Course Name: Image Critique and Evaluation
Course Number: RAD-770
Course Department: Health Science – STEMM
Course Term: Fall
Last Revised by Department: 5/2020
Total Semester Hour(s) Credit: 2.5
Total Contact Hours per Semester:

Lecture: 30 Lab: 15 Clinical: 0 Internship/Practicum: 0

Catalog Description: This is a one semester course; students study the criteria for diagnostic quality radiographs. This course is designed for students who are pursuing a radiologic technology degree. The principles of image evaluation are emphasized as it relates to technique, collimation, radiation protection, positioning and radiographic quality. This course will help students gain knowledge of image critique and evaluation and will help provide entry-level skills related specifically to radiologic technologist's job duties while enhancing their overall knowledge when making important life decisions.

Prerequisites/ Co-requisites:
RAD-163, RAD-182, RAD-270

Co-requisites:
RAD-896 & RAD-510

Credit for Prior Learning:
There are no Credit for Prior Learning opportunities for this course.

Textbook(s) Required:

1. McQuillen-Martensen, Radiographic Image Analysis, 5th Edition, 2019, Elsevier. ISBN: 978-0323661201

2. McQuillen-Martensen, Radiographic Image Analysis Workbook, 5th Edition, 2019, Elsevier. ISBN: 978-0323280716

Access Code: N/A

Required Materials: Surface Go or an approved device, Folders and/or Binder to organize notes and papers.

Suggested Materials: N/A

Course Fees: None

Institutional Outcomes:

Critical Thinking: The ability to dissect a multitude of incoming information, sorting the pertinent from the irrelevant, in order to analyze, evaluate, synthesize, or apply the information to a defendable conclusion.

Effective Communication: Information, thoughts, feelings, attitudes, or beliefs transferred either verbally or nonverbally through a medium in which the intended meaning is clearly and correctly understood by the recipient with the expectation of feedback.

Personal Responsibility: Initiative to consistently meet or exceed stated expectations over time.

Program Outcomes:

1. Demonstrate disciplinary competence and professional proficiency.
2. Develop critical thinking skills in planning priorities and providing safe patient care.
3. Utilize basic communication skills to foster working relationships with individuals, families, and members of the health care team.
4. Practice within the profession's ethical and legal framework.

Student Learning Outcomes:

1. Apply knowledge of anatomy, physiology, positioning and radiographic techniques to accurately demonstrate and critique anatomical structures on a radiographic image.
2. Demonstrate knowledge of image standards and the characteristics of an optimal radiographic image, correctly identifying anatomic structures of clinical interest.
3. Recognize radiographs that do not exhibit diagnostic quality, that do not meet the standards for visibility of image detail, and demonstrate the ability to correctly reposition the body part in order to produce a radiograph that shows optimal diagnostic information.
4. Describe exposure factors, how they affect visibility of anatomic structures, and how they should be adjusted to produce a diagnostic radiograph.
5. Adjust positioning techniques and exposure factors for varied patient conditions and situations.
6. Describe positioning and exposure considerations for pediatric imaging.
7. Demonstrate professionalism by following written and verbal instruction, responding appropriately to directions, working well with peers and instructors, and developing a commitment to quality work.

Objectives:

Unit 1 – Chapters 1 and 2 Image Analysis Guidelines, Criterions, and Principles/Digital Imaging Guidelines.

- State the characteristics of an optimal radiographic image.
- Demonstrate the ability to correctly display diagnostic radiographs of all body structures.
- List the demographic information that must appear on each radiographic projection and why the information is required.
- Describe appropriate collimation practice and control of scatter radiation (SR) and radiation protection.
- List the guidelines that ensure proper collimation.
- Describe the relationships between anatomic structures, central ray placement, and IR alignment/ placement and how they affect the diagnostic quality of the resulting radiograph.
- State the method used to identify similarly appearing structures in a radiograph.
- Determine how to correctly adjust patient part or the CR adjustment required to produce a diagnostic image when a repeat x-ray is necessary in order to correct for an incorrectly positioned projection.
- Describe the factors that control or affect Geometric Resolution (recorded detail) of the radiograph.
- Summarize the radiation protection measures that are protection measures that are followed to limit patient and occupational ionizing radiation dose.
- Describe processing steps for CR and DR digital radiography.
- Describe the importance of exposure field recognition in CR and DR.
- Identify the regions of the image histogram and list the guidelines to produce an optimal histogram.
- Summarize the relationship between the image histogram and the lookup table (LUT) chosen during the automatic rescaling process.
- Recognize the causes for histogram analysis error.
- List the method of exposure indicator parameters for the digital systems used in your facility and further describe how they are used to evaluate and improve the diagnostic image quality.
- Identify over and under exposure in a digital imaging system, the causes for over and under exposure, and the resulting effect that each has on diagnostic image quality.
- List the factors that affect contrast resolution.
- Describe artifacts and how they can be prevented.
- Compare the differences between an optimal radiograph and an acceptable radiograph.

- List the guidelines for obtaining mobile and trauma projections, technical factors that need to be adjusted in order to adapt for various mobile and trauma related circumstances.
- Describe the conditions to consider when performing radiographic procedures and evaluating pediatric and obese patient projections.

Unit 2 – Chapter 3 Chest and Abdomen.

- Identify the anatomy that must be included on all chest and abdominal projections.
- Describe how to properly position the patient, image receptor (IR), and central ray (CR), for adult and pediatric chest and abdominal radiographs.
- State the technical data that is used for chest and abdominal projections.
- List image analysis guidelines for correctly positioned adult and pediatric chest and abdominal projections.
- State how to correctly reposition the patient to obtain a diagnostic radiograph when a repeat x-ray is necessary.
- Determine the needed adjustment in patient positioning or CR to correct for inadequate positioning.
- State the differences in air-fluid diagnoses in upright, semi-upright, and supine radiographs of the chest and abdomen.
- State the purpose and appropriate location of internal devices, tubes and catheters for chest and abdominal radiographs.
- List normal chest dimensions with maximum inspiration and conditions that prevent full lung expansion.
- Describe relevant pathology affecting chest and abdominal radiographs, specifically scoliosis.
- Demonstrate methods used to identify right and left hemidiaphragms on lateral CXRs, explain how the liver affects the right hemidiaphragm.
- Describe the lateral decubitus chest projection to demonstrate pneumothorax and pleural effusion.
- Compare the degree of obliquity required to demonstrate the heart shadow without spinal column superimposition for right anterior oblique (RAO) and left anterior oblique (LAO) chest projections.
- Explain the development of the neonate lungs and how the changes as they grow impacts CR centering adjustment.
- Identify and locate the psoas muscles and kidneys.
- Describe technique adjustments for additive and destructive pathologies that affect chest and abdomen radiographs.
- State the reason it is necessary to center differently for female and male patients for the AP abdominal projection.
- Identify the reason for including the diaphragm in all upright and lateral decubitus abdominal projections.

Unit 3 – Chapter 4 Upper Extremity

- Identify the required anatomy for upper extremity radiographs.

- Describe proper positioning of the patient, IR, and CR on all upper extremity projections.
- List image analysis guidelines for upper extremities.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- State the technical factors used for upper extremity radiographs and describe the anatomic structures visualized when the correct technique factors are used.
- List soft tissue structures that should be visualized on upper extremity projections, their location, and the reason their visualization is important.
- Compare how wrist and elbow rotations change the position of the radial and ulnar styloids.
- State carpal bone changes that happen as the wrist is extended, deviated, or ulnar- and radial- deviated in the PA and Lateral projections.
- Explain the reasons and why the CR is adjusted for the PA ulnar- deviated scaphoid projection if a proximal or distal scaphoid fracture is suspected and the patient cannot adequately ulna-flex.
- List the palpable structures that are used to identify the location of the elbow and glenohumeral joints.
- Describe the method used to position the patent if only one joint can be placed in its true position for AP and lateral forearm and humeral projections.
- Describe how hand and wrist positions affect visualization of the radial tuberosity and lateral elbow projections.
- State the reason the patient's humerus is never rotated if a humeral fracture is suspected.

Unit 4 – Chapter 5 Shoulder

- Identify the required anatomy for the shoulder, clavicle, AC Joints, and Scapula Projections.
- Describe proper positioning of the patient, IR, and CR for all projections.
- List image analysis guidelines and the related positioning procedures for all projections.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- State the technical factors routinely used for shoulder, clavicular, AC Joint, and scapular radiographs and describe what anatomic structures are visualized when the correct technique factors are used.
- State humerus location on radiographs when the shoulder is dislocated.
- Compare how the visualization of the proximal humerus changes when humeral epicondyles are placed at different angles to the IR.
- Describe scapula movement as the humerus is abducted.
- Identify the anatomic structures forming the Y on a PA Oblique (scapula Y) shoulder projection.
- State how the medial and lateral scapular borders are identified.
- Describe the anatomic structure that must move to allow humerus abduction.

- Describe how humeral abduction affects the degree of patient obliquity needed to position the scapula in a lateral position.

Unit 5 – Chapter 6 Lower Extremity

- Identity the required anatomy for lower extremity radiographs.
- Describe proper positioning of the patient, IR, and CR on all lower extremity projections.
- List image analysis guidelines for accurate positioning of the lower extremities.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- State the technical factors routinely used for lower extremity projection and the anatomic structures that are visualized when the correct technique factors are used.
- Describe which aspects of a toe phalanges are concave and which are convex.
- State how the CR angulation is adjusted for an AP axial toe if the patient cannot fully extend the toe.
- Describe how the longitudinal arch, whether it is high or low, affects proper patient position, degree to oblique the foot, and CR angulation.
- Evaluate the high longitudinal arch from the low longitudinal arch on radiographs.
- Describe how to adjust CR angulation for a patient who cannot dorsiflex their foot during axial calcaneal x-ray.
- State how the medial and lateral talar domes can be identified on a lateral foot, calcaneal, or ankle projection with poor positioning.
- Explain why the IR must extend beyond the knee and ankle joints when the lower leg is imaged.
- Describe CR angulation and the AP and Oblique knee.
- Describe a valgus and varus knee deformity.
- Describe a patella subluxation and state how it is demonstrated on an AP and tangential (axial) projections.
- List the soft tissue structures of importance on lower leg projections, why they are important, where they are located.
- State how suspicion of patellar fracture affects positioning for the lateral knee projection.
- State the how the relationship of the lateral and medial femoral condyles impact positioning and the degree of femoral inclination demonstrated in erect and lateral recumbent position.
- State the femoral length and pelvic width that demonstrate the least amount of femoral inclination.
- Describe how to distinguish between the medial and lateral femoral condyles, and methods to properly align and/or superimpose them on lateral projections.
- Recognize the importance of including femoral soft tissue on femoral projections.
- State the reason why the leg is never rotated or manipulated when a femoral fracture is suspected.

Unit 6 – Chapter 7 Pelvis, Hip, and Sacroiliac (SI) Joints.

- Identify the required anatomy for the hip, pelvis and SI joints.
- Describe proper positioning of the patient, IR, and CR on all projections.
- List image analysis guidelines for hip, pelvis, and SI joints.
- Demonstrate methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- List the soft tissue fat planes demonstrated on AP hip and pelvic projections and their locations.
- Compare how leg rotation affects which anatomic structures of the proximal femur are visualized.
- Explain why the leg of a patient with a proximal femoral fracture should never be rotated to obtain AP and Lateral radiographs and state how these radiographs should be taken.
- Differentiate between the male and female pelvis.
- Describe how the anatomic structures of the proximal femur are visualized differently for frog-leg hip and pelvic projections when the distal femur is abducted at different angles to the imaging table.
- Describe how to locate the femoral neck for an axiolateral hip projection.
- State which SI joint is of interest when the patient is rotated for oblique SI joint projections.

Unit 7 – Chapter 8 Cervical and Thoracic Vertebrae

- Identify the required anatomy for cervical and thoracic radiographs.
- Describe proper positioning of the patient, IR, and CR on all cervical and thoracic projections.
- List image analysis guidelines for cervical and thoracic projections.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- Describe how the upper and lower cervical vertebrae can move independently and simultaneously.
- Explain how a patient with a suspected subluxation or fracture of the cervical vertebral column is positioned.
- Describe the curvature of the cervical vertebrae, and explain how the intervertebral disk spaces slant.
- State how the relationship between the dens and lateral masses of the atlas change when the head is rotated.
- Describe how the prevertebral fat stripe is used as a diagnostic tool.
- Describe the positioning and analysis differences between AP and PA oblique cervical projections.
- Describe the curvature of the thoracic vertebrae.
- List methods to achieve uniform image density on AP thoracic vertebral projections.
- Compare how scoliosis differs from rotation on AP and Lateral thoracic projections.
- Describe method used to offset the sagging of the lower thoracic column when the patient is in the lateral position.

Unit 8 – Chapter 9 Lumbar, Sacral, and Coccygeal Vertebrae.

- Identify the required anatomy for lumbar, sacral, and coccyx projections.
- Describe proper positioning of the patient, IR, and CR for all projections.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- State how to mark and display projections correctly.
- List the image analysis guidelines for lumbar, sacrum, can coccyx projections.
- State the features of the vertebrae of interest.
- Identify which zygapophyseal joints are seen with AP and PA Oblique projections.
- List the anatomic structures that make up the “Scottie dogs”.
- Explain methods to reduce scatter radiation (SR) on lateral projections.
- Describe how the patient is positioned to demonstrate mobility of the lumbar vertebral column.

Unit 9 – Chapter 10 Sternum and Ribs.

- Identify the required anatomy for sternum and rib projections.
- Describe proper positioning of the patient, IR, and CR on all projections.
- Demonstrate method used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- List the image analysis requirements for sternal and rib projections.
- Describe how the patient is positioned to achieve homogenous density on PA oblique sternal projections.
- Explain why reduced SID is appropriate for PA oblique sternal projections.
- Compare costal breathing to normal breathing and state the advantages of using it for the PA Oblique sternum.
- Compare costal breathing to how it affects the distance between the sternum and vertebral column when the patient is rotated.
- List method of reducing Scatter Radiation on the lateral sternum.
- Discuss when it is appropriate to take an AP projection of the ribs instead of a PA projection and why the AP oblique is better for axillary rib images.

Unit 10 – Chapter 11 Cranium, Facial Bones, and Paranasal Sinuses.

- Identify the required anatomy for all projections of the cranium, facial bones, and paranasal sinuses.
- Describe proper positioning of the patient, IR, and CR on all projections.
- List image analysis guidelines for the cranium, facial bones, and paranasal sinuses.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- Explain CR adjustments when the patient cannot be positioned in the normal way.
- State the cranial positioning lines and their abbreviations.
- Explain the reason for the open mouth Waters projection.

- Demonstrate accurate patient positioning for visualization of air-fluid levels in the sinus cavities.

Unit 11 – Chapter 12 Digestive System.

- Identify the required anatomy on upper and lower gastrointestinal projections.
- Describe proper positioning of the patient, IR, and CR on all projections.
- List the image analysis guidelines gastrointestinal projections.
- Demonstrate the methods used to reposition the patient when repeat radiographs are necessary due to incorrect positioning.
- Explain patient preparation instructions for the different GI procedures.
- Describe the variations in size, shape, and position of GI structures of the four main body habitus types.
- Define the appropriate barium suspensions for the GI procedure to be performed.
- State where the barium and air will be visualized for the different projections of the GI double contrast images.
- Explain the reason for timed radiographs of a small intestine study.

College Procedures: All college-wide procedures are located in the Iowa Central Community College Student Handbook**.**

Assessments: Assessments for this course come from; reading, workbook assignments, worksheets, anatomy quizzes, textbook quizzes, classwork, homework, presentations, writing assignments, analysis of clinical procedures, unit exams, and comprehensive final exam.

Please note that assessments are subject to change

Non-discrimination Statement:

It is the policy of the Iowa Central Community College not to discriminate in its programs, activities, or employment on the basis of race, color, national origin, sex, disability, age, sexual orientation, gender identity, creed, religion, and actual or potential family, parental, or marital status.

If you have questions or complaints related to compliance with this policy, please contact Stacy Ihrig, Human Resources, 515-574-1138, ihrig@iowacentral.edu, or the Director of the Office for Civil Rights U.S. Department of Education, Citigroup Center, 500 W. Madison Street, Suite 1475, Chicago, IL 60661-7204, Telephone: (312) 730-1560 Facsimile: (312) 730-1576, Email: OCR.Chicago@ed.gov.

Disability/Accommodation Services:

If you have a request for an accommodation based on the impact of a disability, it is Iowa Central's policy that you contact the Academic Assistance & Accommodations Coordinator to discuss your specific needs and to provide supporting information and documentation, so we may determine appropriate accommodations. The office for accommodations is located in the Academic Resource Center, and it can be reached by calling 515-574-1045. For online information about accommodations, please go to www.iowacentral.edu/accommodations.

Bias-Free Classroom Statement:

Althea Rouse maintains high standards of respect in regard to individual beliefs and values when selecting classroom materials including textbooks, project activities, power points, videos, presentations, and classroom discussions.

It is our belief that all people have the right to obtain an education within our department/program courses free of bias, with full respect demonstrated to all who enroll in the courses of this department/program.

External Accreditation: The Iowa Central Community College Radiology Program is accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT)

Contact Information for JRCERT: 20 N Wacker Drive, Suite 2850 Chicago, IL 60606-3182 Phone: 312-704-5300 Fax: 312-704-5304 Website: www.jrcert.org E-mail: mail@jrcert.org