



## Curriculum Breast and Women's Imaging (rev 1/6/11)

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**Faculty point person: Azfal Riaz, MD and Ruby Meierotto, MD**

Diagnostic Radiology: University of Kansas Medical Center  
Fellowship: Women's Imaging, University of Southern California

**Other teaching faculty in breast imaging:**

Amy Soetart, DO (SLH) – Breast imaging  
Larry Ricci, DO (TMC) – Breast imaging  
Kay North, DO (CMH) – Fetal MRI/OB US  
George Lu, MD (SLH) – OB US  
Kristin Fickenscher (CMH) – Fetal imaging

### Core lecture series in breast imaging:

Core lectures -	7:30am	Biweekly at SLH
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1. Introduction to Breast Imaging
2. Mammography: Calcifications
3. Mammography: Masses
4. Breast Ultrasound
5. Breast MRI
6. Breast Intervention
7. Breast Implants
8. Miscellaneous Breast/Women's Lectures
9. Fetal MRI
10. OB US first trimester
11. OB US anomalies

**This curriculum is supplemented by the following interdisciplinary (radiology, hem-onc, path, surgery) resident attended conferences:**

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| 1. Weekly morning con - | SLH |
| 2. Weekly Monday noon   | SLH |
| 3. Weekly Tuesday noon  | TMC |

**Suggested Reading:**

1. Begin with the breast imaging section in Brandt and Helms to get a general overview
2. Breast Imaging by Kopans or Breast Imaging: The Requisites by Ikeda
3. ACR Discs
4. Breast Imaging: Case Review Series
5. Helpful websites:
  - a. <http://www.mammoed.com>
  - b. <http://www.birads.at/>
  - c. <http://www.uhrad.com/mamarc.htm>
  - d. <http://sprojects.mmi.mcgill.ca/mammography/cases.htm>
6. If considering a breast/women's imaging fellowship, Breast Ultrasound by Stavros and Breast MRI by Morris and Liberman

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**Breast Imaging – Rotation 1**

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**General overview**

Radiology resident rotations in Breast Imaging will include at least 3 months (12 weeks) during the residency program at Saint Luke's Cancer Institute Breast Imaging Center and Truman Medical Center. Mammography quality standards act (MQSA) standards are followed to meet requirements in the last 6 months of Radiology residency, during which time at least 240 mammograms are interpreted by each resident with direct faculty supervision. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of breast imaging will be incorporated into the residency, including mammography, ultrasound, MRI and interventional breast procedures.

**Resident responsibilities:**

1. The resident is involved in the daily conduct of breast imaging services. At the start of every working day, the resident should be familiar with the patient schedule and anticipate needs for any procedures.
2. The resident will check requisitions to evaluate for appropriateness of requested procedure or if additional exams/protocol needs to be performed. Absent clinical indication or seemingly inappropriate requests will be clarified and discussed with the referring physician.
3. The resident assigned to breast imaging is expected to be available for consultation by mammography and ultrasound technologists, clinicians and other health care professionals during regular office hours except during conference times, when attending faculty will cover.
4. Examinations should be checked by the resident before the patient leaves the department if requested to do so by the supervising faculty.
5. The resident should refer questions to his/her supervising faculty.
6. Preliminary reports may be written for patients who are going to clinic appointments on the same day of the examination when appropriate.
7. Review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient work flow.
8. All examinations should be dictated by the end of every working day.
9. 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 as well as through rotation evaluations.
4. Supervising faculty should sign resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** Breast imaging faculty evaluate the residents monthly using the UMKC electronic evaluation system based on the 6 ACGME core competencies as explained in the resident manual.

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**BREAST IMAGING - Rotation 1 – Goals and Objectives**

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**I. Patient care:**

- (a) Residents are required to complete an on line Patient Care, Radiation Safety module at least biannually.
- (b) 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.
- (c) The resident should be familiar with available medical records and how to access them for purposes of patient care.
- (d) All studies should be reviewed with supervising faculty attending.
- (e) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. If there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

## II. Medical Knowledge:

At the end of the rotation, the resident should be able to:

- Appreciate the importance of screening mammography
  - a. Screening guidelines for the general population and high risk patients.
  - b. Controversies regarding screening women age 40-49 years and younger than 40 years.
    - i. Screening guidelines of the ACR, NCI and the US preventive services task force.
  - c. Basic breast cancer statistics.
  - d. Proper call back protocol.
  - e. Relative screening efficacy of breast self-exam, clinical breast exam, and mammography.
  - f. Benefit-risk assessment, including radiation risk and false-positive results.
  - g. Cost-effectiveness.
  - h. ACR practice guidelines for performance of screening mammography.
- (b) Understand the difference between screening versus diagnostic mammograms.
  - a. Indications for a diagnostic mammogram.
  - b. Appropriate additional views and imaging for abnormalities found on screening mammograms.
  - c. Proper work up for various patient presentations including a palpable breast or axillary mass, focal versus diffuse pain, nipple discharge, nipple or skin retraction, skin redness/swelling.
  - d. Proper management for a negative imaging work up.
- (c) Properly localize a lesion on mammography using only the cranial-caudal and medial-lateral oblique views.
- (d) Understand the four types of breast density and how they affect breast cancer detection.
- (e) Recognize the strengths and weaknesses of screen film versus digital mammography.
- (f) Appreciate the importance of comparison with prior films.
- (g) Understand common presentations on mammography and sonography of:
  - Benign etiologies: cyst, fibroadenoma, lymph node, secretory mastitis, milk of calcium, vascular calcifications.
  - Malignant etiologies: ductal carcinoma in situ (DCIS), invasive ductal carcinoma.
- (b) Describe breast ultrasound and MRI indications.
- (c) Make preliminary reviews of mammograms and sonograms and discuss findings with the faculty, then dictate as directed.
- (d) Contact the referring physician for clarification of orders or to obtain additional patient history.
- (e) Assist the technologist in preparation of the patient for examinations if needed.
- (f) Residents should be familiar with the following quality assurance:
  - ACR mammography quality control manual.
  - Purpose and frequency of quality control tests performed by the technologist and the physicist.

- Demonstrate proficiency in recognizing the mammographic appearance of artifacts for both screen-film and digital mammography.
  - Appreciate proper mammographic positioning and the effects on cancer detection.
- (m) Understand the following regarding reporting and medico legal aspects of breast imaging:
- ACR Breast Imaging Reporting and Data Systems (BI-RADS).
  - Implications on patient management.
  - ACR lexicon terms for mammography, ultrasound and MRI.
  - MQSA regulatory requirements.

III. **Interpersonal Communication Skills:**

- (a) The resident should be able to communicate effectively results of studies to referring clinicians whenever needed.
- (b) The resident should be able to effectively convey the findings of breast examinations through accurate dictation of reports.
- (c) Residents should discuss mammographic procedures and study results with patients when requested to do so by supervising faculty.

IV. **Professionalism:**

- (a) Residents are required to complete an on line professionalism module at least biannually.
- (b) Residents should recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence.
- (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 at work, wearing a name badge at all times.
- (f) Mammographic and sonographic breast technologists and other health workers should be treated with respect as part of the health care team.
- (g) Patient confidentiality should be observed at all times.

V. **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) Residents are encouraged to make suggestions to improve methods and systems utilized in radiology whenever appropriate.

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***BREAST IMAGING - Rotation 2***

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**General overview**

Radiology resident rotations in Breast Imaging will include at least 3 months (12 weeks) during the residency program at Saint Luke's Cancer Institute Breast Imaging Center and Truman Medical Center. Mammography quality standards act (MQSA) standards are followed to meet requirements in the last 6 months of Radiology residency, during which time at least 240 mammograms are interpreted by each resident with direct faculty supervision. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of breast imaging will be

incorporated into the residency, including mammography, ultrasound, MRI and interventional breast procedures.

**Resident responsibilities:**

1. The resident is involved in the daily conduct of Breast imaging 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 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 breast imaging is expected to be available for consultation by imaging technologists, 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. Questions should be referred to the supervising faculty to which the resident is assigned.
5. Preliminary reports may be written for 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 as well as through rotation evaluations.
4. Supervising faculty should sign resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** Breast imaging faculty evaluate the residents monthly using the UMKC electronic evaluation system based on the 6 ACGME core competencies as explained in the resident manual.

***BREAST IMAGING - Rotation 2 – Goals and Objectives***

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I. **Patient care:**

- (a) Residents are required to complete an on line Patient Care, Radiation Safety module at least biannually.
- (b) 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.
- (c) The resident should be familiar with available medical records and how to access them for purposes of patient care.
- (d) All studies should be reviewed with supervising faculty attending.
- (e) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. If there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

II. **Medical Knowledge:**

At the end of the rotation, the resident should be able to:

- (a) Dictate breast imaging studies readily with little assistance from the faculty supervisor.
- (b) Demonstrate proficiency with ultrasound scanning:
  - Correlate mammographic and clinical exam findings.
  - Adjust scanning parameters to improve images.
  - Appreciate the appearances of common artifacts and how to correct them.
  - Know the appearances of common benign (cysts, fibroadenomas) and malignant etiologies.
  - Properly describe lesions using the ACR BI-RADS Lexicon.
- (c) Begin breast intervention training and understand:
  - The types of breast intervention (FNA, cyst aspiration, spring loaded core biopsy, vacuum assisted core biopsy, galactography, wire localization) and equipment used for guidance (mammography, ultrasound, MRI).
  - Proper indications.
  - Optimum equipment and approach.
  - Informed consent.
  - Proper post procedure management.
  - Common complications and appropriate treatment.
  - Interpreting specimen radiographs after core or surgical excisional biopsies.
  - Proper management of high risk lesions such as ADH, ALH, LCIS, papillary lesion, and radial scar.
- (d) Understand the integration of breast cancer management with other departments:
  - Radiologic-pathologic concordance of biopsies and appropriate management of discordant results.
  - Breast cancer staging, survival rates, and appropriate treatment including surgery (breast conservation versus mastectomy), chemotherapy/radiation therapy, or hospice.
  - Importance of genetic testing for appropriate patient treatment and impact on family members.
  - Importance of interdepartmental communication with the breast medical oncologists, radiation oncologists, pathologists and surgeons.
  - Appreciate the psycho-social aspects of breast cancer.
- (e) Better comprehend the common appearances of benign and malignant etiologies on mammography and ultrasound.
- (f) Appreciate the appearances of less common malignancies such as invasive lobular carcinoma, mucinous carcinoma, medullary carcinoma, tubular carcinoma, Paget's disease, inflammatory carcinoma, lymphoma, and metastases.
- (g) Be aware of subtle presentations of malignancy such as microcalcifications, architectural distortion, asymmetries on mammogram and ill-defined shadowing on ultrasound.
- (h) Know the appearances of cancer mimickers such as fat necrosis, radial scar, hematoma, abscess, galactocele, lactational adenoma, fibroadenoma, diabetic mastopathy, and granulomatous mastitis.
- (i) Appreciate normal variants such as accessory breast tissue, accessory nipple, sternalis muscle, lymph nodes, and duct ectasia.
- (j) Understand the effects of hormone therapy, lactation, and weight loss on imaging interpretation.
- (k) Differentiate between multifocal versus multicentric disease and the impact on treatment.
- (l) Understand the surgically altered breast:
  - Breast augmentation and proper imaging for cancer evaluation versus implant rupture.
  - Breast reduction.
  - Lumpectomy with or without radiation therapy.
  - Mastectomy with or without reconstruction.
- (m) Appreciate normal male anatomy and understand the appearances of pathology such as gynecomastia and carcinoma.

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

- (a) Residents are required to complete an on line Radiation Safety module at least biannually.
- (b) The resident should demonstrate evidence of independent reading and learning through the use of printed and electronic sources.
- (c) Follow-up of abnormal or interesting studies should be accomplished through communication with the referring physician and/or patient medical records.
- (d) Residents should assist with preparation and presentation of cases for breast interdisciplinary conferences when requested by the attending physician.
- (e) The resident should be competent in using the PACS and Dictation systems in the daily accomplishment of the work load and instruct others in its use.

IV. **Interpersonal Communication Skills:**

- (a) Residents should be able to communicate effectively results of studies to referring clinicians whenever needed. For emergent studies, 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.
- (c) Residents should discuss breast procedures and study results with patients and their families when requested to do so by supervising faculty.

V. **Professionalism:**

- (a) Residents are required to complete an on line professionalism module at least biannually.
- (b) Recognize limitations in personal skill and knowledge, always making sure dictations and consultations are checked by the breast imager in charge.
- (c) Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence.
- (d) Residents should observe ethical principles when recommending further work-up for cases.
- (e) Promptness and availability at work are expected of every resident.
- (f) Residents should dress appropriately at work, wearing a name badge at all times.
- (g) Breast imaging technologists and other health workers should be treated with respect as part of the health care team.
- (h) 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) Residents are encouraged to make suggestions to improve methods and systems utilized in radiology whenever appropriate.

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***BREAST IMAGING - Rotation 3 and optional 4, 5, or 6***

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**General overview**

Radiology resident rotations in Breast Imaging will include at least 3 months (12 weeks) during the residency program at Saint Luke's Cancer Institute Breast Imaging Center and Truman Medical Center.

Mammography quality standards act (MQSA) standards are followed to meet requirements in the last 6 months of Radiology residency, during which time at least 240 mammograms are interpreted by each resident with direct faculty supervision. The specific goals include objectives required for every level of training with graded supervision by the attending faculty. All aspects of breast imaging will be incorporated into the residency, including mammography, ultrasound, MRI and interventional breast procedures.

**Resident responsibilities:**

1. The resident is involved in the daily conduct of Breast Radiology 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 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 Breast Radiology is expected to be available for consultation by breast imaging technologists, 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. Questions should be referred to the supervising faculty to which the resident is assigned.
5. Preliminary reports may be written for 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 as well as through rotation evaluations.
4. Supervising faculty should sign resident-generated reports in a timely manner and inform the resident of any major changes he/she made.

**Resident evaluation:** Breast imaging faculty evaluate the residents monthly using the UMKC electronic evaluation system based on the 6 ACGME core competencies as explained in the resident manual.

***BREAST IMAGING - Rotation 3 (optional 4-6) – Goals and Objectives***

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I. ***Patient care:***

- (a) Residents are required to complete an on line Patient Care, Radiation Safety module at least biannually.
- (b) 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.
- (c) The resident should be familiar with available medical records and how to access them for purposes of patient care.
- (d) All studies should be reviewed with supervising faculty attending.



- (e) Preliminary reports should be made available to all referring clinicians if needed prior to final review of cases. If there is a significant discrepancy between the preliminary reading and final reading, the resident should notify the referring clinician immediately.

## II. **Medical Knowledge:**

At the end of the rotation, the resident should be able to:

- (a) Add to his/her knowledge base in all areas of breast imaging through continued study and imaging interpretation.
- (b) Efficiently evaluate diagnostic mammograms and order appropriate additional imaging.
- (c) Dictate breast studies nearly independently with little assistance from the supervising faculty.
- (d) Improve breast ultrasound knowledge.
- (e) Better comprehend the common appearances of benign and malignant etiologies.
- (f) Understand the proper management of probably benign lesions versus indeterminate lesions.
- (g) Perform second look ultrasound to localize breast MRI findings.
- (h) ACR practice guidelines for the performance of a breast ultrasound exam.
- (i) Be familiar with ACR breast ultrasound accreditation program.
- (j) Appreciate breast MRI interpretation:
  - i. Know the common appearances of benign and malignant etiologies using both morphologic and kinetic information.
  - ii. Properly localize and describe lesions using the ACR BI-RADS Lexicon.
  - iii. Correlate the MRI findings with mammography, ultrasound, and physical exam.
  - iv. Determine chest wall, skin, or nipple involvement by known carcinoma.
  - v. Evaluate for abnormal axillary and internal mammary lymph nodes.
  - vi. Identify occult ipsilateral and contralateral malignancy.
  - vii. Assess positive surgical margins.
  - viii. Differentiate post surgical or post radiation changes from residual or recurrent disease.
  - ix. Evaluate for neoadjuvant chemotherapy response.
  - x. Interpret type and placement of breast implants as well as distinguishing implant rupture.
  - xi. Understand controversies regarding the role of screening breast MRI.
  - xii. Appreciate the limitations of breast MRI and common false positives (fibrocystic disease, fibroadenomas, lymph nodes) and false negatives (DCIS, lobular carcinoma, and low grade carcinomas).
  - xiii. Be familiar with the ACR Practice Guidelines for the performance of breast MRI.
- (k) Perform breast intervention with little assistance.
- (l) Resident should expand knowledge on quality assurance including:
  - a. Medical audit definitions as provided by BI-RADS.
  - b. Desirable goals and benchmarks for standard outcome parameters.
  - c. Auditing requirements for MQSA certification.
- (m) Work with the technologists and nurses to maximize work flow.
- (n) Understand the principals, methods, strengths and weaknesses of the latest breast imaging technology including computer-aided detection (CAD), tomosynthesis, automated ultrasound screening, breast specific gamma imaging (BSGI), and positron emission mammography (PEM).

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

- (a) Residents are required to complete an on line Radiation Safety module at least biannually.
- (b) The resident should demonstrate evidence of independent reading and learning through the use of printed and electronic sources.
- (c) Follow-up of abnormal or interesting studies should be accomplished through communication with the referring physician and/or patient medical records.
- (d) Residents should assist with preparation and presentation of cases for breast interdisciplinary conferences when requested by the attending physician.

- (e) The resident should be competent in using the PACS and Dictation systems in the daily accomplishment of the work load and instruct others in its use.

IV. **Interpersonal Communication Skills:**

- (a) Residents should be able to effectively communicate imaging results to referring clinicians whenever needed. 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.
- (c) Residents should discuss breast procedures and study results with patients and their families when requested to do so by supervising faculty.

V. **Professionalism:**

- (a) Residents are required to complete an on line professionalism module at least biannually.
- (b) At the end of the rotation, the resident should be able to make preliminary decisions on all matters of film interpretation and consultation, recognizing and obtaining assistance with situations that require the expertise of the breast imager.
- (c) Recognize limitations in personal knowledge and skills, being careful to not make decisions beyond the level of personal competence.
- (d) Residents should be able to explain the nature of the examination or findings to patients and their families when needed.
- (e) Residents should observe ethical principles when recommending further work-up for cases.
- (f) Promptness and availability at work are expected of every resident.
- (g) Residents should dress appropriately at work, wearing a name badge at all times.
- (h) Breast radiology technologists and other health workers should be treated with respect as part of the health care team.
- (i) 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) Residents are encouraged to make suggestions to improve methods and systems utilized in radiology whenever appropriate.