Must choose and complete a minimum of 6 core and/or elective procedures (pre-competency and competency count as 1 procedure) from this list to complete by the end of semester I. You may complete more than 6 core*/elective procedures in Semester I if you are able. The ramining core* and/or elective procedures from this list must be completed by the first Friday in June (Semester II).*

*Myocardial Perfusion – Rest *(preferred completion in Semester I)*
*Myocardial Perfusion – Stress *(preferred completion in Semester I)*
*Thyroid Uptake
*Thyroid Scan
*Hepatobiliary (HIDA) *(preferred completion in Semester I)*
*Gastric Emptying *(preferred completion in Semester I)*
GI Bleed / Meckels / Liver_Spleen *(choose 1)*
*Renal Function (Lasix)
*Tumor (F-18 FDG) *(preferred completion in Semester I)*
*Lung Ventilation (Aerosol) – Statics
*Lung Perfusion – Statics
*Skeletal – Total/Wholebody *(preferred completion in Semester I)*
*Skeletal – 3-Phase
*Bone SPECT or SPECT/CT *(preferred completion in Semester I)*
*Lung SPECT or SPECT/CT
*I-131 (ablation/hyperthyroid) *(preferred completion in Semester II)*
Elective #1 of 9: WBC Imaging
Elective #2 of 9: Parathyroid SPECT or SPECT/CT
Elective #3 of 9: Thyroid Metastatic Survey
Elective #4 of 9: Gated Blood Pool (MUGA)
Elective #5 of 9: Lymphoscintigraphy (breast/melanoma)
Elective #6 of 9: PET Brain (F-18 FDG)
Elective #7 of 9: Student Choice
Elective #8 of 9: Student Choice
Elective #9 of 9: Student Choice

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Assignments:
The student will attend all clinical rotations as assigned by the program director and outlined on the clinical rotation schedule. The following is a guide to clinical rotations.

Rotation	Area/Camera	Hours	Duties / Responsibilities
1, 2, 3 *1, *2, *3	SPECT/CT Nuc Med Early Shift	7am-3:30pm 6:30am-3pm	QC, all Nuc Med studies and related duties Open/close hot lab, survey, camera duties
HVI *HVI	D-SPECT HVI Early Shift	7am-3:30pm 6:30am-3pm	Myocardial Perfusions and related duties QC, open/close hot lab, camera duties
INJ	Injection	7am-3:30pm	Draw doses, start IV, inject patients
PET *PET	PET/CT PET/CT Early Shift	7am-3:30pm 6:30am-3pm	All PET/CT studies and related duties QC rotation and all camera duties
RS	Radiation Safety	8:30am-3:30pm	Assist Radiation Safety
RR	Reading Room	8:00am-3:30pm	Read with a Radiologist
RP	Radiopharmacy	1am-9:30am	Elute generator, make kits, QC, draw unit doses

Course Grading:

1. *Weekly Performance Evaluations* – The student is assigned to a specified area for a 1 to 2 week rotation. At the end of each rotation the technologist assigned to the student will complete a weekly performance evaluation in Trajecsys to rate the students overall performance for the rotation. See sample form in The student is scored based on the following scale:
   1 = unsatisfactory, 2 = below average, 3 = average, 4 = above average, 5 = excellent
   The weekly performance evaluations are averaged and are worth **10%** of the student's clinical grade.

2. *Quarterly Student Evaluations* – At the end of each quarter, all WVUH (Ruby Memorial Hospital) Nuclear Medicine Technologists will complete a quarterly evaluation on each student to rate his/her/their comprehensive knowledge based on amount of time in the program. The quarterly student evaluations are worth **20%** of the student's clinical grade.

3. *Clinical Education Coordinator Quarterly Evaluation* – At the end of each quarter, the clinical education coordinator will complete an evaluation of each student to assess: professional demeanor and documentation completion. The student is rated on a the following scale:
   1 = unsatisfactory, 2 = below average, 3 = average, 4 = above average, 5 = excellent
   The clinical education coordinator quarterly evaluation is worth **15%** of the student's clinical grade.

4. *Pre-Competency Evaluations* – Certain common nuclear medicine and PET/CT procedures requires the student to be pre-comped or "qualified" on an exam prior to attempting competency on the exam (denoted by an * on course objective #16, clinical competencies as well as the clinical examination record). Each examination is worth 100%. The sum of the scores from clinical pre-competency evaluations will be worth **15%** of the student's clinical grade.

5. *Competency Evaluations* – After successful completion of a clinical pre-competency evaluation (if required), the student is eligible to attempt the examination as a clinical competency exam with a clinical instructor. In order for a student to be competent in an exam and work under indirect supervision on stated exam, the student must have completed a clinical competency examination. Each examination is worth 100%. The sum of the scores from clinical competency examinations will be worth **40%** of the student's clinical grade. **NOTE: It is the student's responsibility to inform the

technologist he/she/they wishes to attempt exam competency PRIOR to performing any aspect of the exam.

6. *Overall Clinical Grade Requirements* – All nuclear medicine students must pass each Applied Procedures course with a minimum 86% weighted percentage average. Failure to achieve the 86% overall weighted average will prohibit the student form advancing to the subsequent semester and therefore dismissal from the program will result.

Grading Scale:
93%-100% = A; 86%-92% = B; 78%-85% = C; 70%-77% = D; <70% = F

Trajecsys Report System:

The West Virginia University Nuclear Medicine Education Program has implemented the use of the Trajecsys Report System ®. This system is an electronic based program that contains the student's pre-competency and competency forms, all evaluation forms, student handbook, clinical handbook, all didactic lecture materials, and serves to track attendance. This system has replaced the traditional paper forms and evaluations. The student is required to purchase access to this system for the duration of the 12-month program (a one-time fee of $100 paid directly to Trajecsys®)

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NMT 402: Applied Procedures: Clinical Experience II

Semester II
2025-2026
640 Clock Hours (approx.)

Instructor(s): Tiffany D. Davis, M.A., R.T.(R)(N), CNMT
Various staff technologists
Prerequisites: NMT 401: Applied Procedures: Clinical Experience I
Room: WVUH (Ruby Memorial Hospital) Nuclear Medicine Department
WVUH (Ruby Memorial Hospital) PET/CT Department
WVUH (Ruby Memorial Hospital, HVI) Nuclear Cardiology Department
PharmaLogic Inc. Bridgeport, WV, Radiopharmacy
Time: Monday-Friday, day shift. Hours vary: 6:00am-2:30pm, 6:30am-3:00pm or 7:00am-3:30pm. See clinical and didactic schedules/calendars for more specific information. There will be a one-week rotation in the spring semester at the radiopharmacy which will be a midnight shift rotation, 1:00am-9:30am, Monday-Friday
Textbook: N/A
Supporting Documents: Clinical Handbook and Trajecsys Report System

Course Description:

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Course Objectives:

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Quality Control Procedures – Semester II:

SPECT Gamma Camera (Center of Rotation) *(complete by first Friday of June (Semester II))*
Dose Calibrator (Linearity) *(complete by first Friday of June (Semester II))*
PET or PET/CT (Reference or Blank Scan) *(complete by end of 2nd week of QC rotation (Semester II))*

Radiopharmacy – Semester II:

Generator Elution / Moly Assay *(complete by end of radiopharmacy rotation (Semester II))*
Radiopharmaceutical Kit Prep / QC *(complete by end of radiopharmacy rotation (Semester II))*

Nuclear Medicine and PET/CT Procedures (Diagnostic and Therapeutic)

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Imaging Science Education Programs
Nuclear Medicine

Department Outline

Governing Bodies

- The Joint Commission (inspection cycles and specific regulatory guides for healthcare organizations)
- JRCNMT (regulates accredited educational programs in Nuclear Medicine Technology)
- NRC
    1. Regulates our license
    2. Inspections

Diagnostic Services

- Radiology
- Nuclear Medicine
- PET/CT
- Ultrasound
- Radiation Therapy
- MRI
- Breast Care Center
- Special Procedures
- Reading rooms
- Heart and Vascular Institute

Other Services

- Nutrition Services (food for GE study)
- Pharmacy (Inpt. & OP)
- Emergency Department
- Gift Shop
- Cafeteria (Ruby) & The Market (HSC)
- HR
- Employee Health
- Other Ruby units
- Classrooms – HSC 2041 & 2041A, (HSC CAI, HSC Radiology Resident Room, HSC Radiology Administration Conference Room, HSC Radiology Library – all as needed)
- WVU Library – HSC
- Radiology Conference Room

Confidentiality

- HIPAA
- Protect computer passwords, logout when not using system

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Imaging Science Education Programs
Nuclear Medicine

Patient Services

- Transporters – centralized system (teletracking computer system performed through EPIC)

Customer Satisfaction

- Telephone Etiquette
    1. No personal Phone calls allowed, unless emergency
    2. No cell phones or texting during school (class or clinic)
    3. Calling units (1+7+four digit floor number)
    4. Calling outside numbers (local OR long distance: area code+number)
    5. Pager system (on CONNECT, use directory, and choose pager for doctor you need, send text via computer)
- Patient Introductions-use Mr./Mrs./Ms./Miss –try to avoid using first names
- Patient Scheduling – EPIC (we schedule inpatients, schedulers take care of scheduling outpatients)

Daily NM Duties/Procedures

Morning

- Linen – take out dirty bags, replace with new, clean bags
- Stocking – stock supplies, refill blanket supply in blanket warmer in imaging room.
- QC –Perform on Symbia SPECT/CT, D-SPECT, and PET/CT.
- Hot Lab – Dose calibrator constancy, room monitor check with Cs source, remove full radioactive needle boxes and trash and store in lead lined cabinets, stock supplies, put doses on wall, enter inventory into NMIS. Friday morning, change chux.
- Cleanliness of department – make sure your work area is clean, neat, and free of clutter. O2 tubing (and all others) must not be touching floor. Don't place anything on top of red trash cans and ensure only appropriate waste is being placed in these cans.

Afternoon

- Linen – if not able to do in the morning or if there is a need for items.

- Stocking – if not able to do in the morning or if there is a need foritems.
- Room survey – student on SPECT/CT rotation 3 will be responsible for this. Log results into NMIS. I will monitor this and points will be deducted from your clinic grade if not being completed on a regular basis.
- Personnel hand monitoring – done at end of day or anytime when contamination is suspected; place hands and feet in front of device and check for contamination on hands. Log into NMIS. If contaminated, call program director or have a tech to assist you (don't touch anything).
- Radionuclide ordering for next day's doses– observe in Semester I. You will be required to perform this duty by mid-term in Semester II.
- Daily schedule – observe in Semester I. You will be required to perform this duty by mid-term in Semester II.
- Clean camera, table, P-scope, hand controller after every patient with Sani-Cloth wipes. If you have an isolation patient, depending on the type of isolation, you must clean the camera/table with approved cleaners/ methods.

Daily Quality Control Procedures

- Dose Calibrator
- Geiger Counter
- Morning QC on Symbia SPECT/CT, PET/CT, and D-SPECT. Check flood values, and then proceed to CT QC if necessary.
- Well counter – with constancy
- Thyroid probe (only if I-123 patient is on the schedule)
- Check room monitor with Cs source

Department Flow

1. OP orders print directly to our dept. when pt. arrives; we print IP orders from EPIC
2. Write on white board when pt. arrives so others are aware.
3. Prepare dose, equipment, etc.
4. Explanation to patient
5. Procedure
   Dose patient
   Put dose in NMIS
   Make sticker, put in red book. Complete EPIC Inj. portion. Image patient.
6. Check images with technologist

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7. Completion checklist
   Charge for study, dose, time, and techs involved in EPIC. Also include patient history.

Time/Attendance

- Clinic: 6:30am-3pm, 7am-3:30 pm, Monday – Friday depending on rotation; some special times for certain areas are denoted on clinical schedule.
- Class: Varies, (subject to change per program director) (2nd floor HSC, room 2041A)
- You should arrive to clinic a few minutes early and be ready to work at your scheduled time. This means all personal items must be put away and you must be in proper uniform, in scheduled area, and logged into Trajecsys by scheduled time.
- Lunch varies daily; know your schedule for the day and do not wait on classmates to finish exams to go to lunch.
- Don't ask me or techs to leave early; if you're not busy on your rotation, help someone else out (follow steps on page 2 of clinical standards policy for instructions). If schedules complete early, techs or program director will let you go early on occasion. Asking will only prevent future perks in this respect.
- Stay in clinic until 3:30pm (or your scheduled quit time per schedule), unless released early by program director or techs.
- If you should stay past 3:30 pm to finish a scan, or watch an unusual study, or assist a tech with a difficult patient, you may be compensated with comp time. (Must be pre-approved by program director) The amount of comp time awarded for such an event will be equal to the amount of time you spend past 3:30pm. However, comp time will not be awarded for staying over for common procedures. You may stay for these exams on your own time.
- For your own knowledge, please keep track of all PTO and comp time. You can always verify time with program director, but it is preferred that you keep your own record so you know where you stand.
- If calling off due to illness or any other reason, text program director at (will provide number) ,and call the department in which you are scheduled, 304-598-4261(NM),304-293-1884 (PET), 304-598-4642 (HVI) and leave message.
- If scheduling time off, write it on desk calendar in dept. so techs will know and complete a Personal Time Off Request in Trajecsys. Must be requested by 2pm the day prior to requested time off.
- Attendance policy is in student handbook. Make sure you fully understand all regulations. If not, please do not hesitate to ask for clarification.

Miscellaneous

- You may use the fridge in the Radiology break room, 3rd floor of hospital. Label your items well.

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Schedules

- Typical Clinic schedule – Monday - Friday
  - 7:00am-3:30pm: SPECT/CT rotations
  - 6:30am-3:00pm: Injection/Hot Lab rotation
  - 7:00am-3:30pm: Radiation Safety rotation, NM 7-8:30am, then radiation safety
  - 7:00am-3:30pm: PET/CT rotation (QC rotation in Jan/Feb is 6:30am-3pm)
  - 1:00am-9:30am: Radiopharmacy rotation
  - Subject to change at any time per the program director.
- Class schedule – Varies, (subject to change per Program Director, see monthly calendar in Trajecsys.)

*******We are here to help you become a great Nuclear Medicine Technologist. We will assist you in any way possible. Please don't be afraid to ask questions. No question is a stupid one. We will not look down upon you if you don't know an answer to one of our questions. You only have 12 months to learn everything. Use your time in clinic and the classroom wisely. If you need anything, my door is always open.**

WVU Medicine
IMAGING SCIENCE EDUCATION PROGRAMS
Nuclear Medicine

West Virginia University Hospitals
Medical Center Drive
Morgantown, WV 26506

Faculty Roster
Nuclear Medicine
2026-2027

Nuclear Medicine Staff Technologists/ Clinical Instructors

Julianne Coddington, RT(R)(N)
Rachel Dzimiera, RT(N)
Megan Reda, BS, CNMT
Torrie Sova, RT(R)(N), CNMT

PET/CT Staff Technologists/ Clinical Instructors

Taylor Gall, BS, RT(CT)(BD), CNMT
Sara Hackett, BA, CNMT, RT(N)(CT)
Timothy Lion, CNMT
Jennifer Pettry, MBA, RT(R)(N), CNMT, PET
Marka Potts, BS, RT(R)(N), CNMT, PET
Hannah Shreve, RT(R)(N)
Katie Smith, BS, CNMT
Logan Whetzel, AAS, RT(R)(N)

Nuclear Cardiology Staff Technologists/ Clinical Instructors

Presley Bates, RT(R)(N)
Debra Burton, BA, RT(N), NMTCB(CT)
Danielle Kostelac, CNMT
Maggie Sebeck, RT(N)
Ellen Tucci, RT(R)(N)
Felesha Ueltschy, RT(R)(N)

PharmaLogic Staff Pharmacists/ Clinical Instructors

Shelby Griffith, PharmD, AU, AES, RSO
Carson Alderson, PharmD, AU
Kenna Spurlock, PharmD, AU
Abigail Roach, Nuclear Pharmacy Tech
Jeremy Shipp, Nuclear Pharmacy Tech
Mark Duty, Lead DOT

Didactic Faculty

Tiffany Davis, MA, RT(R)(N), CNMT
Didactic Instructor, Core NM Courses
R. Alfredo C. Siochi, PhD
Didactic Instructor, Physics
Christina Paugh, MA, RT(R)(T) and Tiffany Davis, MA, RT(R)(N), CNMT
Didactic Instructors, Sectional Anatomy
Christina Paugh, MA RT(R)(T), Tiffany Davis, MA, RT(R)(N), CNMT, and Brad Holben, MSHA, RT(R)(MR)
Didactic Instructors, Hybrid Imaging
Marka Potts, BS, RT(R)(N), CNMT, PET
Didactic Instructor, PET/CT Course

Administration

Jennifer Pettry, MBA, RT(R)(N), CNMT, PET
Manager, Molecular Imaging
Tiffany Davis, MA, RT(R)(N), CNMT
NM Education Program Director
Xiaofei Wang, MD
Assistant Professor and Section Chief, Molecular Imaging
Jay Morris, MA, RT(R)(CV)
Manager, Education
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Modality Specialist, PET/CT
Candise Kerns
Manager, Nuclear Cardiology
Julianna Coddington, RT(R)(N)
Modality Specialist, Nuclear Medicine
Maggie Sebeck, RT(N)
Lead Technologist, HVI

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Student Guidelines

- Inform the designated clinical instructor that you wish to perform a competency evaluation. Patients should be chosen at random.
- Prepare yourself both clinically and didactically for the evaluation.
- Once a competency has been achieved, the student MUST MAINTAIN that level of competency for that procedure. Failure to do so will result in the competency being revoked.
- ALL COMPETENCIES MUST BE ACHIEVED BY JUNE 4, 2027.
  ***The Venipuncture Competency must be completed by September 11, 2026.

Clinical Instructor Guidelines

- Approve/disapprove the student's choice for evaluation.
- Have the student demonstrate the clinical procedure while observing the student's performance.
- Complete appropriate form in Trajecsys.

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Code of Ethics: For the Nuclear Medicine Technologist

Nuclear Medicine Technologists, as members of the health care profession, must strive as individuals and as a group to maintain the highest ethical standards.

The following Principles were adopted by the Technologist Section and the Society of Nuclear Medicine at the 1985 Winter Meeting. They are standards of conduct to be used as a quick guide by nuclear medicine technologists.

Principle 1: The nuclear medicine technologist should provide service with compassion and respect the rights of the patient.

Principle 2: The nuclear medicine technologist should hold in strict confidence all privileged information concerning the patient.

Principle 3: The nuclear medicine technologist should comply with the laws and regulations governing the practice of nuclear medicine.

Principle 4: The nuclear medicine technologist should be responsible for competent performance of assigned duties.

Principle 5: The nuclear medicine technologist should strive continuously to improve knowledge and skills.

Principle 6: The nuclear medicine technologist should not engage in fraud or deception.

Principle 7: The nuclear medicine technologist should be willing to assume responsibility to participate in activities that promote community and national response to health needs.

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General Nuclear Medicine Radiation Safety Rules

The following are recommended practices for safe use of radioactive materials while working in the nuclear medicine department.

1. Wear lab coats or other protective clothing in areas where radioactive materials are used.
2. Wear disposable gloves at all times while handling radioactive materials.
3. Monitor hands and clothing for contamination after working with radionuclides or before leaving the area.
4. Always use syringe shields for routine preparation of patient doses and administration to patients.
5. Do not eat, drink, smoke, or apply cosmetics in areas where radioactive materials are stored or used.
6. Do not store food, drink, or personal effects with radioactive materials.
7. Assay each patient dose in the dose calibrator prior to administration. Donot use doses that differ from the prescribed dose by more than $\pm$ 20%.
8. For therapeutic doses, also check patient's name, the radionuclide, the chemical form, and the activity vs. the order written by the attending physician.
9. Wear personnel monitoring devices (film badges, ring badges) at all timeswhile in areas where radioactive materials are used or stored.
10. Dispose of radioactive waste only in specially designated and properly shielded receptacles.
11. Use automatic pipettes to measure or transfer radioactive solution. (NEVER pipette by mouth).
12. Survey kit preparation and injection areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.
13. Confine radioactive solutions in properly shielded covered containers, identified and labeled with name of radionuclide, date, activity, and expiration date.
14. Clean up radioactive spills promptly.
15. Always transport radioactive materials in shielded containers.
16. When working with I-131 capsules, keep capsules sealed and shielded until use; do not break/crush capsules.
17. When performing lung ventilation studies with radioactive gas, ensure the nebulizer is working properly.
18. Be familiar with Nuclear Medicine Emergency Procedures and Radiation Safety Spill Procedures.

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WVUH Clinical Pre-Competency & Competency

Elective Procedures:

All elective procedures may only be performed once. Elective procedures do NOT require a pre-competency exam to be performed prior to the competency exam, however practice on the exam is recommended before attempting competency. Elective procedures may be performed in either Semester I or Semester II.

1. Liver-Spleen
2. Gastric Reflux
3. GI Bleed
4. Meckel's Diverticulum
5. DMSA Renal
6. Captopril Renal
7. Quantitative Lung Scan (Lung Perfusion only with ROIs and quantification)
8. OctreoScan
9. MIBG
10. Lymphoscintigraphy (breast or melanoma, must include images in department)
11. Cisternography: Routine
12. Cisternography: CSF Leak with pledgets, blood draw
13. Shunt Patency (VP or LP)
14. Y-90 SIRT MAA Liver/Lung Shunt Study
15. Nuclear Arthrogram Study
16. Bone Marrow Study
17. Salivary Gland Imaging
18. DaTscan
19. Neurolite Brain
20. Diamox Brain
21. Cardiolite Brain
22. Thallium Brain
23. Cardiac Amyloid
24. PET/CT: Body (Somatostatin Receptor; Copper 64)
25. PET/CT: Amyloid Brain
26. PET/CT: WB Prostate
27. PET/CT: Body (ER Breast)
28. PET/CT: Head/Neck

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If you have questions about other exams eligible for elective competencies not listed above, please ask the program director for approval.
A student is NEVER PERMITTED to perform the following studies without DIRECT SUPERVISION and may not use for a pre-competency and/or competency graded procedure:

- Y-90 Post TX Scan
- Brain Death Study
- Any scan or TX dose if refused by PD or Clinical Instructor/AES due to various conditions such as but not limited to patient condition, time restraints, etc.

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Commonly Used Radiopharmaceuticals

Arthorogram	**1 mCi 99mTc MAA**
Bone Scan (WB & 3-Phase)	20 mCi 99mTc HDP (or MDP)
Brain Death	**20 mCi 99mTc DTPA**
Cisternogram	500 uCi In-111 DTPA
CSF Leak	**500-800 uCi In-111 DTPA**
Esophageal Reflux	150 uCi 99mTc Sulfur Colloid
Gastric Emptying	**1 mCi 99mTc Sulfur Colloid**
GI Bleed	15-25 mCi 99mTc Ultratag RBC's
Hepatobiliary (HIDA)	**10 mCi 99mTc Choletec**
Lung Perfusion	5 mCi 99mTc MAA; 3mCi 99mTc MAA for pulmonary hypertension
Lung Ventilation	**1 mCi 99mTc PYP (make kit 30-40mCi)**
Breast Lymphoscintigraphy	450 µCi 99mTc Lymphoseek
Melanoma Lymphoscintigraphy	**200 µCi 99mTc 0.4 Filter Lymphoseek**
Meckel's Diverticulum	10 mCi 99mTcO4
MIBG	**10 mCi I-123 MIBG**
MUGA (EF = Ejection Fraction)	15-25 mCi 99mTc Ultratag RBC's
Myocardial Perfusion	**6 mCi 99mTc Myoview Rest** **18 mCi 99mTc Myoview Stress**
Neurolite Brain	20 mCi 99mTc Neurolite
Octreoscan	**6 mCi In-111 Octreoscan**
Parathyroid	30 mCi 99mTc Sestamibi
Renal Scan (Lasix)	**10 mCi 99mTc Mag 3**
Sestamibi Brain	20 mCi 99mTc Sestamibi

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Commonly Used Medications & Dosages

CCK = 0.02 micrograms / kilogram

Morphine = 0.04 milligrams / kilogram

Adult Lasix = 20 milligrams for adult dosage

Pediatric Lasix = 1 milligram / kilogram

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Pediatric Dose Calculations

The following calculations are in accordance with the WVUH policy number IV.04, Pediatric Dosage.

Determination of Children's Doses from Adult Doses

Kg	Lb	% of Adult Dose
2	**4.4**	**10**
4	8.8	15
6	**13.2**	**20**
8	17.6	25
10	**22.0**	**27**
15	33.0	35
20	**44.0**	**50**
25	55.0	55
30	**66.0**	**60**
35	77.0	70
40	**88.0**	**75**
45	99.0	80
50	**110.0**	**85**
55	121.0	90

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Scan Name & Organ(s) of Interest

Scan	Organ
Bone	Skeletal System (CA, infection, fractures, arthritis, etc)
Brain	**Blood Flow, Tumor, etc**
MUGA	LV Blood (inside)
MPI/MPS	**Blood Flow to heart muscle (outside)**
Cisternography	CSF Leak
Gastric Empty	**Stomach (solids or liquids)**
GI Bleed	GI tract
HIDA	**Hepatobiliary System and GB function**
Lung Scan (VQ)	Ventilation and perfusion
Lympho	**Cancer spread (breast or melanomas)**
Meckel's Diverticulum	Gastric mucosa usually RLQ (children)
OctreoScan	**Detect tumors that have somatostatin receptors on the surface of cells (Hypothalamus, brain stem, GI tract, and pancreas)**
Ictal & Interictal	Seizures (epilepsy)
Testicular Scan	**Torsion versus epidydimus**
Thyroid Scan	Image thyroid glands
Thyroid Uptake	**No image measure iodine (degree of functionality)**
WBC	Infection and inflammatory
MIBG	**Adrenal gland tumor imaging (neuroendocrinetumors) or found Outside of adrenal gland called paragangliomas (bladder, neck, thorax, abdomen, or pelvis) Neuroblastomas (adrenal medulla, mediastinal andretroperitoneal regions)**
Gallium	Infection and tumor
Diamox	**Blood flow to brain (Stroke / TIAs)**
DaTScan	Parkinsons Disease Brain SPECT
Y-90 Sirspheres	**Liver cancer treatment (non-resectable liver tumors)**

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General Information and Instructions to Patients

Bone Scan

-20 mCi 99mTc MDP or HDP
-Do you have any other tests today? If CT, then start IV (22g or 20g).
-*Whole Body*: The first part, which is the injection, will only take 10 minutes. Inject and tell them to return in 2.5-3 hours. Give EXACT TIME for them to return. Record time on "desk schedule." The pt can then leave and do whatever they want. Eat and drink extra fluids if not contraindicated by other tests. (at least 3- 8 oz cups of any fluid). Urinate as much as possible.
-*3 Phase*: After you draw your dose and prepare room, go get pt and take to camera. Inject and do flow and immediate statics. They still come back in 2.5 -3 hours for the third phase-whole body. Make sure to remind them to drink extra fluid.
-*When the bone scan pts return, have them void before starting scan.
-WB scan total time=20 min
-WB with SPECT/CT total time=40 min

MPS

-Rest dose: **BMI 25-34**, 6 mCi 99mTcMyoview; **BMI 35-40** 8 mCi 99mTcMyoview; **BMI 41-50**, 10 mCi 99mTc Myoview; **BMI 50+,** 12 mCi 99mTc MV
-Stress dose: **BMI 25-34**, 18 mCi 99mTcMyoview; **BMI 35-40** 24 mCi 99mTcMyoview; **BMI 41-50**, 30 mCi 99mTc Myoview; **BMI 50+**, 36 mCi 99mTc Myoview
-Always take BP before starting.
-NPO for 4 hours, no caffeine for 12 hours
-Start IV and give resting dose. Pt to wait 30 mins. Given at least 16 oz of water to drink before imaging.
-Rest imaging (upright, gated – hooked up to 4 ECG leads) = approx. 10 min
-If BMI 50+, do additional rest image (supine, not gated)
-Patient taken to stress lab
-When they return, given additional at least 16 oz of water. Take out OP IV before obtaining stress images.
-Wait 60 minutes before scanning stress. For a walker who adequately exercised can wait approximately 30 minutes, for dobutamine/lexiscan, always wait 60 mins, for Regadenoson with low level exercise (lexi-walk) can wait approximately 45 minutes before 2nd set of pictures (go fromtime of 2nd inj, which is given in the stress lab).
-After you wait the required time, put on for pics. For stress imaging, do upright, gated as well as supine, not gated on all patients. Upright takes approximately 4 minutes.
-When 2nd set of pics are completed, they are free to go.
-Process pics.
-Stress dose given:
    Walker=@ target HR
    Adenosine=@ 3 min
    Dobutamine=@target HR
    Regadenoson (Lexiscan)=@10 seconds post injection of Regadenoson

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HIDA (liver & GB function/EF)

-**Make sure they have a GB**
-10 mCi Choletec
-NPO 4 hours
-Start IV
-Test takes 1.5-2 hours.
-Do not need a flow-inj!
-Perform dynamic imaging study for 1 hour
-At the 1 hour mark look at pics to determine what to do:
    A) GB & small bowel-give CCK .02 mcg/Kg
    B) Small bowel but no GB-give Morphine .04mg/Kg
-*CCK can cause nausea and very rarely vomiting (it only lasts about 5-10 mins).
-After this you will take 2 more pictures:
    1) 15 min post CCK
    2) 30 min post CCK
-After the CCK or Morphine is given you can take IV out as long as they don't have any other tests where an IV is needed.

MUGA (multiple gated acquisition)

-Done to get the EF of LV in the heart-use Ultra Tag Kit to tag RBC with 20 mCi 99mTC.
-Start IV with 20g or bigger.
-Withdraw 3 cc of blood into 3cc heparinized syringe using 20g needle or bigger.
-At this point, instruct the pt to the waiting room and tell them it will be 25 min to tag the blood (make sure IV is secure).
-Make sure you put bracelet on pt. with number labels and label their blood
-Ultra Tag Kit:
    -inject blood into vial and wait 5 min then inj syringe I "swirl", then syringe II "swirl" and last 99mTC "swirl"(you want to draw up no less than 25 mCi to start with b/c after tagging you will have less).
    -After inj I, II & 99mTC, let it sit 20 min.
    -After 20 min, draw blood out of vial using a shield b/c it is now radioactive (use 5cc syringe b/c there is more volume now. Also use 20g needle or bigger to draw it up).
-Get pt. Hook up 3 leads and make sure the ECG trigger is on.
-Inj them with the radioactive blood. You can use 1-3 ml of blood but 3 ml is better.
-Slide under camera and position camera in the LAO (about 30-35 degrees) with a caudal tilt (about 10 degrees). Make sure the LV is clearly visualized before starting camera.
-Pics only take about 5-10 min.
-When images are finished, take off leads and make sure IV is taken out (as long as they don't need it for another test or chemotherapy that day. A lot of CA pts stop on the way to their treatment in the CA center).
-Process and have someone else process too to see if numbers match

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Thyroid Scan & Uptake

-I-123: 200-300 µCi
-Day 1=thyroid questionnaire and dose with pill; takes about 10 min.
-Day 2=imaging and counting their thyroid and BKG; takes 1 hour

Day 1:
-Get thyroid questions paper

-Get pill and measure in dose calibrator.
-Count background. Count pill in neck phantom with thyroid probe (this is done in the morning during hot lab preparation)
-Get pill and give to pt PO.
-Assure them that there will be no side effects.
-Make sure it is clear to them that they have to return the next day. Make sure they know what time. They have to register again at the registration desk on 3rd floor by windows.
-Make sure pt is off any kind of thyroid medication and that they still have a thyroid gland (for meds, see questionnaire)
-After they take the pill they are free to leave.

Day 2:
-Takes 1 hour.
-First count the pt BKG. (computer prompts you what to do, follow instructions)
-Second, count the patients thyroid.
-Move the pt to camera to start pics.
-3 different pics (each takes 10 min):

1) ANT w/ marker
2) RAO
3) LAO

-When these pics are complete, the pt is free to go. Computer processing.

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Stress Lab Injections

Stress Doses

BMI 25-34, 18 mCi 99mTcMyoview
BMI 35-40 24 mCi 99mTcMyoview
BMI 41-50, 30 mCi 99mTc Myoview
BMI 50+, 36 mCi 99mTc Myoview

*Image 60 min. post injection

Resting Doses

BMI 25-34, 6 mCi 99mTc Myoview
BMI 35-40, 8 mCi 99mTc Myoview
BMI 41-50, 10 mCi 99mTc Myoview
BMI 50+, 12 mCi 99mTc Myoview

*Imaging 30 min. post injection

Treadmill
Inject at Doctor's request (goal: target HR or until only have 1 min. left)

Pharmalogic Agents
Adenosine = Inject @ 3min. (6 min. infusion)

Dobutamine = Inject at Doctor's request (goal: target HR)

Regadenoson (Lexiscan) = Inject 10-20 seconds post injection of Regadenoson (give tracer after nurse pushes the flush)

Flow of Stress

1. Outpatient doses are pre-calibrated and should not need adjusted. Inpatient doses may require very minimal adjusting.
2. Take box to stress lab. Inject when appropriate based on stress type
3. When returning from stress lab, re-measure the dose, put information into the daily log on hot lab computer (and write out information on the daily schedule in control room (stress type, % target achieved, positive or negative chest pain, injection time, scan time –always put scan time as one hour from injection time)
4. EPIC and NMIS (stress dose only)
5. Put dose in scan system on acquisition computer

Symbia Shut Down/Start Up Procedure

End of Day- Start the Auto Daily QC Protocol - On Thursdays, start the Weekly QC Auto QC Procedure - must remove collimators.

In the AM- Check the values for the Daily Flood and complete protocol. Proceed to the shutdown procedure.

Shut down/Start up: Options, End Session, Shutdown, Yes

- While system is shutting down, go to the PPM. Click Setup tab at bottom right comer. Press Shutdown, and Green Arrow (proceed).
- Tum power off to the UPS by holding the button in for a couple seconds. Wait 15 seconds and power back up the UPS.
- When PPM displays Ready for Shutdown, tum SNAC and CT off. Wait 15 seconds and tum SNAC back on. Push Green Go on Emergency Stop, wait for lights to show up on hand remote and then tum CT back on (off no less than 1 minute).
- Return to computer, Ctrl-Alt-Delete, wait for PPM to say Siemens and then sign on, password Esoft, click on Esoft in center of screen.

Quick Shut Down for Motion Errors

- PPM shutdown
- 3 switches off: SNAC, Motion and Camera
- CT box off
- 3 switches on: SNAC, Motion and Camera
- Emergency Stop Green button (wait until hand control lights come on)
- CT box on