Syllabus
for
RT 98
Independent Study
Mammography Course
Objective: This Special Studies course is designed to give the advanced radiologic technology student the opportunity to study and be tested on materials in Mammography. This self-paced course is also designed to assist the registered radiologic technologist to obtain continuing education in all areas of knowledge as related to radiologic sciences.

Course Objectives:
Upon completion of this section, the student will be able to:

1. Identify the current incidence rates for breast cancer.

2. Describe risk factors / predictors of breast cancer.

3. Describe the roles of radiographers, radiologists, and patients during mammography.

4. Describe the roles of BCDDP and MQSA for clinical mammography.

5. Describe ways to encourage patients to submit to screening mammography.


7. Briefly describe the evolution of mammography techniques and equipment through time. (industry-grade film, xeromammography, dedicated x-ray systems)

8. Identify the current ACS and ACR recommendations for screening mammography frequency.

9. Compare screening mammography and diagnostic mammography.

10. Explain why mammography is technically a detection tool, not a diagnostic tool.

11. Identify the external and internal anatomy of the breast. (position in fascia, relation to muscles, axillary tail, nipple, areola, Cooper's ligaments, lobes, lobules, acini, stroma, lactiferous ductules, axillary lymph nodes / internal mammary lymph nodes)

12. Describe cyclical and other changes that may influence the mammographic image (such as age, pregnancy, fibrocystic disease, hormonal therapy, stage of menstrual cycle, etc.)

13. Compare the film-screen system for mammography with conventional diagnostic film-screen systems.

15. Describe the radiographic purpose of grids and of compression.

16. Briefly list some of the quality control tests that must be verified to operate a certified mammography unit.

17. Describe patient prep for a mammogram. (previous films, communication, gown, powder / deodorant, history, assessment)

18. Recognize and be able to position for:
   a. craniocaudal
   b. mediolateral oblique
   c. mediolateral
   d. exaggerated craniocaudal

19. Explain how the mobility of the breast influences positioning, in particular directions of compression.

20. Describe how to determine that adequate compression is being applied.

21. Describe how to determine that sufficient breast tissue is demonstrated on the mammogram.

22. Describe how to handle special mammographic imaging situations such as
   a. magnification
   b. augmented breast
   c. breast lesion localization
   d. excised biopsy specimen
   e. FNAB
   f. spot compression
   g. male breast / small female breast
   h. stereotactic procedures

23. Describe the advantages and disadvantages of digital mammography.
RT 98
Mammography Course Outline

Anatomy and Physiology
1. External Anatomy
   a. Breast Margins
   b. Nipple
   c. Areola
   d. Montgomery's glands
   e. Skin, sebaceous glands, pores, axillary tail, inframammary fold, margins of pectoralis major, base

2. Internal anatomy
   a. Glandular tissue
   b. Parenchyma
   c. Connective tissue
   d. Pectoralis muscle
   e. Fibrous or connective
   f. Adipose or fatty

3. Male Breast Composition
   a. fat
   b. fibroglandular tissue

4. Breast vasculature
5. Retromammary Space
6. Lymph Nodes

Positioning

1. Cranio-caudal
2. Medio-lateral oblique
3. 90 degree lateral, medio-lateral and latero-medial
4. Latero-medial oblique
5. Caudal-cranial
6. Exaggerated cranial-caudal
7. Spot compression
8. Cleavage
9. Tangential
10. Axillary tail
11. Rolled lateral and medial
12. Implant displaced
13. Axillary view( Cleopatra)
14. Magnification and or spot views
15. Patients with augmented breasts
16. Patients for breast lesion localization
17. Specimen radiography
18. Patients with post operative breasts
   a. Augmented
   b. Irradiated
   c. Reconstructed
19. Patients with breast implants
   a. Eklund projection
20. Post-mastectomy patients
21. Skin lesion markers

Pathology

1. Breast disease
   a. - sign and symptoms,
   b. risk factors for breast cancer,
   c. early detection, breast self examination
   d. epidemiology,
2. mammographic pathophysioloay,
   a. benign lesions,
   b. malignant lesions,
   c. skin (dimpling, erythema, edema, Peau d’orange, discharge)
   d. nipple retraction,
   e. eczema,
   f. erythema,
   g. lump,
   h. mass (shape and margins);
   i. density;
   j. calcifications,
   k. spiculated lesions;
   l. cysts,
   m. galactocele,
   n. fibroadenoma,
   o. lipoma,
   p. hamartoma,
   q. pappiloma,
   r. ductal ectasia,
   s. fat necrosis,
   t. microcalcifications;
Professional ethics and patient care

1. patient follow up,
2. outreach programs
3. cultural diversity,
4. care of special patient populations: patient concerns, early detection, patient education;
5. localization conventions- quadrant system;
6. patient preparation;
7. visual inspection- areas of interest (perimeter, nipples, lymph nodes);
8. involution.

Technical aspects of mammography

1. Breast composition;
2. fundamental of image quality,
3. methods of improving image quality,
   a. image receptor, screen/film combination;
   b. cathode (purpose, effect on focal spot, orientation),
   c. focal spot size; anode/target (purpose, material, anode angle, line focus principle, heel effect);
   d. window material,
   e. filtration,
   f. source-to-image distance;
   g. use of grids,
   h. magnification;
   i. compression (pressure settings, hand versus foot pedal use),
   j. beam alignment, film receptor;
   k. technical variables (density, contrast, kVp-range, mAs, phototiming-automatic exposure control, half-value layer);
   l. fully automated exposure,
   m. collimation;
   n. screen/film combination (rare earth screens, single emulsion, double emulsion film, film speed, film contrast);
   o. cassettes;
   p. Standard lesion localization,
   q. stereotactic lesion localization,
   r. cyst aspiration, galactography,
   s. fine-needle aspiration biopsy,
   t. core biopsy,
   u. pneumocystography.
Radiation protection and radiation biology

a. Risk versus benefit,
b. methods of reducing dose to the patient,
c. collimation,
d. compression;
e. basic principles of radiation protection-time, distance, shielding;
f. biological consideration;
g. patient safety;
h. pregnant patient;
i. personnel monitoring.

Quality assurance (QA) and quality control (QC)

a. Advantages and cost savings of quality assurance (QA and quality control (QC),
b. QA manual and QA records,
c. automatic processor (dedicated versus non-dedicated, regular development cycle versus extended cycle),
d. film and processing,
e. chemical storage;
f. darkroom conditions; conditions for producing fogged film in the darkroom; base fog or base density; darkroom cleanliness,
g. processor quality control, quality control for automatic processors-tank level check, clean-up films, cleaning of crossover rollers;
h. processor sensitometric evaluation; replenishment rate of processing solutions; processor transport time; washing time; processing solution temperature; processor filters; screen cleanliness,
i. screen-film contact,
j. compression force determination,
k. repeat film analysis,
l. viewbox and viewing conditions,
m. analysis of fixer retention film,

Quality assurance accessories and test equipment

a. densitometer, sensitometer,
b. breast phantom,
c. film/screen contact tool,
d. compression force gauge,
e. ion chamber with mammo probe,
f. digital timer,
g. kVp mammo meter,
h. star pattern test tool,
i. HVL set,
j. light field and X-ray field alignment,
k. screen film-cassette matching;
l. screen-film contact;
m. conditions for creating film artifacts – light and dark spots, static electricity, crinkle marks;
n. proper use of sensitometer and densitometer;
o. processing (dedicated vs., non-dedicated processing);
p. cleaning and maintenance;
q. kVp accuracy – reproducibility;
r. automatic exposure control;
s. output;
t. film handling;
u. average glandular dose.
STATE OF CALIFORNIA
MAMMOGRAPHY OBJECTIVES

The 100-question final written exam will be based on the following curriculum

1. Anatomy and physiology of the human breast:

External anatomy (breast margins, nipple, areola, Montgomery’s glands, skin – sebaceous glands – pores, axillary tail, inframammary fold, margin of pectoralis major, base); internal anatomy (glandular tissue, parenchyma, connective tissue, pectoralis muscle, fibrous or connective, adipose or fatty); male breast; breast composition (fat, fibro glandular tissue); blood vessels; retromammary space; lymph nodes; mammographic anatomy.

2. Positioning of the human breast:

Cranio-caudal, medio-lateral oblique, 90° lateral, 90° medio-lateral, 90° latero-medial, latero-medial oblique, caudal-cranial, exaggerated cranial-caudal, spot compression cleavage, tangential, axillary tail, rolled lateral and medial, implant displaced, axillary views (Cleopatra); magnification and/or spot views; patients with augmented breasts; patients for breast lesion localization and specimen radiography; patients with post operative breasts, augmented breast, irradiated breast, reconstructed breast; patients with breast implants (Eklund projection); post-mastectomy patients; skin lesion markers.

3. Pathology, breast self examination, professional ethics and patient care:

Breast disease – signs and symptoms; risk factors for breast cancer, early detection, epidemiology, mammographic pathophysiology, benign lesions, malignant lesions, skin (dimpling, erythema, edema, Peau d’orange, discharge); nipple retraction, eczema, erythema, lump; mass (shape and margins); density; calcifications, spiculated lesions; cysts, galactocele, fibroadenoma, lipoma, haemartoma, papilloma, ductal ectasia, fat necrosis, microcalcifications; patient follow-up, outreach programs, cultural diversity, care of special patient populations; patient concerns, early detection, patient education; localization conventions – quadrant system; patient preparation; visual inspection – areas of interest (perimeter, nipples, lymph nodes); involution.

4. Technical aspects of mammography:

Breast composition; fundamentals of image quality, methods of improving image quality, image receptor, screen/film combinations; cathode (purpose, effect on focal spot, orientation), focal spot size; anode/target (purpose, material, anode angle, line focus principle, heel effect); window material, filtration, source-to-image distance; use of grids, magnification; compression (pressure settings, hand versus foot pedal use), beam alignment, film receptor; technical variables (density, contrast, kVp – range, mAs, phototiming-automatic exposure control, half-value layer); fully automated exposure, collimation; screen/film combinations (rare earth screens, single emulsion,
double emulsion film, film speed, film contrast); cassettes; automatic exposure control. Standard lesion localization, stereotactic lesion localization, cyst aspiration, galactography, fine-needle aspiration biopsy, core biopsy, pneumocystography.

5. Radiation protection and radiation biology pertaining to mammography:

Risks versus benefit, methods of reducing dose to the patient, collimation, compression; basic principles of radiation protection – time, distance, shielding; biological considerations; patient safety; pregnant patient; personnel monitoring.

6. Quality assurance (QA) and quality control (QC) of dedicated mammography X-ray equipment, processor, and ancillary equipment:

Advantages and cost savings of quality assurance (QA) and quality control (QC), QA manual and QA records, automatic processor (dedicated versus non-dedicated, regular development cycle versus extended cycle), film and processing, chemical storage; darkroom conditions; conditions for producing fogged film in the darkroom; base fog or base density; darkroom cleanliness, processor quality control, quality control for automatic processors – tank level check, clean-up films, cleaning of crossover rollers; processor sensitometric evaluation; replenishment rate of processing solutions; processor transport time; washing time; processing solution temperature; processor filters; screen cleanliness, screen-film contact, compression force determination, repeat film analysis, viewbox and viewing conditions, analysis of fixer retention in film, quality assurance accessories and test equipment (densitometer, sensitizer, breast phantom, film/screen contact tool, compression force gauge, ion chamber with mammo probe, digital timer, kVp mammography meter, star pattern test tool, HVL set), light field and X-ray field alignment, screen film-cassette matching; screen-film contact; conditions for creating film artifacts – light and dark spots, static electricity, crinkle marks; proper use of sensitizer and densitometer; processing (dedicated vs. non-dedicated processing); cleaning and maintenance; kVp accuracy – reproducibility; automatic exposure control – phototiming; output; film handling; average glandular dose.
MODULES:

The following multimedia modules are available for your Mammography component:

C 123 Radiographic Contrast

C 128 Radiographic Density

CD 24 Mammography: a study of anatomy and physiology of the breast (R)

CD 140 12 Mammography learning units
http://online.santarosa.edu/presentation/page/?54336

V 403 The Art of Positioning - Level 1: Basic Mammographic Positioning (R)

V 407 The Art of Positioning - Level 2: Problem Solving (R)

V 405 Mammography: Precision Positioning

V 435 Mammography Film QC I: Film Contrast Variables (R)

V 436 Mammography Film QC II: Processor Variables (R)

V 437 Mammography Film QC III: Phantom Tests (Missing)

V 406 Technical/Clinical Aspects of Breast Cancer and Mammography (Missing)

C121 Mammography Examination (R)
Instructions for this independent study class:

As you enroll in this course, you hereby agree to abide to the following terms in order to complete this course successfully:

1. Complete and sign the form on the last page. Submit this complete form to the course instructor.
2. Email the course instructor to request an add code. Use this add code to enroll in the class.
3. At your own pace, schedule time to work on this class’ material in the Health Learning Resource Center, **If you plan to study this material online, you must sign in and out the CATE webpage of this class**. Failure to do so, your study hours will not be counted.
4. Attached is a timesheet that MUST accompany the paper and be turned in to the course instructor by the last day of the Finals week.
5. Your grade will be based on the following:
   - Attendance 48 hrs (for each credit unit) 40%
   - A two-page term paper (for each credit unit) 30%
   This final paper should summarize the experience in your privately arranged rotation of 40 hands-on in mammography, following the guide of suggested procedures (see page 11). This final paper will be graded based on grammar, organization, and expository skills.
   - A 100-question final examination 30%
6. Make sure to schedule with the instructor if clarification or assistance is needed. If you do not feel that you can make a commitment to this class - DO NOT register. If you DO follow through, you will benefit a great deal from this experience.

12-step Add Code Instructions:

1. Obtain an Add Code for the course
2. Log on to Weblink at https://www.santarosa.edu/app/registration-weblink/
3. Enter your SSN or ID and birth date - Log In
4. Select semester and then
5. Select Add/Drop/Register - Submit
6. Enter the course SECTION NUMBER FIRST
7. You will be informed that the class is closed
8. You will be asked for an Add Code
9. Now enter the Add Code (given by the course instructor)
10. Press "Complete Transaction"
11. Make sure you have completed all 5 registration steps
12. Always print a receipt for your records.
Recommended textbook:
- Mammographic Imaging: A Practical Guide
  Valerie F. Andolina,  Kathleen M. Willison,  Shelly L. Lil.  Lippincott.  ISBN# 0781716969
- Merrill's Atlas (Ballinger/Frank) - Mammography, Vol II
- Pert, Olive. Appleton & Lange Mammography Review. ISBN# 0-07-137828-6

Recommended websites:
- http://www.fda.gov/cdrh/mammography/frnamcom2.html

A certificate of completion will be issued upon your successful completion of the didactic component and clinical experience.
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Radiologic Technology Program
Mammography Time Sheet

Student's Name: ________________________________
Clinical Mammo Facility: ________________________  Semester/Year: ___________
Clinical Instructor/Mammographer: ________________________________

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Subtotal ______

Total Hours: ___________

(Signature of Clinical Instructor/Mammographer)

Students: Please provide the signed original page to college officials.
Mammography Rotation

Student Name: ________________________________

Clinical Site: _____________________ Semester: ________

Mammographer: ________________________________

**It is desirable that students are allowed to perform mammographic exams, after appropriate and authorized observation.**

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<th>Procedures</th>
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SANTA ROSA JUNIOR COLLEGE  
Radiologic Technology 98 – Independent Study Course

FALL □       SPRING □        SUMMER □      201 __

Name ____________________________________________________________  SID # __________________________
Street Address ____________________________________ City ______________ Zip ________

Previous "49" units ______ and/or "98" units ______ (total allowable = 6 units)

Prior course in department? YES __________   NO __________

NOTE: Total enrollment over 18 units requires an approved petition.

Course Name and Number  __ Rad T 98____ Section # ______________

UNITS: _________   (1 -2 -3 = 3 - 6 - 9 hours/week)

DETAILLED COURSE DESCRIPTION

Please describe the nature and extent of proposed study, listing specific outcomes and objectives.

I understand that this is an optional course that is available to all interested students. The purpose of
this class is to study complementary material in Radiology by reviewing the mammography
Powerpoint series and videos on positioning and QC available in the HLRC. I will adhere to the
attendance requirements and will take a 100-question final exam in the finals week of the said
semester. In addition, I will submit a final term paper upon the completion of my mammography
hands-on experience.

I have read and agree to abide by the course requirements. I understand that I will receive a failed
grade if I will not follow the terms of this agreement.

________________________________________________________________________
Student Signature                                      Date

________________________________________________________________________
Instructor Signature                                      Date

________________________________________________________________________
Department Chair Signature                                Date

________________________________________________________________________
Dean of Instruction Signature                            Date

Student: Complete, sign, make a copy, and submit this original page to the instructor.