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A SYSTEM APPROACH TO NAVY MEDICAL EDUCATION AND TRAINING. APPEN-ETC (1)

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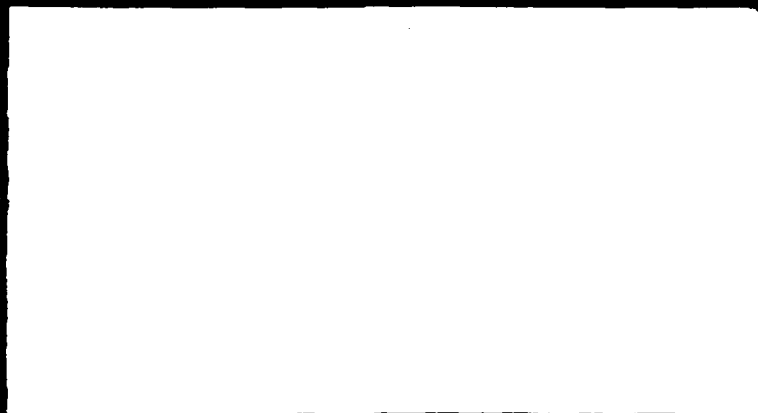
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APPENDIX 26.

COMPETENCY CURRICULUM FOR
X-RAY TECHNICIAN

APPLICATION OF A SYSTEM APPROACH
U.S. NAVY MEDICAL DEPARTMENT
EDUCATION AND TRAINING PROGRAMS
FINAL REPORT

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Prepared under Contract to
OFFICE OF NAVAL RESEARCH
U.S. DEPARTMENT OF THE NAVY

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Program Manager
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Bureau of Medicine and Surgery (Code 71G)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The study objective consisted of a determination of what the health care personnel in the Navy's Medical Department, Bureau of Medicine and Surgery actually do in their occupations; improving the personnel process (education and training); and building a viable career pathway for all health care personnel. Clearly the first task was to develop a system of job analyses applicable to all system wide health care manpower tasks. A means of postulating simplified occupational clusters covering some 50		

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currently designated Navy enlisted occupations, 20 Naval Enlisted Classification Codes (NEC's) were computerized. A set of 16 groupings that cover all designated occupations was developed so as to enhance the effectiveness of professionals and sub-professionals alike.

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FOREWORD

The project, "Application of a System Approach to the Navy Medical Department Education and Training Programs," was initiated in May of 1969 as a realistic, comprehensive response to certain objectives set forth in ADO 43-03X, and to memoranda from both the Secretary of Defense and the Assistant Secretary of Defense, Manpower and Reserve Affairs. The Secretary's concern was stated in his memorandum of 29 June 1965, "Innovation in Defense Training and Education." More specific concerns were stated in the Assistant Secretary's memorandum of 14 June 1968, "Application of a System Approach in the Development and Management of Training Courses." In this he called for "vigorous and imaginative effort," and an approach "characterized by an organized training program with precise goals and defined operational interrelation among instructional system components." He also noted, "Job analyses with task descriptions expressed in behavioristic terms are basic and essential to the development of precise training goals and learning objectives."

The Project

System survey and analysis was conducted relative to all factors affecting education and training programs. Subsequently, a job-analysis sub-system was defined and developed incorporating a series of task inventories "... expressed in behavioristic terms ..." These inventories enabled the gathering of job activity data from enlisted job incumbents, and data relating to task sharing and delegation from officers of the Medical, Nurse and Dental Corps. A data management sub-system was devised to process incumbent data, then carry out needed analyses. The development of initial competency curricula based upon job analysis was implemented to a level of methodology determination. These methods and curriculum materials constituted a third (instructional) sub-system.

Thus, as originally proposed, a system capability has been developed in fulfillment of expressed needs. The system, however, remains untested and unevaluated. ADO 43-03X called for feasibility test and cost-effectiveness determination. The project was designed to so comply. Test and evaluation through the process of implementation has not proved feasible in the Navy Medical Department within the duration of the project. As designed and developed the system does have "... precise goals and defined operational interrelation among instructional system components." The latter has been achieved in terms of a recommended career structure affording productive, rewarding manpower utilization which bridges manpower training and health care delivery functions.

Data Management Sub-System

Job analysis, involving the application of comprehensive task inventories to thousands of job incumbents, generates many millions of discrete bits of response data. They can be processed and manipulated only by high speed computer capability using rigorously designed specialty programs. In addition to numerical data base handling, there is the problem of rapidly and accurately manipulating a task statement data base exceeding ten thousand carefully phrased behavioral statements. Through the use of special programs, task inventories are prepared, printouts for special purposes are created following a job analysis application, access and retrieval of both data and tasks are efficiently and accurately carried out, and special data analyses conducted. The collective programs, techniques and procedures comprising this sub-system are referred to as the Navy Occupational Data Analysis Language (NODAL).

Job Analysis Sub-System

Some twenty task inventory booklets (and associated) response booklets) were the instruments used to obtain job incumbent response data for more than fifty occupations. An inventory booklet contains instructions, formatted questions concerning respondent information ("bio-data"), response dimension definitions, and a list of tasks which may vary in number from a few hundred to more than a thousand per occupational field.

By applying NODAL and its associated indexing techniques, it is possible to assemble modified or completely different inventories than those used in this research. Present inventories were applied about three years ago. While they have been rendered in operational format, they should not be reapplied until their task content is updated.

Response booklets were designed in OPSCAN mode for ease of recording and processing responses.

Overall job analysis objectives and a plan of administration were established prior to inventory preparation, including the setting of provisional sample target sizes. Since overall data attrition was forecast to approximate twenty percent, final sample and sub-sample sizes were adjusted accordingly. Stratified random sampling techniques were used. Variables selected (such as rating, NEC, environment) determined stratifications, together with sub-population sizes. About fifteen percent of large sub-populations were sought while a majority of all members of small sub-populations were sought.

Administration procedures were established with great care for every step of the data collecting process, and were coordinated with sampling and data analysis plans. Once set, the procedures were formalized as a protocol and followed rigorously.

Instructional Sub-System

Partial "competency curricula" have been composed as an integral sub-system bridging what is required as performance on the job with what is, accordingly, necessary instruction in the training process. Further, curriculum materials were developed to meet essential requirements for implementing the system so that the system could be tested and evaluated for cost effectiveness. However, due to the fact that test and evaluation was not feasible in the Navy Medical Department within the duration of the project, it was not possible to complete the development of the system through the test and evaluation phase. The inability to complete this phase also interrupted the planned process for fully developing the curricula; therefore, instead of completed curricula ready for use in the system, the curricula were partially developed to establish the necessary sub-system methodology. The competency curricula are based on tasks currently performed by job incumbents in 1971. (The currency of a given curriculum depends upon periodic analysis of incumbents' jobs, and its quality control resides in the evaluation of the performance competency of the program's graduates.)

A competency curriculum provides a planned course of instruction or training program made up of sequenced competency units which are, in turn, comprised of sequenced modules. These modules, emphasizing performance objectives, are the foundation of the curriculum.

A complete module would be comprised of seven parts: a cluster of related tasks; a performance objective; a list of knowledges and skills implied by the objective; a list of instructional strategies for presenting the knowledges and skills to the learner; an inventory of training aids for supporting the instructional strategies; a list of examination modes; and a statement of the required training time. In this project, curriculum materials have been developed to various levels of adequacy, and usually comprise only the first three parts; the latter four need to be prepared by the user.

The performance objective, which is the most crucial part of the module, is the basis for determining curriculum content. It is composed of five essential elements: the stimulus which initiates the behavior; the behavior; the conditions under which the behavior takes place; the criteria for evaluating the behavior; and the consequence or results of the behavior. A sixth element, namely next action, is not essential; however, it is intended to provide linkage for the next behavior.

Knowledges and skills listed in the module are those needed by the learner for meeting the requirements of the performance objective.

Instructional strategies, training aids, examination modes and training time have been specified only for the Basic Hospital Corps Curriculum. The strategies, aids and modes were selected on the basis of those considered to be most supportive in presenting the knowledges and skills so as to provide optimum learning effectiveness and training efficiency. The strategies extend from the classroom lecture as traditionally presented by a teacher to the more sophisticated mediated program for self-instruction. The training aids, like strategies, extend from the traditional references and handout material in the form of a student syllabus to mediated programs for self-instruction supported by anatomical models. Examination modes extend from the traditional paper and pencil tests to proficiency evaluation of program graduates on the job, commonly known as feedback. Feedback is essential for determining learning effectiveness and for quality control of a training program. The kind of instructional strategies, training aids and examination modes utilized for training are limited only by such factors as staff capability and training budget.

The training time specified in the Basic Hospital Corps Curriculum is estimated, based upon essential knowledge and skills and program sequence.

The competency curriculum module, when complete, provides all of the requirements for training a learner to perform the tasks set forth in the module. A module may be used independently or related modules may be re-sequenced into modified competency units to provide training for a specific job segment.

Since the curricula are based upon tasks performed by job incumbents in 1971, current analysis of jobs needs to be accomplished using task inventories that have been updated to reflect changes in performed tasks. Subsequent to job analysis, a revision of the curricula should be accomplished to reflect task changes. When the foregoing are accomplished, then faculty and other staff members may be indoctrinated to the competency curricula and to their relationship to the education and training system.

In addition to the primary use for the systematic training of job incumbents, these curricula may be used to plan for new training programs, develop new curricula, and revise existing curricula; develop or modify performance standards; develop or modify proficiency examinations; define billets; credentialize training programs; counsel on careers; select students; and identify and select faculty.

The System

Three sub-systems, as described, comprise the proposed system for Education and Training Programs in the Navy Medical Department. This exploratory and advanced developmental research has established an overall methodology for improved education and training incorporating every possible means of providing bases for demonstrating feasibility and cost effectiveness. There remains only job analysis sub-system up-dating, instructional sub-system completion, and full system test and evaluation.

Acknowledgements

The authors wish to acknowledge the invaluable participation of the several thousands of Naval personnel who served as respondents in inventory application. The many military and civilian personnel who contributed to developmental efforts are cited by name in the Final Report.

The authors also wish to acknowledge former colleagues for singularly important contributions, namely, Elias H. Porter, Ph.D., Carole K. Kauffman, R.N., M.P.H., Mary Kay Munday, B.S.N., R.N., Gail Zarren, M.S.W., and Renee Schick, B.A.

Identity and acknowledgement of the project Advisory Group during the project's final year is recorded in the Final Report.

Lastly, the project could not have been commenced nor carried out without the vision, guidance and outstanding direction of Ouida C. Upchurch, Capt., NC, USN, Project Manager.

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X-RAY TECHNICIAN

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Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT I: FILM PROCESSING -- DARKROOM

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Determining Adequacy of Darkroom	2
2	Identification of Radiographs.	3
3	Manual Radiograph Processing	4
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Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 1: DETERMINING ADEQUACY OF DARKROOM

TASKS

- a. Check x-ray darkroom for light leaks
- b. Check temperature and humidity for proper conditions for film storage
- c. Perform tests for safety fog factor of safelights
- d. Check for adequate supplies
- e. Check temperature of incoming water supply
- f. Determine operating condition of processing equipment and machinery
- g. Prepare processing chemicals
- h. Determine precise replenishing rates and/or chemical exhaustion periods

PERFORMANCE OBJECTIVE

(Stimulus) Upon assignment to darkroom duties
(Behavior) The XRT will determine the adequacy of facilities for x-ray film processing
(Criteria) According to established standards
(Consequence) This will enhance the quality of finished radiographs
(Next Action) Process exposed radiographic film

KNOWLEDGES AND SKILLS

Determination of cause of fog, e.g., light, shelf life and chemistry, temperature
Techniques for eliminating fog levels
Effect on film of variations in climatic conditions
Sensitivity relative to speed characteristics of x-ray film
Processing temperature control and its effects
Procedure for mixing chemicals
Determination of causes of artifacts on radiographs, e.g., malfunctioning equipment or film handling
Techniques to eliminate artifacts on radiographs
Standard darkroom equipment and supplies

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 2: IDENTIFICATION OF RADIOGRAPHS

TASKS a. Identify radiograph

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of film holder and removal of film
(Behavior)	The XRT will determine whether appropriate patient identification of film has been made; if not, the XRT will properly identify the radiographic film with patient identification information
(Conditions)	Using standard darkroom equipment, film marker and other appropriate equipment
(Criteria)	Radiograph properly identified with patient information, according to institutional procedures
(Next Action)	Process the film

KNOWLEDGES AND SKILLS

Film identification methods
Procedures for marking and identifying radiographic film
Proper identification of film in relation to patient information

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 3: MANUAL RADIOGRAPH PROCESSING

TASKS

- a. Process medical radiographs
- b. Maintain proper temperature controls
- c. Determine exhaustion period of developer and fixer

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of film with proper patient identification

(Behavior) The XRT will process the film manually, e.g., remove film from holder, place on appropriate size hanger, place in developer, fix and rinse for appropriate time, place radiograph in dryer for specific drying time, remove from dryer

(Consequence) Processed radiograph acceptable for diagnostic interpretation

(Next Action) Make radiograph available to requesting physician for diagnosis

KNOWLEDGES AND SKILLS

Procedures for manual radiograph processing
Chemistry of processing

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 4: AUTOMATED RADIOGRAPH PROCESSING

- TASKS
- a. Process medical radiographs
 - b. Retrieve silver from spent hypersulphate
 - c. Adjust controls on automatic processor for maintenance of temperature and replenishment rate
 - d. Maintain proper temperature controls
 - e. Determine exhaustion period of developer and fixer

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of film with proper patient identification
- (Behavior) The XRT will process the film using automatic techniques, i.e., energize processing equipment, remove film from holder, insert exposed film into processing equipment through feeding station
- (Consequence) Processed radiograph acceptable for diagnostic interpretation
- (Next Action) Make radiograph available to requesting physician for diagnosis

KNOWLEDGES AND SKILLS

Components of automatic processor
Use of automatic processor
Procedures for automatic film processing
Silver retrieval methods and components
Techniques for providing preventive maintenance and second echelon major repairs

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 5: SILVER RECLAMATION

TASKS a. Retrieve silver from spent hypersulphate

PERFORMANCE OBJECTIVE

(Stimulus)	When processing radiographic film
(Behavior)	The XRT will perform silver reclamation procedures
(Conditions)	Using necessary equipment
(Criteria)	Performed using the appropriate technique for the processing method employed, e.g., manual or automatic, and according to predetermined exhaustion schedules. (The silver reclamation process can be performed at the end of the last exhaustion period of hypersulphate for manual and on a continuing basis for automatic equipment)
(Consequence)	This action will retrieve maximum percentage of available silver from hypersulphate (fixer)
(Next Action)	Weigh reclaimed silver and submit to salvage disposal personnel

KNOWLEDGES AND SKILLS

Technique and process for retrieving silver from manual processing system
Technique and process for silver retrieval from automated system, i.e., continuous electrolysis
Reason for silver collection

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 6: QUALITY CONTROL

TASKS a. Inspect radiographic film quality to
evaluate processing techniques

PERFORMANCE OBJECTIVE

(Stimulus) When the radiographic film has been identified,
developed, fixed, washed and dried
(Behavior) The XRT will evaluate the finished radiograph for
proper processing techniques
(Criteria) Observing for absence of artifacts, streaks,
hypersulphate residue and under- or overdevelopment;
using equipment according to instructions
(Consequence) Properly processed radiograph
(Next Action) Make radiograph available to radiologist for
interpretation

KNOWLEDGES AND SKILLS

Process for evaluating finished radiograph
Radiograph processing techniques
Use of radiographic film processor and components
Darkroom chemistry
Recognition of technically unacceptable radiographs
and technical factors causing poor quality
Recognition of improper processing techniques
Effect of improperly processed film on archival
life and diagnostic value of radiograph

Competency: X-RAY TECHNICIAN (XRT)
Unit I: Film Processing -- Darkroom

MODULE 7: RADIOGRAPH REPRODUCTION

TASKS a. Reproduce radiographs

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request for same size or
miniaturized reproduction of radiograph
(Behavior) The XRT will reproduce the radiograph on unexposed
film and process it
(Conditions) Without supervision; using printer, processor
and/or other devices for radiograph reproduction
(Criteria) Reproduced according to established procedures,
producing radiograph copy of acceptable technical
quality
(Consequence) Reproduced radiograph
(Next Action) Make available to requester

KNOWLEDGES AND SKILLS

Components of printer
Operation of reproduction equipment, e.g.,
printer, processor
Techniques for radiograph reproduction--same
size and miniaturization
Recognition of quality copy

Competency: X-RAY TECHNICIAN (XRT)

Unit I: Film Processing -- Darkroom

MODULE 8: ROUTINE PREVENTIVE MAINTENANCE OF ACCESSORIES

TASKS a. Test cassettes for screen film contact
 b. Test cassettes for screen latent image

PERFORMANCE OBJECTIVE

(Stimulus) When image distortion or fuzzy detail is
 observed on film screen
(Behavior) The XRT will check the cassettes and intensifying
 screen for latent image or contact
(Conditions) Using cassettes with intensifying screens
(Criteria) Tests and corrections made according to established
 procedures; intensifying screens and cassettes
 are determined to be adequate for screen film
 contact
(Consequence) Cassettes and screens ready for radiographic use

KNOWLEDGES AND SKILLS

Components of cassettes and intensifying screens
Use of darkroom equipment
Techniques for testing screen contact and
latent image

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT II: ENVIRONMENTAL AND PERSONNEL RADIATION
SAFETY

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Monitoring Personnel Exposure to Radiation. .	11
2	Personnel Protection.	12
3	Radiation Protection for Attendants	13
4	Personnel Protection During X-Ray Exposure. .	14
5	Personnel Protection with Mobile Equipment. .	15
6	Monitoring Radiation-Producing Equipment. . .	16
7	Radiation Survey File	17

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 1: MONITORING PERSONNEL EXPOSURE TO RADIATION

- TASKS
- a. Inspect photodosimetry film prior to issue for identification
 - b. Issue personnel monitoring devices, e.g., pocket dosimeter, film badge
 - c. Collect personnel monitoring devices for processing
 - d. Prepare photodosimetry film for processing

PERFORMANCE OBJECTIVE

- (Stimulus) When assigned by supervising physician
(Behavior) The XRT will provide personnel exposed to ionizing radiation with a proper monitoring device for personal wear and, at a designated time, will collect all monitoring devices worn by personnel, submit them for processing and for interpretation as to the radiation exposure level over a given time period
(Conditions) Using photodosimeter badges
(Criteria) According to specifications established by the supervising physician

KNOWLEDGES AND SKILLS

- Purpose for assuring that all personnel wear and have periodic monitoring of personal dosimetry badges
Examples of time schedules for monitoring badges

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 2: PERSONNEL PROTECTION

TASKS a. Wear photodosimeter badge
 b. Submit photodosimeter badge for monitoring

PERFORMANCE OBJECTIVE

(Stimulus)	When assigned to the x-ray department
(Behavior)	The XRT will wear a radiation exposure monitoring device and submit it periodically for evaluation
(Conditions)	Using photodosimeter badge
(Criteria)	Badge worn in the prescribed manner and submitted according to standard procedure established by the radiologist
(Consequence)	Continuous surveillance of the degree of radiation exposure personnel receive in the work environment

KNOWLEDGES AND SKILLS

Technique for properly wearing badge
Purpose of photodosimeter badge
Importance of personnel wearing badge for self-protection

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 3: RADIATION PROTECTION FOR ATTENDANTS

- TASKS
- a. Maintain radiation safety practices for non-subject people
 - b. Provide protective devices, e.g., clothing, lead barriers

PERFORMANCE OBJECTIVE

- (Stimulus) When it is necessary to have a person other than the x-ray subject in the exposure area
- (Behavior) The XRT will provide appropriate radiation protection devices for the attendant
- (Conditions) Using protective clothing and/or lead barriers
- (Criteria) According to standards established by the supervising physician; no part of the attendant's body should be in the unattenuated beam
- (Consequence) Non-subject person is adequately protected from undue radiation exposure and possible health hazards

KNOWLEDGES AND SKILLS

- Types of protective clothing, e.g., gloves, aprons
- Physical protection devices, e.g., mobile barriers
- Determining adequacy of protection of attendant from radiation exposure

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 4: PERSONNEL PROTECTION DURING X-RAY EXPOSURE

TASKS a. Wear protective clothing, e.g., gloves,
apron

PERFORMANCE OBJECTIVE

(Stimulus) When assisting outside the control area of
the exposure room during a fluoroscopy
examination or filming
(Behavior) The XRT will wear protective garments, e.g.,
gloves and apron
(Conditions) Using protective gloves, apron
(Criteria) The XRT's body is adequately covered and no
part of the body is placed in the primary beam
without patient attenuation or adequate body
protection

KNOWLEDGES AND SKILLS

Harmful effects of radiation
Minimum exposure factors
Fluoroscopy techniques
Personnel safety precautions during fluoroscopy

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 5: PERSONNEL PROTECTION WITH MOBILE EQUIPMENT

TASKS

- a. Wear protective lead apron
- b. Protect body from primary beam with adequate shield
- c. Maintain proper distance from radiation source

PERFORMANCE OBJECTIVE

(Stimulus) When assigned to make diagnostic x-rays using mobile machines

(Behavior) The XRT will provide for his own protection from radiation exposure by wearing the appropriate protective clothing and positioning himself at a maximum distance from the radiation source

(Conditions) Using appropriate protective devices

(Criteria) According to standards established by supervising physician

KNOWLEDGES AND SKILLS

Different types of protection appropriate for use with mobile units, e.g., protective clothing, positioning, protective shields

Self-positioning of technicians when using mobile units

Frequency of use of mobile units

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 6: MONITORING RADIATION-PRODUCING EQUIPMENT

- TASKS
- a. Identify malfunctioning beam defining devices
 - b. Perform minor repair on malfunctioning beam defining devices
 - c. Report major malfunctions of beam devices for second echelon equipment repair

PERFORMANCE OBJECTIVE

- (Stimulus) When using ionizing equipment, particularly after changes in the equipment, e.g., replacement of x-ray tube, changes in filtration of primary beam, generator repair
- (Behavior) The XRT will continuously monitor the equipment to identify malfunctioning beam devices and make minor repairs or adjustments or report major malfunctions to appropriate source for repair
- (Criteria) According to standards established by the Radiation Committee, National Council on Radiation Protection
- (Consequence) Radiation hazard situations caused by ionizing equipment will be kept to a minimum

KNOWLEDGES AND SKILLS

Technique for determining malfunctioning collimator (overframing film size)
Beam characteristics
Effects of specific equipment repairs
Radiation Committee standards and revisions
Principles and techniques of minor repair for beam defining devices

Competency: X-RAY TECHNICIAN (XRT)

Unit II: Environmental and Personnel Radiation Safety

MODULE 7: RADIATION SURVEY FILE

TASKS

- a. Maintain radiation survey file
- b. Maintain records for equipment repairs effecting ionizing device output
- c. Report malfunctions to responsible personnel

PERFORMANCE OBJECTIVE

(Stimulus) When assigned
(Behavior) The XRT will take necessary action to have ionizing radiation-producing equipment surveyed annually or when any of the following conditions occur: replacement of x-ray tubes, high voltage generator repairs, changes in filtration of primary beam or its defining device
(Conditions) With indirect supervision
(Criteria) According to established local standards and the standards of the Radiation Committee, National Council on Radiation Protection
(Next Action) Evaluation of output of radiation-producing machines by supervising physician

KNOWLEDGES AND SKILLS

Proper forms for recording and reporting
What constitutes a thorough radiation survey according to established standards
Maximum and minimum limitations of radiation output
Appropriate action for abnormal radiation output
Radiation health safety implications/factors of survey

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT III: ROUTINE RADIOGRAPHS OF UPPER OR LOWER EXTREMITIES

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Patient Instruction	19
2	Selection of Accessories	20
3	Patient Measurement	21
4	Calibration and Controls Adjustment	22
5	Selection of Film and Related Devices	23
6	Patient Positioning and Central Beam Alignment	24
7	Radiographic Examination	25

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 1: PATIENT INSTRUCTION

- TASKS
- a. Review provisional information from patient chart and/or radiograph request
 - b. Instruct patient on general examination procedures
 - c. Instruct patient to remove necessary clothes and foreign objects
 - d. Instruct patient in preparing self for examination

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of patient and request for radiographic examination of the upper or lower extremities
- (Behavior) The XRT will interpret the radiograph request and prepare the patient psychologically and physically for the examination
- (Conditions) Using appropriate supplies, facilities and patient information
- (Consequence) A patient adequately prepared for the specific examination with a minimum of apprehension
- (Next Action) Select appropriate accessories for examination

KNOWLEDGES AND SKILLS

Instructional techniques
Patient preparation procedures for specified examination
Interpretation of radiograph request
Implications of available patient information for requested radiographic examination

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 2: SELECTION OF ACCESSORIES

TASKS a. Select needed immobilizing/restraining devices
 b. Prepare patient information needed for
 radiograph identification

PERFORMANCE OBJECTIVE

(Stimulus) While patient is preparing for examination
(Behavior) The XRT will determine and select immobilizing or
 restraining devices required for the extremity
 or extremities to be examined and will prepare
 the patient identification information needed
 on the exposed film
(Conditions) Using necessary equipment and accessories
(Criteria) Necessary accessories for producing quality
 radiographs are ready for immediate use
(Next Action) Measure specific body part to be examined

KNOWLEDGES AND SKILLS

Purpose and procedures for radiograph identification
Types of immobilizing or restraining devices
appropriate for extremity examinations and
patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 3: PATIENT MEASUREMENT

TASKS a. Measure specific body part
 b. Determine technique factors

PERFORMANCE OBJECTIVE

(Stimulus) When patient is appropriately prepared for the examination
(Behavior) The XRT will establish the thickness of the body part to be x-rayed and will reference this information to the technique chart to determine the kilovoltage, milliamperes and time required to produce a quality radiograph, making compensation in the technique factors according to patient's body structure and suspected diagnosis or pathological condition
(Conditions) Using calipers
(Criteria) Accurate technique factors for a quality radiograph providing minimum radiation exposure for patient
(Consequence) Proper x-ray penetration, film exposure and film contrast needed for the examination will be obtained
(Next Action) Calibrate and adjust controls for mobile or stationary equipment

KNOWLEDGES AND SKILLS

Technique for using calipers to take body measurements
Technique for compensating body measurements for body structure and/or suspected pathological condition
Technique for correlating measurement data with machine technique chart to determine milliamperes, kilovoltage and time required

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 4: CALIBRATION AND CONTROLS ADJUSTMENT

- TASKS
- a. Calibrate equipment
 - b. Determine and set MA meter on x-ray unit
 - c. Determine and set timer on x-ray unit
 - d. Adjust controls for kilovoltage

PERFORMANCE OBJECTIVE

- (Stimulus) After determining technique factors for the stationary or mobile x-ray unit
- (Behavior) The XRT will calibrate the equipment and adjust the controls for the kilovoltage, milliamperes and time requirements for the specified body part to be examined
- (Criteria) Accurate adjustment of the machine according to preestablished validated techniques to produce a quality radiograph with minimum patient exposure to radiation
- (Consequence) The machine is adjusted for the proper technical settings consistent with the requirements for the requested diagnostic examination
- (Next Action) Select appropriate film type and size, holders and other devices

KNOWLEDGES AND SKILLS

Function and operating parts of x-ray unit
X-ray generator and its parts
Calibration and adjustment of stationary and mobile x-ray units
Purpose for calibrating x-ray unit
Determining x-ray exposure factors and their effects
Setting x-ray exposure factors
Electrical and radiation safety precautions for stationary and mobile x-ray units
Procedures for testing timer and generator by using spinning top and pentotrometer

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 5: SELECTION OF FILM AND RELATED DEVICES

- TASKS
- a. Determine need for fixed grid (focused/non-focused)
 - b. Determine need for screen technique
 - c. Determine need for non-screen technique
 - d. Determine need for Bucky or stationary grid technique

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | When machine controls are established |
| (Behavior) | The XRT will determine and select the size and type of film required and the various types of film holders, intensifying screens and grids needed |
| (Conditions) | Using the appropriate equipment, film and holders |
| (Criteria) | According to established operating procedures and the thickness of the body part to be examined |
| (Consequence) | The appropriate combination of film, film holders and related devices is selected to produce a quality radiograph |
| (Next Action) | Position the patient and align the central ray |

KNOWLEDGES AND SKILLS

- Types of screens, grids and film
- Function and use of grids, screens and film
- Use of grid ratio, grid cassettes, grid technique
- Procedures for using radiograph formula for determining technique

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 6: PATIENT POSITIONING AND CENTRAL BEAM ALIGNMENT

- TASKS
- a. Position patient on x-ray table for examination of extremity/extremities
 - b. Immobilize patient for examination
 - c. Align central ray

PERFORMANCE OBJECTIVE

- (Stimulus) After selecting appropriate film, film holders and related devices
- (Behavior) The XRT will position the part of the patient's body to be examined, immobilize it as necessary and align the x-ray tube's central ray
- (Criteria) Proper positioning of body part to produce quality radiograph with minimum patient radiation exposure; appropriate positioning of central ray permitting entrance and exit of the x-ray beam to properly display the anatomical view requested
- (Next Action) Energize equipment to produce exposed film

KNOWLEDGES AND SKILLS

Gross anatomy and physiology of extremities
Radiographic positioning for requested examination
Operation of x-ray apparatus
Use of immobilizing or restraining devices appropriate for extremity examinations and patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit III: Routine Radiographs of Upper or Lower Extremities

MODULE 7: RADIOGRAPHIC EXAMINATION

TASKS	a. Instruct patient
	b. Energize equipment to produce radiograph
	c. Make routine radiograph of extremities
	d. Process film
	e. Determine quality of radiograph
	f. Dismiss patient

PERFORMANCE OBJECTIVE

(Stimulus)	When the body part to be examined is positioned and the central ray is aligned
(Behavior)	The XRT will instruct the patient as necessary, energize the equipment and make a radiograph of the specified body part, remaining at the unit control behind the barrier during exposure. The film will be processed and determined to be of acceptable diagnostic quality prior to dismissal of the patient
(Conditions)	Using mobile or stationary radiograph equipment
(Criteria)	According to established procedures
(Consequence)	An acceptable radiograph is produced for diagnostic purposes
(Next Action)	Make radiograph and records available to the requesting physician

KNOWLEDGES AND SKILLS

Instructional techniques
Procedures to energize radiographic equipment
Use and operation of stationary and mobile
x-ray units

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT IV: ROUTINE RADIOGRAPHS OF THE TRUNK

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Patient Instruction	27
2	Selection of Accessories	28
3	Patient Measurement	29
4	Calibration and Controls Adjustment	30
5	Selection of Film and Related Devices	31
6	Patient Positioning and Central Beam Alignment	32
7	Radiographic Examination	33

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 1: PATIENT INSTRUCTION

- | | |
|-------|--|
| TASKS | <ul style="list-style-type: none">a. Review provisional information from patient chart and/or radiograph requestb. Instruct patient on general examination proceduresc. Instruct patient to remove necessary clothes and foreign objectsd. Instruct patient in preparing self for examination |
|-------|--|

PERFORMANCE OBJECTIVE

- | | |
|---------------|--|
| (Stimulus) | Upon receipt of patient and request for routine radiographic examination of the trunk, e.g., abdomen, chest, pelvis, KUB, ribs and sternum |
| (Behavior) | The XRT will interpret the radiograph request and prepare the patient psychologically and physically for the examination |
| (Conditions) | Using appropriate supplies, facilities and patient information |
| (Consequence) | A patient is prepared for the specified examination with a minimum of apprehension |
| (Next Action) | Select appropriate accessories for examination |

KNOWLEDGES AND SKILLS

- Instructional techniques
- Patient preparation procedures for specified examination
- Interpretation of radiograph request
- Implications of available patient information for requested radiographic examination

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 2: SELECTION OF ACCESSORIES

- TASKS
- a. Select needed immobilizing/restraining devices
 - b. Prepare patient information needed for radiograph identification

PERFORMANCE OBJECTIVE

- (Stimulus) While patient is preparing for examination
(Behavior) The XRT will determine and select the immobilizing or restraining devices required for the anatomical area of the trunk to be examined and will prepare the patient identification information needed on the exposed film
(Conditions) Using necessary equipment and accessories
(Criteria) Necessary accessories for producing quality radiograph are ready for immediate use
(Next Action) Measure specific body part to be examined

KNOWLEDGES AND SKILLS

Purpose and procedures for radiograph identification
Types of immobilizing or restraining devices appropriate for the specified trunk examination and the patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 3: PATIENT MEASUREMENT

TASKS a. Measure specific body part
 b. Determine technique factors

PERFORMANCE OBJECTIVE

(Stimulus)	When patient is appropriately prepared for the examination
(Behavior)	The XRT will establish the thickness of the body part to be x-rayed and will reference this information to the technique chart to determine the x-ray machine kilovoltage, milliamperes and time required to produce a quality radiograph, making compensation in the technique factors according to patient's body structure and suspected diagnosis or pathological condition
(Conditions)	Using calipers
(Criteria)	Accurate technique factors for a quality radiograph providing minimum radiation exposure for patient
(Consequence)	Proper x-ray penetration, film exposure and film contrast needed for the examination will be obtained
(Next Action)	Calibrate and adjust controls for mobile or stationary equipment

KNOWLEDGES AND SKILLS

Technique for using calipers to take body measurements
Technique for compensating body measurements for body structure and/or suspected pathological condition of the specified area of the trunk
Technique for correlating measurement data with machine technique chart for determining milliamperes, kilovoltage and time required

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 4: CALIBRATION AND CONTROLS ADJUSTMENT

- TASKS
- a. Calibrate equipment
 - b. Determine and set MA meter on x-ray unit
 - c. Determine and set timer on x-ray unit
 - d. Adjust controls for kilovoltage

PERFORMANCE OBJECTIVE

- (Stimulus) After determining technique factors for the stationary or mobile x-ray unit
- (Behavior) The XRT will calibrate the equipment and adjust the controls for the kilovoltage, milliamperes and time requirements for the specified body part to be examined
- (Criteria) Accurate adjustment of the machine according to preestablished validated techniques to produce a quality radiograph with minimum patient exposure to radiation
- (Consequence) The machine is adjusted for the proper technical settings consistent with the requirements for the requested diagnostic examination
- (Next Action) Select appropriate film type and size, holders and other devices

KNOWLEDGES AND SKILLS

Function and operating parts of x-ray unit
X-ray generator and its parts
Calibration and adjustment of stationary and mobile x-ray units
Purpose for calibrating x-ray unit
Determining x-ray exposure factors and their effects
Setting x-ray exposure factors
Electrical and radiation safety precautions for stationary and mobile x-ray units
Procedures for testing timer and generator by using spinning top and pentotrometer

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 5: SELECTION OF FILM AND RELATED DEVICES

- | | |
|-------|--|
| TASKS | a. Determine need for fixed grid (focused/non-focused)
b. Determine need for screen technique
c. Determine need for non-screen technique
d. Determine need for Bucky or stationary grid technique |
|-------|--|

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | When machine controls are established |
| (Behavior) | The XRT will determine and select size and type of film required and the various types of film holders, intensifying screens and grids needed |
| (Conditions) | Using the appropriate equipment, film and holders |
| (Criteria) | According to established operating procedures and the thickness of the body part to be examined |
| (Consequence) | The appropriate combination of film, film holders and related devices is selected to produce a quality radiograph |
| (Next Action) | Position the patient and align the central ray |

KNOWLEDGES AND SKILLS

- Types of screens, grids and film
- Function and use of grids, screens and film
- Use of grid ratio, grid cassettes, grid technique
- Procedures for using radiograph formula for determining technique

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 6: PATIENT POSITIONING AND CENTRAL BEAM ALIGNMENT

- TASKS
- a. Position patient on x-ray table for examination of specified area of trunk, e.g., thoracic cage, abdomen, pelvis
 - b. Immobilize patient for examination
 - c. Align central ray

PERFORMANCE OBJECTIVE

- (Stimulus) After selecting appropriate film, film holders and related devices
- (Behavior) The XRT will position the part of the patient's body to be examined, immobilize it as necessary and align the x-ray tube central ray
- (Criteria) Proper positioning of body part to produce quality radiograph with minimum patient radiation exposure; appropriate positioning of central ray permitting entrance and exit of the x-ray beam to properly display the anatomical view requested
- (Next Action) Energize equipment to produce exposed film

KNOWLEDGES AND SKILLS

Gross anatomy and physiology of the trunk
Radiographic positioning for requested examination
Operation of x-ray apparatus
Use of immobilizing or restraining devices appropriate for specified trunk examination and patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit IV: Routine Radiographs of the Trunk

MODULE 7: RADIOGRAPHIC EXAMINATION

- TASKS
- a. Instruct patient
 - b. Energize equipment to produce radiograph
 - c. Make routine radiograph of specified view of trunk, e.g., thoracic cage, pelvis, abdomen, KUB
 - d. Process film
 - e. Determine quality of radiograph
 - f. Dismiss patient

PERFORMANCE OBJECTIVE

- (Stimulus) When body part to be examined is positioned and the central ray is aligned
- (Behavior) The XRT will instruct the patient as necessary, energize the equipment and make a radiograph of the specified body part, remaining at the unit controls behind the barrier during exposure. The film will be processed and determined to be of acceptable diagnostic quality prior to dismissal of the patient
- (Conditions) Using mobile or stationary radiograph equipment
- (Criteria) According to established procedures
- (Consequence) An acceptable radiograph is produced for diagnostic purposes
- (Next Action) Make radiograph and records available to the requesting physician

KNOWLEDGES AND SKILLS

- Anatomical views of trunk routinely requested, i.e., automated systems for chest examination, abdomen, KUB (kidney/ureter/bladder), ribs and sternum
- Criteria for determining technical acceptability of specified radiograph for diagnostic purposes

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT V: ROUTINE RADIOGRAPHS OF THE SPINAL COLUMN

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Patient Instruction	35
2	Selection of Accessories	36
3	Patient Measurement	37
4	Calibration and Controls Adjustment	38
5	Selection of Film and Related Devices . . .	39
6	Patient Positioning and Central Beam Alignment	40
7	Radiographic Examination	41

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 1: PATIENT INSTRUCTION

- TASKS
- a. Review provisional information from patient chart and/or radiograph request
 - b. Instruct patient on general examination procedures
 - c. Instruct patient to remove necessary clothes and foreign objects
 - d. Instruct patient in preparing self for examination

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of patient and request for routine radiographic examination of the spinal column, e.g., atlas/axis/cervical/thoracic/lumbar vertebrae, sacrum, coccyx
- (Behavior) The XRT will interpret the radiograph request and prepare the patient psychologically and physically for the examination
- (Conditions) Using appropriate supplies, facilities and patient information
- (Consequence) A patient prepared for the specified examination with a minimum of apprehension
- (Next Action) Select appropriate accessories for examination

KNOWLEDGES AND SKILLS

Instructional techniques
Patient preparation procedures for specified examination
Interpretation of radiograph request
Implications of available patient information for requested radiographic examination

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 2: SELECTION OF ACCESSORIES

- TASKS
- a. Select needed immobilizing/restraining devices
 - b. Prepare patient information needed for radiograph identification

PERFORMANCE OBJECTIVE

- | | |
|---------------|--|
| (Stimulus) | While patient is preparing for examination |
| (Behavior) | The XRT will determine and select the immobilizing or restraining devices required for the anatomical area of the spinal column to be examined and prepare the patient identification information needed on the exposed film |
| (Conditions) | Using necessary equipment and accessories |
| (Criteria) | Necessary accessories for producing quality radiograph ready for immediate use |
| (Next Action) | Measure specific body part to be examined |

KNOWLEDGES AND SKILLS

- Purpose and procedures for radiograph identification
- Types of immobilizing or restraining devices appropriate for specified examination of the spinal column and patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 3: PATIENT MEASUREMENT

TASKS a. Measure specific body part
 b. Determine technique factors

PERFORMANCE OBJECTIVE

(Stimulus) When patient is appropriately prepared for the examination
(Behavior) The XRT will establish the thickness of the body part to be x-rayed and will reference this information to the technique chart to determine the x-ray machine kilovoltage, milliamperes and time required to produce a quality radiograph, making compensation in the technique factors according to patient's body structure and suspected diagnosis or pathological condition
(Conditions) Using calipers
(Criteria) Accurate technique factors for a quality radiograph providing minimum radiation exposure for patient
(Consequence) Proper x-ray penetration, film exposure and film contrast needed for the examination will be obtained
(Next Action) Calibrate and adjust controls for mobile or stationary equipment

KNOWLEDGES AND SKILLS

Technique for using calipers to take body measurements
Technique for compensating body measurements for body structure and/or suspected pathological condition of the spinal column
Technique for correlating measurement data with machine technique chart for determining milliamperes, kilovoltage and time required

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 4: CALIBRATION AND CONTROLS ADJUSTMENT

TASKS

- a. Calibrate equipment
- b. Determine and set MA meter on x-ray unit
- c. Determine and set timer on x-ray unit
- d. Adjust controls for kilovoltage

PERFORMANCE OBJECTIVE

- (Stimulus) After determining technique factors for the stationary or mobile x-ray unit
- (Behavior) The XRT will calibrate the equipment and adjust the controls for the kilovoltage, milliamperes and time requirements for the specified body part to be examined
- (Criteria) Accurate adjustment of the machine according to preestablished validated techniques to produce a quality radiograph with minimum patient exposure to radiation
- (Consequence) The machine is adjusted for the proper technical settings consistent with the requirements for the requested diagnostic examination
- (Next Action) Select appropriate film type and size, holders and other devices

KNOWLEDGES AND SKILLS

Function and operating parts of x-ray unit
X-ray generator and its parts
Calibration and adjustment of stationary and mobile x-ray units
Purpose for calibrating x-ray units
Determining x-ray exposure factors and their effects
Setting x-ray exposure factors
Electrical and radiation safety precautions for stationary and mobile x-ray units
Procedures for testing timer and generator by using spinning top and pentotrometer

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 5: SELECTION OF FILM AND RELATED DEVICES

- TASKS
- a. Determine need for fixed grid (focused/non-focused)
 - b. Determine need for screen technique
 - c. Determine need for non-screen technique
 - d. Determine need for Bucky or stationary grid technique

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | When machine controls are established |
| (Behavior) | The XRT will determine and select the size and type of film required and the various types of film holders, intensifying screens and grids needed |
| (Conditions) | Using the appropriate equipment, film and holders |
| (Criteria) | According to established operating procedures and the thickness of the body part to be examined |
| (Consequence) | The appropriate combination of film, film holders and related devices is selected to produce a quality radiograph |
| (Next Action) | Position the patient and align the central ray |

KNOWLEDGES AND SKILLS

Types of screens, grids and film
Function and use of grids, screens and film
Use of grid ratio, grid cassettes, grid technique
Procedures for using radiograph formula for determining technique

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 6: PATIENT POSITIONING AND CENTRAL BEAM ALIGNMENT

- TASKS
- a. Position patient on x-ray table for examination of specified area of the spinal column
 - b. Immobilize patient for examination
 - c. Align central ray

PERFORMANCE OBJECTIVE

- (Stimulus) After selecting appropriate film, film holders and related devices
- (Behavior) The XRT will position the part of the patient's body to be examined, immobilize it as necessary and align the x-ray tube central ray
- (Criteria) Proper positioning of body part to produce a quality radiograph with minimum patient radiation exposure; appropriate positioning of central ray permitting entrance and exit of the x-ray beam to properly display the anatomical view requested
- (Next Action) Energize equipment to produce exposed film

KNOWLEDGES AND SKILLS

Gross anatomy and physiology of the spinal column
Radiographic positioning for requested examination
Operation of x-ray apparatus
Use of immobilizing or restraining devices appropriate for specified spinal cord examination and patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit V: Routine Radiographs of the Spinal Column

MODULE 7: RADIOGRAPHIC EXAMINATION

- TASKS
- a. Instruct patient
 - b. Energize equipment to produce radiograph
 - c. Make routine radiograph of specified view of spinal column, e.g., atlas/axis/cervical/thoracic/lumbar vertebrae, sacrum, coccyx
 - d. Process film
 - e. Determine quality of radiograph
 - f. Dismiss patient

PERFORMANCE OBJECTIVE

- (Stimulus) When body part to be examined is positioned and the central ray is aligned
- (Behavior) The XRT will instruct the patient as necessary, energize the equipment and make a radiograph of the specified body part, remaining at the unit controls behind the barrier during exposure. The film will be processed and determined to be of acceptable diagnostic quality prior to dismissal of the patient
- (Conditions) Using mobile or stationary radiograph equipment
- (Criteria) According to established procedures
- (Consequence) An acceptable radiograph is produced for diagnostic purposes
- (Next Action) Make radiograph and records available to the requesting physician

KNOWLEDGES AND SKILLS

- Anatomical views of spinal column routinely requested
- Criteria for determining technical acceptability of specified spinal column radiograph for diagnostic purposes

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT VI: ROUTINE RADIOGRAPHS OF THE HEAD

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Patient Instruction	43
2	Selection of Accessories	44
3	Patient Measurement	45
4	Calibration and Controls Adjustment	46
5	Selection of Film and Related Devices	47
6	Patient Positioning and Central Beam Alignment	48
7	Radiographic Examination	49

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 1: PATIENT INSTRUCTION

- TASKS
- a. Review provisional information from patient chart and/or radiograph request
 - b. Instruct patient on general examination procedures
 - c. Instruct patient to remove necessary clothes and foreign objects
 - d. Instruct patient in preparing self for examination

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of patient and request for routine radiographic examination of the head, e.g., skull, foreign body localization, facial bones, sinuses, mastoids and teeth
- (Behavior) The XRT will interpret the radiograph request and prepare the patient psychologically and physically for the examination
- (Conditions) Using appropriate supplies, facilities and patient information
- (Consequence) A patient prepared for the specified examination with a minimum of apprehension
- (Next Action) Select appropriate accessories for examination

KNOWLEDGES AND SKILLS

Instructional techniques
Patient preparation procedures for specified examination
Interpretation of radiograph request
Implications of available patient information for requested radiographic examination

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 2: SELECTION OF ACCESSORIES

TASKS	a. Select needed immobilizing/restraining devices b. Prepare patient information needed for radiograph identification
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PERFORMANCE OBJECTIVE

(Stimulus)	While patient is preparing for examination
(Behavior)	The XRT will determine and select the immobilizing or restraining devices required for the anatomical area of the head to be examined and will prepare the patient identification information needed on the exposed film
(Conditions)	Using necessary equipment and accessories
(Criteria)	Necessary accessories for producing quality radiograph ready for immediate use
(Next Action)	Measure specific body part to be examined

KNOWLEDGES AND SKILLS

Purpose and procedures for radiograph identification
Types of immobilizing or restraining devices for specified radiographic examination of the head and patient's condition

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 3: PATIENT MEASUREMENT

TASKS a. Measure specific body part
 b. Determine technique factors

PERFORMANCE OBJECTIVE

(Stimulus)	When patient is appropriately prepared for the examination
(Behavior)	The XRT will establish the thickness of the body part to be x-rayed and reference this information to the technique chart to determine x-ray machine kilovoltage, milliamperes and time required to produce a quality radiograph, making compensation in the technique factors according to patient's body structure and suspected diagnosis or pathological condition
(Conditions)	Using calipers
(Criteria)	Accurate technique factors for a quality radiograph providing minimum radiation exposure for patient
(Consequence)	Proper x-ray penetration, film exposure and film contrast needed for the examination will be obtained
(Next Action)	Calibrate and adjust controls for mobile or stationary equipment

KNOWLEDGES AND SKILLS

Technique for using calipers to take body measurements
Technique for compensating body measurements for body structure and/or suspected pathological condition of the head
Technique for correlating measurement data with machine technique chart for determining milliamperes, kilovoltage and time required

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 4: CALIBRATION AND CONTROLS ADJUSTMENT

- TASKS
- a. Calibrate equipment
 - b. Determine and set MA meter on x-ray unit
 - c. Determine and set timer on x-ray unit
 - d. Adjust controls for kilovoltage

PERFORMANCE OBJECTIVE

- (Stimulus) After determining technique factors for the stationary or mobile x-ray unit
- (Behavior) The XRT will calibrate the equipment and adjust the controls for the kilovoltage, milliamperes and time requirements for the specified body part to be examined
- (Criteria) Accurate adjustment of the machine according to preestablished validated techniques to produce a quality radiograph with minimum patient exposure to radiation
- (Consequence) The machine is adjusted for the proper technical settings consistent with the requirements for the requested diagnostic examination
- (Next Action) Select appropriate film type and size holders and other devices

KNOWLEDGES AND SKILLS

Function and operating parts of x-ray unit
X-ray generator and its parts
Calibration and adjustment of stationary and mobile x-ray unit
Purpose for calibrating x-ray unit
Determining x-ray exposure factors and their effects
Setting x-ray exposure factors
Electrical and radiation safety precautions for stationary and mobile x-ray units
Procedures for testing timer and generator by using spinning top and pentotrometer

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 5: SELECTION OF FILM AND RELATED DEVICES

- | | |
|-------|---|
| TASKS | a. Determine need for fixed grid (focused/
non-focused) |
| | b. Determine need for screen technique |
| | c. Determine need for non-screen technique |
| | d. Determine need for Bucky or stationary grid
technique |

PERFORMANCE OBJECTIVE

- | | |
|---------------|--|
| (Stimulus) | When machine controls are established |
| (Behavior) | The XRT will determine and select the size
and type of film required and the various types
of film holders, intensifying screens and grids
needed |
| (Conditions) | Using the appropriate equipment, film and holders |
| (Criteria) | According to established operating procedures and
the thickness of the body part to be examined |
| (Consequence) | The appropriate combination of film, film
holders and related devices is selected to
produce a quality radiograph |
| (Next Action) | Position the patient and align the central ray |

KNOWLEDGES AND SKILLS

Types of screens, grids and film
Function and use of grids, screens and film
Use of grid ratio, grid cassettes, grid technique
Procedures for using radiograph formula for
determining technique

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 6: PATIENT POSITIONING AND CENTRAL BEAM ALIGNMENT

- TASKS
- a. Position patient on x-ray table for examination of specified area of the head
 - b. Immobilize patient for examination
 - c. Align central ray

PERFORMANCE OBJECTIVE

- (Stimulus) After selecting appropriate film, film holders and related devices
- (Behavior) The XRT will position the part of the patient's body to be examined, immobilize it as necessary and align the x-ray tube central ray
- (Criteria) Proper positioning of body part to produce quality radiograph with minimum patient radiation exposure; appropriate positioning of central ray permitting entrance and exit of the x-ray beam to properly display the anatomical view requested
- (Next Action) Energize equipment to produce exposed film

KNOWLEDGES AND SKILLS

Gross anatomy and physiology of the head
Radiographic positioning for requested examination
Operation of x-ray apparatus
Use of immobilizing or restraining devices appropriate for patient's condition and specified examination of the head

Competency: X-RAY TECHNICIAN (XRT)

Unit VI: Routine Radiographs of the Head

MODULE 7: RADIOGRAPHIC EXAMINATION

- | | |
|-------|---|
| TASKS | a. Instruct patient |
| | b. Energize equipment to produce radiograph |
| | c. Make routine radiograph of the head, e.g.,
facial bones, sinuses, skull, foreign body
localization, mastoids and teeth |
| | d. Process film |
| | e. Determine quality of radiograph |
| | f. Dismiss patient |

PERFORMANCE OBJECTIVE

- | | |
|---------------|--|
| (Stimulus) | When body part to be examined is positioned
and central ray is aligned |
| (Behavior) | The XRT will instruct the patient as necessary,
energize the equipment and make a radiograph of
the specified body part, remaining at the unit
controls behind the barrier during exposure.
The film will be processed and determined to be
of acceptable diagnostic quality prior to
dismissal of the patient |
| (Conditions) | Using mobile or stationary radiograph equipment |
| (Criteria) | According to established procedures |
| (Consequence) | An acceptable radiograph is produced for
diagnostic purposes |
| (Next Action) | Make radiograph and records available to the
requesting physician |

KNOWLEDGES AND SKILLS

- Types of radiographs of the head routinely
requested
- Criteria for determining technical acceptability
of specified radiograph of the head for
diagnostic purposes

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT VII: BASIC CONTRAST MEDIA PROCEDURES

This unit includes the following modules:

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Patient Preparation for Contrast Media Radiography	51
2	Contrast-Induced Emergencies	52
3	Fluoroscopic Preparation and Assistance . .	53

Competency: X-RAY TECHNICIAN (XRT)

Unit VII: Basic Contrast Media Procedures

MODULE 1: PATIENT PREPARATION FOR CONTRAST MEDIA RADIOGRAPHY

TASKS

- a. Test for allergic reaction to specific agent
- b. Maintain antidote section, locker or tray
- c. Terminate intravenous contrast flow and remove instrumentation

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of physician's request for contrast media study
(Behavior)	The XRT will select the specified contrast media, test patient for contraindications and, when appropriate, initiate and terminate contrast media administration
(Conditions)	Using appropriate contrast media, antidote tray or locker and required equipment for contrast media administration
(Criteria)	Contrast media administration performed according to established procedures
(Consequence)	Patient prepared for contrast media examination
(Next Action)	Observe patient for adverse reactions to contrast media; if no adverse reaction occurs, make radiographic examination

KNOWLEDGES AND SKILLS

Principles and techniques of oral and intravenous contrast media administration
Recognition of allergic reactions
Aseptic technique
Maintenance of antidote locker or tray
Use of related equipment, e.g., injectors

Competency: X-RAY TECHNICIAN (XRT)

Unit VII: Basic Contrast Media Procedures

MODULE 2: CONTRAST-INDUCED EMERGENCIES

- TASKS
- a. Recognize adverse reaction to contrast media
 - b. Determine need for medication and/or emergency equipment
 - c. Select indicated medication and/or emergency equipment
 - d. Provide emergency treatment

PERFORMANCE OBJECTIVE

- (Stimulus) When patient exhibits symptoms of adverse reaction to contrast radiographic study
- (Behavior) The XRT will identify the particular reaction, provide emergency care as needed and/or advise physician or supervisor of reaction on a stat basis
- (Conditions) Without supervision
- (Criteria) Proper immediate care exercised to aid patient experiencing adverse reaction
- (Consequence) This will result in early treatment of adverse effects of radiopaque media
- (Next Action) Assist physician/supervisor

KNOWLEDGES AND SKILLS

- Side effects/signs of allergic/anaphylactic reactions
- Immediate/emergency treatment for reaction

Competency: X-RAY TECHNICIAN (XRT)

Unit VII: Basic Contrast Media Procedures

MODULE 3: FLUOROSCOPIC PREPARATION AND ASSISTANCE

- TASKS
- a. Prepare contrast media for administration
 - b. Prepare patient for specific examination
 - c. Adjust x-ray controls for fluoroscopy and filming
 - d. Select appropriate accessories and protective attire
 - e. Assist physician with fluoroscopic examination

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of request for a specific fluoroscopic patient examination
- (Behavior) The XRT will prepare the patient and set up equipment prior to examination and assist the physician during the examination
- (Conditions) With supervision by the physician; using radiographic equipment with image intensification, closed circuit television, tape, disc or film recording, film changers
- (Criteria) According to established techniques and procedures for the specified examination and according to the physician's instructions
- (Consequence) Fluoroscopic examination with or without permanent record
- (Next Action) Perform patient-related care and process film

KNOWLEDGES AND SKILLS

- Selection and use of accessories, e.g., compression devices, proper enema tips
- Selection and use of protective devices, e.g., barriers, gloves, aprons
- Operation of radiographic equipment and components, e.g., intensification apparatus, closed circuit television, film, tape or disc recording, film changers
- Preparation of contrast media for administration

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT VIII: CONTRAST RADIOGRAPHY EXAMINATIONS

This unit includes the following modules:

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2	Urinary System Radiographs	56
3	Gynecologic Radiographs	57
4	Radiographs of the Joint Spaces	58
5	Cerebral Radiographs	59
6	Radiographs of the Salivary Glands and Ducts	60
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8	Tomograms and Laminograms	62
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13	Radiographs of the Inferior Vena Cava and Related Vessels	67

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 1: GASTROINTESTINAL RADIOGRAPHS

- | | |
|-------|--|
| TASKS | a. Make contrast study radiographs of upper G.I. tract |
| | b. Make contrast study radiographs of small intestine |
| | c. Make contrast study radiographs of large intestine |
| | d. Make contrast study radiographs of gall bladder |
| | e. Make contrast study radiographs of esophagus |

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | Upon request for a contrast radiographic study of a specific area of the gastrointestinal tract |
| (Behavior) | The XRT will prepare the patient, set up the technique and assist the physician during the specified examination |
| (Conditions) | With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media |
| (Criteria) | According to established procedures and physician's instructions for proper radiologic techniques and patient positioning |
| (Consequence) | Quality radiographs produced for interpretation |

KNOWLEDGES AND SKILLS

Anatomy of the gastrointestinal tract
Radiographic positioning and technical factors for examination of specific areas of the gastrointestinal tract
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 2: URINARY SYSTEM RADIOGRAPHS

- | | |
|-------|---|
| TASKS | a. Make contrast radiographs of kidneys, ureters and bladder |
| | b. Make retrograde contrast radiographs of kidneys, ureters and bladder |
| | c. Make hypertensive contrast radiographs of kidneys, ureters and bladder |

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | Upon request for a contrast radiographic study of the urinary system |
| (Behavior) | The XRT will prepare the patient, set up the technique and assist the physician during the specified examination |
| (Conditions) | With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media |
| (Criteria) | According to established procedures and physician's instructions for proper radiologic techniques and patient positioning |
| (Consequence) | Quality radiographs acceptable for interpretation are produced |

KNOWLEDGES AND SKILLS

Anatomy of the urinary system
Radiographic positioning and technical factors for urinary system examination
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 3: GYNECOLOGIC RADIOGRAPHS

- TASKS
- a. Make contrast radiographs of the uterus and fallopian tubes
 - b. Make contrast radiographs for pelvimetric studies
 - c. Make contrast radiographs of the placenta

PERFORMANCE OBJECTIVE

- (Stimulus) Upon receipt of request for a contrast radiographic study of a specific area of the female reproductive system
- (Behavior) The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
- (Conditions) With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
- (Criteria) According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
- (Consequence) Quality radiographs acceptable for interpretation are produced

KNOWLEDGES AND SKILLS

Anatomy of the female reproductive system
Radiographic positioning and technical factors for specified examination of the female reproductive system
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media
Use and operation of pelvimetric measuring devices and related graphs
Ethics--respect for patient
Sterile technique

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 4: RADIOGRAPHS OF THE JOINT SPACES

TASKS a. Make contrast radiographs of joint spaces

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a contrast radiograph of the joint spaces
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs acceptable for interpretation are produced

KNOWLEDGES AND SKILLS

- Anatomy of the joint spaces
- Radiographic positioning and technical factors for specific joint spaces examination
- Use of x-ray equipment
- Administration of specific contrast media
- Recognition of adverse reactions to specific contrast media
- Emergency procedures for allergic reactions to contrast media
- Sterile procedures

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 5: CEREBRAL RADIOGRAPHS

- TASKS
- a. Make contrast radiographs of cerebral blood vessels
 - b. Make contrast radiographs of skull using subarachnoid air injection technique

PERFORMANCE OBJECTIVE

- (Stimulus) Upon request for a contrast radiographic study of the cerebral blood vessels or the skull
- (Behavior) The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
- (Conditions) With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media, equipment appropriate to the examination, e.g., pneumoencephalographic chair, catheters
- (Criteria) According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
- (Consequence) Quality radiographs acceptable for interpretation are produced

KNOWLEDGES AND SKILLS

Anatomy of the cerebral venous and arterial systems, subarachnoid space and brain ventricles

Radiographic positioning and technical factors for specified cerebral examination

Use of x-ray equipment

Administration of specific contrast media

Recognition of adverse reactions to specific contrast media

Emergency procedures for allergic reactions to contrast media

Use and operation of related equipment, e.g., pneumoencephalographic chair, catheters

Sterile technique

Techniques for monitoring patient vital signs

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 6: RADIOGRAPHS OF THE SALIVARY GLANDS AND DUCTS

TASKS a. Make contrast radiographs of the salivary glands and ducts

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a sialogram
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs acceptable for interpretation are produced

KNOWLEDGES AND SKILLS

Anatomy of the salivary glands and ducts
Radiographic positioning and technical factors for making a sialogram
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 7: LYMPHATIC SYSTEM RADIOGRAPHS

TASKS a. Make contrast radiographs of the lymphatic system

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a lymphangiogram
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs acceptable for interpretation are produced

KNOWLEDGES AND SKILLS

Anatomy of the lymphatic system
Radiographic positioning and technical factors for lymphangiograms
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 8: TOMOGRAMS AND LAMINOGRAMS

TASKS a. Make tomogram of specified area of body
 b. Make laminogram of specified part of body

PERFORMANCE OBJECTIVE

(Stimulus) Upon request for a tomogram or laminogram of
 a specific area of the body and after contrast
 media has been administered by the physician
(Behavior) The XRT will make a laminogram or tomogram of
 the specified area of the body
(Conditions) Without supervision; using fixed or mobile x-ray
 unit with appropriate equipment necessary for
 either a tomogram or a laminogram
(Criteria) According to established procedure and
 physician's instructions for proper radiologic
 techniques and patient positioning
(Consequence) Quality radiographs produced acceptable for
 interpretation

KNOWLEDGES AND SKILLS

Anatomy of part of body to be examined
Type of contrast media administered
Radiographic positioning and technical factors
for specified tomogram or laminogram
Use and operation of associated equipment for
tomography or laminography
Recognition of adverse reaction to specific
contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 9: BRONCHIAL TREE RADIOGRAPHS

TASKS a. Make contrast radiographs of the chest

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a bronchogram
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media, necessary equipment for the bronchograms
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs produced acceptable for interpretation

KNOWLEDGES AND SKILLS

- Anatomy of trachea and bronchial tree
- Radiographic positioning and technical factors for bronchograms
- Use of x-ray equipment
- Administration of specific contrast media
- Recognition of adverse reactions to specific contrast media
- Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 10: CARDIAC RADIOGRAPHS

TASKS a. Make contrast radiographs of the heart and
greater thoracic blood vessels

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a cardiac study
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs produced acceptable for interpretation

KNOWLEDGES AND SKILLS

Anatomy of the heart and greater thoracic blood vessels
Radiographic positioning and technical factors for specific cardiac studies
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media
Operation of injectors for administering contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 11: VENOUS SYSTEM RADIOGRAPHS

TASKS a. Make contrast radiographs of the venous system

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for a phlebogram
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs produced acceptable for interpretation

KNOWLEDGES AND SKILLS

Anatomy of the venous system
Radiographic positioning and technical factors for phlebograms
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 12: ARTERIAL SYSTEM RADIOGRAPHS

TASKS	a. Make renal arterial radiographs
	b. Make femoral arterial radiographs
	c. Make abdominal arterial radiographs

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for an arteriogram
(Behavior)	The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions)	With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria)	According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence)	Quality radiographs produced acceptable for interpretation

KNOWLEDGES AND SKILLS

Anatomy of the arterial system
Radiographic positioning and technical factors for examination of specific areas of the arterial system
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media
Use of catheters
Sterile technique

Competency: X-RAY TECHNICIAN (XRT)

Unit VIII: Contrast Radiography Examinations

MODULE 13: RADIOGRAPHS OF THE INFERIOR VENA CAVA AND RELATED VESSELS

TASKS a. Make contrast radiographs of the inferior vena cava

PERFORMANCE OBJECTIVE

(Stimulus) Upon request for a contrast radiographic study of the inferior vena cava
(Behavior) The XRT will prepare the patient, set up the technique and assist the physician during the specified examination
(Conditions) With supervision by the physician; using fixed or mobile x-ray unit, designated contrast media
(Criteria) According to established procedures and physician's instructions for proper radiologic techniques and patient positioning
(Consequence) Quality radiographs produced acceptable for interpretation

KNOWLEDGES AND SKILLS

Anatomy of the venous system
Radiographic positioning and technical factors for examination of the inferior vena cava and related vessels
Use of x-ray equipment
Administration of specific contrast media
Recognition of adverse reactions to specific contrast media
Emergency procedures for allergic reactions to contrast media
Use of catheters
Sterile technique

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT IX: SPECIALIZED RADIOGRAPHS

This unit includes the following modules:

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2	Photofluorography	70
3	Stereoscopy	71
4	Foreign Body Localization Other Than Eye	72
5	Foreign Body Localization in the Eye . . .	73

Competency: X-RAY TECHNICIAN (XRT)

Unit IX: Specialized Radiographs

MODULE 1: MAMMOGRAPHY

TASKS a. Make radiographs of the breast

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for a mammogram
(Behavior)	The XRT will take a series of radiographs, including craniocaudad, mediolateral and axillary views of both breasts
(Conditions)	Using special low-energy x-ray tube, special film and xerography plates
(Criteria)	Proper patient positioning and immobilization to enhance technical adequacy of film for diagnostic interpretation; using x-ray and xerography techniques
(Consequence)	A series of radiographs of the breast

KNOWLEDGES AND SKILLS

Anatomy of the mammary glands
Proper patient positioning and immobilization for radiographic examination
Ethics--respect for patient
Use and technical factors for special low-energy x-ray tubes, special film and xerography plates
Procedures for using x-ray and xerography techniques

Competency: X-RAY TECHNICIAN (XRT)

Unit IX: Specialized Radiographs

MODULE 2: PHOTOFLUOROGRAPHY

TASKS a. Make photofluorograms

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for a chest radiograph for screening purposes
(Behavior)	The XRT will position the patient and make specified photofluorograms
(Conditions)	Without supervision; using a camera with necessary accessories for photofluorographic unit
(Criteria)	Properly exposed radiograph produced with minimum patient exposure to radiation
(Consequence)	Chest radiograph technically adequate for screening interpretation
(Next Action)	Process photographic film

KNOWLEDGES AND SKILLS

Use and operation of photofluorographic camera and components
Positioning for chest examination
Anatomy of the chest
Technical factors for photofluorographic examination

Competency: X-RAY TECHNICIAN (XRT)

Unit IX: Specialized Radiographs

MODULE 3: STEREOSCOPY

TASKS a. Make stereoscopic radiographs

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request for stereoscopic examination of a particular area of the body
(Behavior)	The XRT will make the specified stereoscopic radiographs
(Conditions)	Using mobile or stationary x-ray equipment with appropriate stereoscopic attachments
(Criteria)	According to established stereoscopic techniques and patient positioning to produce two radiographs technically adequate for stereoscopic viewing
(Consequence)	Quality stereo radiographs for interpretation

KNOWLEDGES AND SKILLS

Procedures for stereoscopic radiographs--tube travel
Use of film cassettes, screens
Use of stereo x-ray film viewer
Radiographic technical factors and patient positioning for stereoscopic examination
Anatomy of body part to be examined

Competency: X-RAY TECHNICIAN (XRT)

Unit IX: Specialized Radiographs

MODULE 4: FOREIGN BODY LOCALIZATION OTHER THAN EYE

TASKS a. Make foreign body localization radiographs

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a request to localize a foreign body in an area of the body other than the eye
(Behavior)	The XRT will make radiographs and assist the physician in fluoroscopy
(Conditions)	With supervision by the physician; using stationary x-ray equipment, cassettes, immobilizing devices and film markers, fluoroscopy equipment
(Criteria)	According to established technical procedures for producing technically adequate radiographs of the specified area of the body and according to physician's directives for assisting in fluoroscopic examination
(Consequence)	Quality radiograph for interpretation

KNOWLEDGES AND SKILLS

- Gross anatomy of the body
- Use of standard x-ray unit and associated accessories
- Technique for assisting physician in fluoroscopic examination
- Patient orientation to position
- Selecting technical factors for filming and for fluoroscopy
- Positioning x-ray tube and film relationship

Competency: X-RAY TECHNICIAN (XRT)

Unit IX: Specialized Radiographs

MODULE 5: FOREIGN BODY LOCALIZATION IN THE EYE

- TASKS
- a. Make preliminary scout film of orbits
 - b. Make foreign body localization radiographs of the eye

PERFORMANCE OBJECTIVE

- (Stimulus) Upon request for localization of a foreign body in the eye
- (Behavior) The XRT will make a preliminary scout film of the orbits to determine the presence of the foreign body and if a foreign body is present, will perform localization techniques utilizing Sweet's or Pfeiffer's methods
- (Conditions) Without supervision; using special accessories appropriate to the localization method used
- (Criteria) Proper use of localization devices and technical factors; proper patient positioning; precise information for localization of foreign body in the eye
- (Consequence) Adequate visualization and localization of foreign body on a radiograph of the eye for graphing and interpretation by the physician

KNOWLEDGES AND SKILLS

Anatomy of the eye
Sweet's method of localization
Pfeiffer's method of localization
Proper positioning and technical factors for localization method used, e.g., Sweet's, Pfeiffer's
Procedures for making preliminary scout film of orbits
Operation of special accessories for localization method used

Competency: X-RAY TECHNICIAN (XRT)

COMPETENCY UNIT X: RADIOLOGIC PATIENT ADMINISTRATION

This unit includes the following modules:

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Competency: X-RAY TECHNICIAN (XRT)

Unit X: Radiologic Patient Administration

MODULE 1: PATIENT INSTRUCTION

- | | |
|-------|---|
| TASKS | <ul style="list-style-type: none">a. Review with patient printed instructions for examination/procedureb. Explain x-ray procedures to patientc. Inform patient of procedures required prior to/during examinationd. Explain/answer patient's questions regarding examinatione. Explain radiation safety measures to patient |
|-------|---|

PERFORMANCE OBJECTIVE

- | | |
|---------------|---|
| (Stimulus) | As requested by supervisor |
| (Behavior) | The XRT will explain radiographic instructions, procedures and safety measures concerning the specific examination to the patient |
| (Conditions) | Using standard printed or written instructions concerning examination to be performed |
| (Criteria) | Patient must know when to use what medication and when to perform certain procedures |
| (Consequence) | Properly informed patient adequately prepared for examination |
| (Next Action) | Perform examination |

KNOWLEDGES AND SKILLS

Types of radiographic examinations
Standard department instructions
Action of various medications
Communication and instructional techniques

Competency: X-RAY TECHNICIAN (XRT)

Unit X: Radiologic Patient Administration

MODULE 2: PATIENT APPOINTMENTS

- TASKS
- a. Schedule appointments for department, e.g., maintain appointment book
 - b. Contact other departments to obtain/coordinate patient/personnel appointments
 - c. Check consultation requests to insure the correct study is to be carried out

PERFORMANCE OBJECTIVE

- (Stimulus) Upon request from supervisor
(Behavior) The XRT will schedule appointments for examination requested
(Conditions) Using appointment book, department schedule
(Criteria) Properly scheduled examinations according to physician's request, department and hospital instructions, patient preparation and type of examination
(Consequence) Coordinated patient appointment and scheduling
(Next Action) Direct patient for radiographic examination

KNOWLEDGES AND SKILLS

- Department procedures
Procedures for scheduling and coordinating radiographic appointments

Competency: X-RAY TECHNICIAN (ART)

Unit K: Radiologic Patient Administration

MODULE 3: PATIENT OBSERVATION

- TASKS
- a. Ascertain if patient has been prepared for examination
 - b. Explain procedure to patient/family
 - c. Check I.V. site for infiltration, phlebitis, cellulitis
 - d. Inform physician of any contraindications to study

PERFORMANCE OBJECTIVE

- (Stimulus) Upon arrival of a patient in the x-ray department
- (Behavior) The XRT will prepare the patient preceding the x-ray examination
- (Criteria) Proper preparation of patient to gain patient's cooperation during examination, performed according to standard instructions concerning patient preparation for the examination
- (Consequence) This action will determine whether the patient has been adequately prepared for the examination and whether there are any contraindications to it
- (Next Action) Perform examination

KNOWLEDGES AND SKILLS

Examination to be performed
Procedures for patient preparation
Procedures to discontinue I.V. fluids
Recognition of contraindications to examination
Sensitivity to patient's apprehensions