



**Faculty point person:**

**Aaron Lewis, M.D., Volunteer Clinical Asst Professor, UMKC**

Nuclear Medicine Residency: Harvard University, Boston, MA

Diagnostic Radiology Residency: University of Missouri, Kansas City

**Don Yoo, MD (Consultant on curriculum), Assistant Professor, Brown University**

Nuclear Medicine fellowship: Harvard University Medical Center

Residency, Brown University

**UMKC teaching faculty in Nuclear Medicine:**

Jeff Kunin, M.D. (SLH - Chest and Body)

Kelly Andresen, M.D. (SLH - Body)

Gerald Finke, D.O. (TMC - Endocrine and therapy)

Larry Ricci, D.O. (TMC - Endocrine and therapy)

Ian McGhie, M.D. (TMC - Cardiac)

Steve Welch, MD (CMH - Pediatric)

Douglas Rivard, DO (CMH - Pediatric)

## Core lecture series in Nuclear Medicine

**Core lectures - Biweekly year round Monday 7:30am at SLH**

1. Introduction to Positron Emission Tomography (PET)
2. Oncology Imaging
3. Nuclear Endocrine Imaging and therapy
4. Genitourinary System
5. Gastrointestinal and Hepatobiliary System
6. Central Nervous System nuclear imaging
7. Introduction to Cardiac SPECT and PET
8. Nuclear imaging of infection and Inflammation
9. Emergency Nuclear Imaging
10. Introduction Pulmonary Imaging

**This curriculum is supplemented by the following interdisciplinary lectures:**

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|-------------------------------|------------------|
| 1. SLH - Biweekly Wed morning | Pulmonary        |
| 2. SLH - Biweekly Wed noon    | Gastrointestinal |
| 3. SLH - Biweekly Thurs noon  | Journal club     |
| 4. SLH - Biweekly noon        | Oncology         |
| 5. TMC - Monthly Mon noon     | Endocrine        |
| 6. TMC - Weekly Wed noon      | Tumor            |
| 7. TMC - Biweekly Fri 11am    | Pulmonary        |

**Additional Resources:**

**Procedure guidelines are online at:** Society of Nuclear Medicine site-->Practice Management-->

Procedure Guidelines

- Includes: indications, effective radiation doses (including Peds), typical protocols, and other interpretative considerations for all of the staple diagnostic nuclear medicine exams

**Aunt Minnie Reference >>Nuclear Medicine**



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***Nuclear Medicine – Rotation 1***

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**General overview**

Radiology resident rotations in Nuclear Medicine will include at least the equivalent of 4 months during the radiology residency. The learning of nuclear medicine will encompass multiple rotations some of which will be stand alone nuclear medicine rotations and others incorporated into specific body parts rotations, i.e. Thoracic Radiology for V/Q scans. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of general nuclear medicine will be incorporated into the residency, including Nuclear Cardiology (in conjunction with the Department of Cardiology at Saint Luke's Hospital), Endocrine therapy (in conjunction with Truman Medical Center faculty), and Pediatric Nuclear Medicine (in conjunction with Children's Mercy Hospital faculty).

**Resident responsibilities:**

1. The resident is involved in the daily conduct of nuclear medicine services. At the start of every working day, the resident should be familiar with the patient schedule and anticipate needs for any procedures. The resident will check requisitions for next working day to evaluate for appropriateness of requested procedure or if additional exams/protocol needs to be performed. Absent clinical indication or seemingly in-appropriate requests will be clarified and discussed with referring physician.
2. The resident assigned to nuclear medicine is expected to be available for consultation by nuclear medicine technicians, clinicians and other health care professionals during regular office hours except during conference times, when attending faculty will cover.
3. Examinations should be checked by the resident before the patient leaves the department if requested to do so by the supervising faculty.
4. Any questions should be referred to the supervising faculty covering nuclear medicine.
5. Preliminary reports are written for emergency room referrals and patients who are going to clinic appointments on the same day of the examination when appropriate. This is communicated to attending radiologist and documented in the final report with name, date and time of such a communication.
6. Review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient work flow.
7. All examinations should be dictated by the end of every working day.
8. The resident will check his/her reports prior to final verification by supervising faculty.

**Staff responsibilities:**

1. Supervising faculty should be available at all times for any questions or consultations needed by the resident.
2. Supervising faculty should review all cases with the resident before the end of the day.
3. Supervising faculty should provide the resident with constructive feedback in any problem areas encountered during the rotation.
4. Supervising faculty should verify resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** As per description in UMKC Radiology Residency Handbook

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***Nuclear Medicine – Rotation 1 - goals and objectives***

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***1. Patient care:***

- (a) The resident should have knowledge of indications for the examinations requested. When the reason for the examination is not clear, the resident should effectively communicate with the patient or referring physician until this is clarified.
- (b) The resident should be familiar with available medical records and how to access them for purposes of patient care.
- (c) All studies should be reviewed with supervising faculty attending.
- (d) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. When there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

II. **Medical Knowledge:**

- (a) Become comfortable with basic nuclear medicine techniques and scans.
- (b) Become familiar with common diseases detected by nuclear medicine including PET scanning, various Oncological and Inflammatory scintigraphic studies, Hepatobiliary scanning, V/Q scans, GI and GU nuclear medicine scans, endocrine and skeletal imaging.
- (c) The resident should be familiar with the anatomy of the organs examined in every case. An atlas of cross-sectional anatomy should be consulted when there is any doubt.
- (d) Depending upon the indication of the examination, the resident should be familiar with nuclear medicine findings in the disease entity suspected.
- (e) In cases where the resident is not familiar with the disease entity or expected findings on nuclear medicine scans, he/she should recognize their limitations and consult with supervising faculty or appropriate reading material.

III. **Practice Based Learning and Improvement:**

- (a) The resident should demonstrate evidence of independent reading and learning through the use of printed and electronic sources.
- (b) Follow-up of abnormal or interesting studies should be accomplished through personal communication with the referring physician or patient medical records.
- (c) The resident should be competent in using the nuclear medicine PACS in the daily accomplishment of the work load and instruct others in its use.

IV. **Interpersonal Communication Skills:**

- (a) The resident should be able to communicate effectively results of studies to referring clinicians whenever needed. For emergent studies, including but not limited to V/Q and GI bleeding scans, reports to referring clinicians should be made in a timely manner.
- (b) The resident should be able to effectively convey the findings of examinations through accurate dictation of reports.

V. **Professionalism:**

- (a) Residents should be able to explain the nature of the examination or findings in an examination to patients and their families when needed.
- (b) Residents should observe ethical principles when recommending further work-up for cases.
- (c) Promptness and availability at work are expected of every resident.
- (d) Residents should dress appropriately at work, wearing a name badge at all times.
- (e) Nuclear Medicine technologists and other health workers should be treated with respect and part of the health care team.
- (f) Patient confidentiality should be observed at all times.
- (g) Residents are required to complete an on line professionalism module at least biannually.

VI. **System Based practice:**

- (a) Residents should be familiar with departmental procedures necessary in the performance of the examination.

- (b) Residents should learn appropriate language to be used in communicating to clinicians through reports or consultations so proper management decisions can be made.
- (c) Proper dictations should be made with indications, technique, findings and conclusions
- (d) Residents should dictate and correct their reports in a timely fashion to avoid delay in patient disposition.
- (e) Residents should assist in facilitating examinations whenever possible.
- (f) Resident should recognize the role that nuclear medicine plays in the management of patient's illness and make proper recommendations when needed
- (g) Suggestions to improve methods and systems utilized in radiology should be made whenever appropriate.

**Reading list:**

1. The Requisites – Nuclear Medicine – Ziessman HA, O'Maley JP, Thrall JH (eds). Mosby-Year Book. St Louis, 2006
2. Essentials of Nuclear Medicine Imaging – Mettler F, Guiberteau MJ. Saunders. 2005

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***Nuclear Medicine – Rotation 2***

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**General overview**

Radiology resident rotations in Nuclear Medicine will include at least the equivalent of 4 months during the radiology residency. The learning of nuclear medicine will encompass multiple rotations some of which will be stand alone nuclear medicine rotations and others incorporated into specific body parts rotations, i.e. Thoracic Radiology for V/Q scans. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of general nuclear medicine will be incorporated into the residency, including Nuclear Cardiology (in conjunction with the Department of Cardiology at Saint Luke's Hospital), Endocrine therapy (in conjunction with Truman Medical Center faculty), and Pediatric Nuclear Medicine (in conjunction with Children's Mercy Hospital faculty).

**Resident responsibilities:**

1. The resident is involved in the daily conduct of nuclear medicine services. At the start of every working day, the resident should be familiar with the patient schedule and anticipate needs for any procedures. The resident will check requisitions for next working day to evaluate for appropriateness of requested procedure or if additional exams/protocol needs to be performed. Absent clinical indication or seemingly in-appropriate requests will be clarified and discussed with attending MD.
2. The resident assigned to nuclear medicine is expected to be available for consultation by nuclear medicine technicians, clinicians and other health care professionals during regular office hours except during conference times.
3. Examinations should be checked by the resident before the patient leaves the department if requested to do so by the supervising faculty.
4. Any questions should be referred to the attending supervising faculty on nuclear medicine.
5. Preliminary reports are written for emergency room referrals and patients who are going to clinic appointments on the same day of the examination when appropriate. This is communicated to attending radiologist and documented in the final report with name, date and time of such a communication.
6. Review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient work flow.
7. All examinations should be dictated by the end of every working day.
8. The resident will check his/her reports daily prior to final verification by supervising faculty.

**Staff responsibilities:**

1. Supervising faculty should be available at all times for any questions or consultations needed by the resident.
2. Supervising faculty should review all cases with the resident before the end of the working day.
3. Supervising faculty should provide the resident with constructive feedback in any problem areas encountered during the rotation.
4. Supervising faculty should verify resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** Residents are evaluated monthly as per description in UMKC Radiology Resident Manual.

**Nuclear Medicine – Rotation 2 - Goals and objectives**

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I. **Patient care:**

- (a) The resident should have knowledge of indications for the examinations requested. When the reason for the examination is not clear, the resident should effectively communicate with the patient or referring physician until this is clarified.
- (b) The resident should be familiar with available medical records and how to access them for purposes of patient care.
- (c) All studies should be reviewed with supervising faculty attending.
- (d) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. When there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

II. **Medical Knowledge:**

- (a) Become comfortable with basic nuclear medicine techniques and scans.
- (b) Become comfortable with interpretation of common and uncommon diseases detected by nuclear medicine including PET scanning, various nuclear medicine scans in oncology, various inflammatory scans, Hepatobiliary scanning, V/Q scans, GI and GU nuclear medicine scans, endocrine and skeletal imaging.
- (c) Become familiar with and observe nuclear medicine therapies including low level and high level I-131 therapy for thyroid diseases. Be able to determine dosing for thyroid treatments based on pathology, surgical history and thyroid uptake results.
- (d) The resident should be familiar with the anatomy of the organs examined in every case. An atlas of cross-sectional anatomy should be consulted when there is any doubt.
- (e) Depending upon the indication of the examination, the resident should be familiar with nuclear medicine findings in the disease entity suspected.
- (f) In cases where the resident is not familiar with the disease entity or expected findings on nuclear medicine he/she should recognize that limitation and consult with supervising faculty or appropriate reading material.

III. **Practice Based Learning and Improvement:**

- (a) The resident should demonstrate evidence of independent reading and learning through the use of printed and electronic sources.
- (b) Follow-up of abnormal or interesting studies should be accomplished through personal communication with the referring physician or patient medical records.
- (c) The resident should be competent in using the nuclear medicine PACS in the daily accomplishment of the work load and instruct others in its use.

IV. **Interpersonal Communication Skills:**

- (a) The resident should be able to communicate effectively results of studies to referring clinicians whenever needed. For emergent studies including, but not limited to V/Q and GI bleeding scans, reports should be made and documented in a timely manner.
- (b) The resident should be able to effectively convey the findings of examinations through accurate dictation of reports.

V. **Professionalism:**

- (a) Residents are required to complete an on line professionalism module at least biannually.
- (b) Residents should be able to explain the nature of the examination or findings in an examination to patients and their families when needed.
- (c) Residents should observe ethical principles when recommending further work-up for cases.
- (d) Promptness and availability at work are expected of every resident.
- (e) Residents should dress appropriately when coming to work.
- (f) Nuclear Medicine technologists and other health workers should be treated with respect and part of the health care team.
- (g) Patient confidentiality should be observed at all times.

VI. **System Based practice:**

- (a) Residents should be familiar with departmental procedures necessary in the performance of the examination.
- (b) Residents should learn appropriate language to be used in communicating to clinicians through reports or consultations so proper management decisions can be made.
- (c) Proper dictations should be made with indications, technique, findings and conclusions.
- (d) Residents should dictate and correct their reports in a timely fashion to avoid delay in patient disposition.
- (e) Residents should assist in facilitating examinations whenever possible.
- (f) Resident should recognize the role that nuclear medicine plays in the management of patient's illness and make proper recommendations when needed
- (g) Suggestions to improve methods and systems utilized in radiology should be made whenever appropriate.

**Reading list:**

1. The Requisites – Nuclear Medicine – Ziessman HA, O'Maley JP, Thrall JH (eds). Mosby-Year Book. St Louis, 2006
2. Essentials of Nuclear Medicine Imaging – Mettler F, Guiberteau MJ. Saunders. 2005
3. ACR nuclear medicine case files.

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***Nuclear Medicine – Rotation 3, 4 and optional 5, 6***

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**General overview**

Radiology resident rotations in Nuclear Medicine will include at least the equivalent of 4 months during the radiology residency. The learning of nuclear medicine will encompass multiple rotations some of which will be stand alone nuclear medicine rotations and others incorporated into specific body parts rotations, i.e. Thoracic Radiology for V/Q scans. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of general nuclear medicine will be incorporated into the residency, including Nuclear Cardiology (in conjunction with the Department of Cardiology at Saint Luke's Hospital), Endocrine therapy (in conjunction with Truman Medical Center faculty), and Pediatric Nuclear Medicine (in conjunction with Children's Mercy Hospital faculty).

**Resident responsibilities:**

1. The resident is involved in the daily conduct of nuclear medicine services. At the start of every working day, the resident should be familiar with the patient schedule and anticipate needs for any procedures. The resident will check requisitions for next working day to evaluate for appropriateness of requested procedure or if additional exams/protocol needs to be performed. Absent clinical indication or seemingly in-appropriate requests will be clarified and discussed with attending MD.
2. The resident assigned to nuclear medicine is expected to be p for consultation by nuclear medicine technicians, clinicians and other health care professionals during regular office hours except during conference times.
3. Examinations should be checked by the resident before the patient leaves the department if requested to do so by the supervising faculty.
4. Any questions should be referred to the attending supervising faculty on nuclear medicine.
5. Preliminary reports are written for emergency room referrals and patients who are going to clinic appointments on the same day of the examination when appropriate. This is communicated to attending radiologist and documented in the final report with name, date and time of such a communication.
6. Review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient work flow.
7. All examinations should be dictated by the end of every working day.
8. The resident will check his/her reports daily prior to final verification by supervising faculty.

**Staff responsibilities:**

1. Supervising faculty should be available at all times for any questions or consultations needed by the resident.
2. Supervising faculty should review all cases with the resident before the end of the day.
3. Supervising faculty should provide the resident with constructive feedback in any problem areas encountered during the rotation.
4. Supervising faculty should verify resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** Residents are evaluated monthly as per description in UMKC Radiology Resident Manual.

## **Nuclear Medicine – Rotation 3, 4 and optional 5, 6 - Goals and objectives**

I. **Patient care:**

- (a) The resident should have a high level of comfort with indications for the examinations requested. When the reason for the examination is not clear, the resident should effectively communicate with the patient or referring physician until this is clarified.
- (b) The resident should be highly comfortable with available medical records and how to access them for purposes of patient care.
- (c) All studies should be reviewed with supervising faculty attending.
- (d) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. When there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

II. **Medical Knowledge:**

- (a) Become familiar with nuclear cardiology techniques in assessing myocardial function including evaluating for ischemic and infarcted myocardium.



- (b) Be more comfortable with and participate actively in nuclear medicine therapies including low level and high level I-131 therapy for thyroid diseases. Be able to determine dosing for thyroid treatments based on pathology, surgical history and thyroid uptake results.
- (c) Be highly comfortable with basic nuclear medicine techniques and scans, and teach them to lower level residents and medical students.
- (d) Become comfortable with common and uncommon diseases detected by nuclear medicine including PET scanning, different nuclear medicine scans in oncology, Hepatobiliary scanning, V/Q scans, GI and GU nuclear medicine scans, endocrine and skeletal imaging.
- (e) The resident should participate in at least two special hands on senior seminars on handling of radiopharmaceuticals, quality control and misadministrations.
- (f) Depending upon the indication of the examination, the resident should be familiar with nuclear medicine findings in the disease entity suspected.
- (g) In cases where the resident is not familiar with the disease entity or expected findings on nuclear medicine he/she should recognize that limitation and consult with supervising faculty or appropriate reading material.

III. **Practice Based Learning and Improvement:**

- (a) The resident should demonstrate evidence of independent reading and learning through the use of printed and electronic sources.
- (b) Follow-up of abnormal or interesting studies should be accomplished through personal communication with the referring physician or patient medical records.
- (c) The resident should be competent in using the nuclear medicine PACS in the daily accomplishment of the work load and instruct others in its use.

IV. **Interpersonal Communication Skills:**

- (a) The resident should be able to communicate effectively results of studies to referring clinicians whenever needed. For emergent studies including but not limited to V/Q and GI bleeding scans, this should be done in a timely manner.
- (b) The resident should be able to effectively convey the findings of examinations through accurate dictation of reports.
- (c) The resident should be able to instruct lower level residents and medical students regarding the performance and interpretation of nuclear medicine studies.

V. **Professionalism:**

- (a) Residents are required to complete an on line professionalism module at least biannually.
- (b) Residents should be able to explain the nature of the examination or findings in an examination to patients and their families when needed.
- (c) Residents should observe ethical principles when recommending further work-up.
- (d) Promptness and availability at work are expected of every resident.
- (e) Residents should dress appropriately when coming to work.
- (f) Nuclear Medicine technologists and other health workers should be treated with respect and part of the health care team.
- (g) Patient confidentiality should be observed at all times.

VI. **System Based practice:**

- (a) Residents should be familiar with departmental procedures necessary in the performance of the examination.
- (b) Residents should learn appropriate language to be used in communicating to clinicians through reports or consultations so proper management decisions can be made.
- (c) Proper dictations should be made with indications, technique, findings and conclusions
- (d) Residents should assist in facilitating examinations whenever possible.
- (e) Resident should recognize the role that nuclear medicine plays in the management of patient's illness and make proper recommendations when needed

- (f) Suggestions to improve methods and systems utilized in radiology should be made whenever appropriate.

**Reading list:**

1. The Requisites – Nuclear Medicine – Ziessman HA, O’Maley JP, Thrall JH (eds). Mosby-Year Book. St Louis, 2006
2. Essentials of Nuclear Medicine Imaging – Mettler F, Guiberteau MJ. Saunders. 2005
3. Diagnostic Imaging: Nuclear Medicine – Morton KA, et al., Amirsys. 2007
4. Nuclear Medicine and PET/CT Technology and Techniques – Christian PE, Waterstram-Rich K. Mosby. 2007
5. ACR Nuclear medicine case files