

HORRY-GEORGETOWN TECHNICAL COLLEGE

Radiologic Technology Program

Master Plan of Clinical Education

Class of 2021-2023



Marion Medical Center

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HORRY-GEORGETOWN TECHNICAL COLLEGE

RADIOLOGIC TECHNOLOGY PROGRAM

MASTER PLAN SUMMARY OF CLINICAL EDUCATION

Clinical education takes place in various health care settings during all semesters of the program. It begins with observation of procedures and gradually the student learns to assist in procedures. After completing didactic and laboratory sessions, the student performs radiographic examinations unassisted, with the direct supervision of a qualified radiographer. After a determined number of exams have been completed, the student may request a clinical competency evaluation. Upon successful completion of the competency, the student may perform the exam with indirect supervision.

*** At no time can a student perform portable exams outside of the department, or Operating room procedures without direct supervision: RT must be immediately available.**

Throughout the 6 semesters, students gradually become competent in more complicated procedures, until all competency categories are completed. At the end of the 6th semester, the student will perform terminal competencies before he /she qualifies for graduation.

Before taking a competency evaluation in any given area, a student must be directly supervised at all times by a qualified radiographer. Direct supervision is defined by the Standards of an Accredited Program in Radiologic Sciences, as follows:

Until the student achieves and documents competency in any given procedure, all clinical assignments shall be carried out under the direct supervision of qualified radiographers. The parameters of direct supervision are:

1. A qualified radiographer reviews the request for examination in relation to the student's achievement
2. A qualified radiographer evaluates the condition of the patient in relation to the student's knowledge
3. A qualified radiographer is present during the performance of the examination
4. A qualified radiographer reviews and approves the radiographs

After demonstrating competency, students may perform procedures with indirect supervision.

"Indirect supervision is defined as that supervision provided by a qualified radiographer immediately available to assist students regardless of the level of student achievement. Immediately available is interpreted as the presence of a qualified radiographer adjacent to the room or location where radiographic procedures are being performed. This means that a qualified radiographer is within hearing distance, with no electronic means of contact, such as beepers or phones acceptable."

This applies to all areas where ionizing radiation equipment is in use.

To ensure continued competence, students may AND WILL be re-comped at any time during their clinical education.

In order to receive and maintain accreditation status, these standards must be adhered to at all times.

RULES AND GUIDELINES FOR CLINICAL EDUCATION

Radiography students are under the direct supervision of the clinical preceptor for all educational functions within the clinical affiliate. Students will also receive instruction and directions from the radiographer to whom they are assigned. In turn, the radiographer provides input to the clinical instructor regarding the student's progress. Students are not to perform procedures on patients without proper instruction and supervision as described in the Joint Review Committee Standards of an Accredited Program in radiography. Students are to participate in a team effort with staff to perform department activities as needed; such as maintaining department cleanliness, replenishing supplies, and transporting patients as appropriate. Students are to participate in planned learning activities as assigned by the Clinical Preceptor.

ATTENDANCE POLICIES

The daily times of attendance will vary somewhat depending on the clinical assignment. Total hours of class time and clinical education will not exceed 40 hours per week.

Absence and/or tardiness will have a detrimental effect on attainment of clinical and professional goals and will reflect in the student's performance. Tardiness is unprofessional and will be documented on your professional development sheets. After 3 tardies, the student will receive a verbal warning and be charged with 1 day absent. This day must be made-up regardless of total days absent!. Tardy is any time after the scheduled start time. Additional tardies will be counted and each 3 will count as one day absent. 7 tardies in any one semester will result in termination from program.

Two (2) days per semester are allotted for sickness.

* Absences must be reported to the CP and CC 30 minutes before the clinical assignment is set to begin.

- **Failure to report to the CP and the CC 30 minutes prior to start time will result in a mandatory make-up day regardless of amount of previous days absent. No Exceptions!**

If the site clinical preceptor is not available at time of call, the student must call back and speak with the CP. Any illness of more than 2 days may require a written explanation from a physician. Absences past the allowed 2 must be made up. The make-up time must be approved by the clinical preceptor and the clinical coordinator.

Excessive tardiness and any unexcused absences shall be cause for disciplinary action.

Falsifying attendance is grounds for immediate dismissal.

Deficiency of assignments due to absence will be rescheduled by the CP and/or the CC. Available time is limited to semester breaks and final exam week. Make up time must be completed by the end of the semester.

In the event that a student receive the grade of Incomplete, they have a time limit of 2 weeks to make-up any missed work/time.

During the 4th thru 6th semesters, all students are required to rotate through one weekend shift (includes a Saturday and a Sunday), as well as a week of evening rotation; Monday, Wednesday, and Friday- 1:30 - 9 pm.

CLINICAL TIMES

During semester 2, the student will attend clinical on Tuesday and Thursday, 8:30am - 3:30pm. These hours are mandatory and are not subject to change for any reason. Semesters 3 hours are: Tuesday and Thursday, 8:00am - 3:30pm.

During semesters 4 – 6, the student will attend clinical Monday, Wednesday and Friday from 8:00am - 4:00pm. In addition, during the 4th - 6th semester students must rotate through a weekend shift to include Saturday and Sunday, hours to be discussed. The following week the student will be off

Monday and Wednesday. Students must also rotate through a week of evening shifts in the 4th through 6th semester. The hours will be Monday, Wednesday and Friday from 1:00 – 9:00pm.

CLINICAL ATTENDANCE POLICY

Each semester the number of allowed days off will be determined and discussed in the corresponding Instructional Package. This number will be determined based on 90% attendance. Depending on total number of days for each semester; verbal, written, and final warning will be documented. Any absence after a final warning will result in termination from the radiography program. Any absences in excess of 2 during any semester must be made up during the semester the absences occurred.

NO EXCEPTIONS!!!

3 tardies to class or clinical assignments will be equal to one absence and will be counted with total days absent.

REPORTING ABSENCES And TARDINESS

If it is necessary for you to be absent on a clinic day, you **MUST** call:

1. The clinical preceptor at your assigned site – if not available at time of call, leave a message and call later and speak directly with the Clinical Preceptor

AND

-The clinical coordinator office: (843) 477-2180 or program director- (843) 839-1149

Leave a voice message or a text message!!

You must call 30 minutes prior to scheduled start time.

Failure to call these 2 persons at the correct time **WILL** result in a mandatory make-up day regardless of total days missed. 2 no-calls will result in a final warning.

NO EXCEPTIONS!!!!

At any time while a student in the radiology program a second final warning letter is grounds for immediate dismissal!

CLINICAL TRAINING MAKE-UP POLICY

This policy serves to identify the procedure and criteria for making up days in excess of the 2 allotted for illness during the academic semester.

Early departure from the assigned clinic area for any reason other than illness prior to the completion of the assigned clinic hours will be unacceptable and will result in a warning letter being placed in the student's file. (Two warning letters may result in dismissal)

Sick leave days which exceed the allotted 2 days must be accounted for by the student in order to complete their clinical education and receive the recommendation of the program director to sit for the American Registry of Radiologic Technologists Certification Exam. Missing clinic means you will not be able to accomplish your clinical objectives.

Any time taken which exceeds the allowed 2 days must be made-up before final grade is given.

The following criteria will serve as guidelines for the student to reestablish their good standing in the clinical phase of their educational process.

1. All make-up time must be pre-approved by the site Clinical Preceptor and Clinical Coordinator.
2. If the student misses the assigned make-up time they will be assigned an additional make-up day.
3. Make-up time will be made up within the same semester of the missed day.
4. Make-up time is limited to vacation time and Final exam week.
5. The missed time is to be made-up in one block. Ex.- If a seven hour day is missed, the time must be made-up in a 7 hour block.
6. The student must comply with the programs dress code on days the time is being made up.
7. During the 4th through 6th semester, if an evening or weekend rotation is missed, the student must make up an evening or weekend, regardless of total days absent.

These guidelines will be utilized by the Radiologic Technology program to provide the student with a mechanism to complete their clinical education when students' attendance has been affected by adverse circumstances.

CORRECTIVE DISCIPLINARY PROCEDURES

The following progressive guidelines are followed for corrective disciplinary procedures:

Level One

The first step in corrective discipline is a verbal warning. The reason for the warning and the result if the behavior is repeated will be communicated to you. These warnings are routinely documented.

Level Two

A written or second Level warning is the next step in the corrective discipline procedure. The reason for the warning and the result if the behavior is repeated will be documented for your personal file. The program director and/or clinical coordinator will be notified of this event.

Level Three

A final, written warning involving the same offense or a variety of offenses will be documented. The program director and/or clinical coordinator will be immediately notified of this event for evaluation and recommendation of further action. A level three warning will constitute grounds for immediate dismissal from the clinical affiliate and/or dismissal from the program.

- At any time while a student in the radiology program, 2 final warning letters is grounds for immediate dismissal.

DISCIPLINARY PROCEDURES and SUSPENSION

Some offenses are serious enough to be cause for immediate dismissal from the program. Unprofessional, unethical or amoral conduct includes but is not limited to:

1. Breaching patient confidentiality, revealing personally identifiable facts obtained as a result of a student patient relationship or access to patient records, without prior consent of the patient.
2. Performing a task which the student knows or has reason to know that he/she is not competent to perform unsupervised.
3. Reporting to the clinical site under the influence or with the smell of alcohol or drugs; or carrying out student responsibility while the ability to perform is impaired by alcohol, drugs, or mental disability.
4. Impersonating another health care practitioner.
5. Independently delegating a task assigned to him/her by an instructor or supervisor to another individual.
6. Willfully harassing, abusing, or intimidating another individual.
7. Refusal to follow instructions or to complete an assignment.
8. Dishonesty, including theft, plagiarism, cheating or falsification of records
9. Carelessness in handling drugs or drug records.
10. Conduct endangering the welfare of patients, employees or visitors.
11. Possession of dangerous weapons on hospital premises.
12. Fighting, assault and battery.
13. Solicitation, posting or distributing articles/literature of any nature on hospital premises without approval.

METHODS OF CLINICAL EVALUATION

Clinical Competency/Professional Development

The student begins his/her clinical participation by assisting the radiographer in the performance of radiographic procedures. The rate of student progress depends on the students' ability to comprehend and perform the various tasks required by the program.

As the student becomes experienced in a given procedure or procedures, he/she will perform the procedure unassisted and directly supervised by the radiographer.

Clinical competencies may only be performed after the didactic instruction is complete.

JRCERT Standard 5.4 The program assures that medical imaging procedures are performed under the appropriate supervision of a qualified radiographer.

Direct Supervision- a registered radiologic technologist must be in the room or immediately outside the room and the RT must watch the student perform the exam.

The qualified radiographer must:

- review the procedure in relation to the students achievement
- evaluate the condition of the patient in relation to the students knowledge
- is physically present during the conduct of the procedure and
- reviews and approves the procedure and/or image.

Indirect Supervision- the registered radiologic technologist is immediately available to the student if they need assistance regardless of the student achievement.

Students may request competency examinations or the clinical preceptor may direct students to perform a competency according to the following procedure:

1. a request for competency evaluation or check-off is initiated.
2. clinical educator verifies all prerequisites have been met.

The evaluator will complete the appropriate clinical competency evaluation form based on students' performance of the exam. The grade is calculated and evaluated with the student after the exam.

Students must receive a minimum grade of 80% to pass the competency. A student who receives less than 80% will have an opportunity to repeat the competency ONCE during that grading period. The repeat exam grade will be averaged in with the other competency exam for the final competency grade.

Students who do not successfully complete the required competencies for each grading period will lose points toward final clinic grade.

Repeat images must be completed under direct supervision.

Clinical Grading Scale

The scale for conversion of **Clinical Competency** percentage is as follows:

100-96% = A

95-90% = B

89-84% = C

83-80% = D

79-0% = F

The scale for conversion of **Professional Development** score is as follows:

Grade A = 96-100

Grade B = 90-95

Grade C = 84-89

Grade D = 80-83

79% or below is failing for clinical grades

*Any area of clinical grading is subject to change

Semester Clinical Requirements

Competency exams are divided by semester according to the level of difficulty, with only semester 1 and 6 having specific requirements. Students must complete the specified number of requirements per semester to receive a Final Grade (See Competency Requirements per Semester)

YEAR 1

FALL SEMESTER I

1. Male CXR
2. Female CXR
3. KUB- Male
4. KUB- Female
5. 3 PD's
6. 3 Room Competencies
7. Site Orientation Form

SPRING SEMESTER I

1. 12 (minimum) CC's
2. 3 Re-comps- CXR, KUB, Upper Limb
3. 4 PD's

SUMMER SEMESTER I

1. 12 (minimum) CC's
2. 4 Re-Comps- CXR, Knee, Elbow, Shoulder
3. 3 room Competencies
4. Site Orientation Form
5. 4 PD's

YEAR 2

FALL SEMESTER II

1. 15 (minimum) Competencies
2. 5 Re-Comps
3. 5 PD

SPRING SEMESTER II

1. 15 (minimum) Competencies
2. 1 CT checklist
3. 5 Re-comps
4. 5 PD
5. 3 room Competencies
6. Site Orientation Form

SPRING SEMESTER II

1. 15 (minimum) Competencies/ 1 CT checklist/ Terminal Comp Exam
2. 5 PD
3. Re-Comps

* Head Work- may include: facial bones, skull, mandible series, orbits, zygomatic arches,
- all to include 3 view minimum series
Cannot be: nasal bones, Panorex, 1 view sinuses

There are a specific number of competencies that are assigned each semester.

Each time a student changes sites the following Miscellaneous CC's must be completed within 1st 2 weeks of semester- Stretcher, Wheelchair, O2 equipment, suction equipment and MRI Safety checklist

A Terminal Competency examination will be required in the 5th and 6th semester. Its intent is to evaluate the students' ability to integrate previously learned clinical skills. Students must receive a C or better to pass. A student who receives a D or F must repeat and earn a C to pass the course.

Beginning in semester II, re-comps will be due each semester. The "re-comp" exam will be specifically assigned by the CC or can be requested at any time by the clinical instructor at students' assigned site. The "re-comp" grade will be part of the semester final grade.

Summer I	Fall I	Spring I	Summer I	Fall II	Spring II
20	20	20	20	20	20
	Required CC's Routine CXR <ul style="list-style-type: none"> • male • female <ul style="list-style-type: none"> • KUB- • male • female Suggested CC's <ul style="list-style-type: none"> • Upper Ext • Lower Ext • shoulder • pelvis • hip • C-Spine • T-Spine • L-Spine • Abd. Series 	Suggested CC's <ul style="list-style-type: none"> • IVU or UGI -not previously comped on • Hip AP and frog OR AP and XTL • Mobile chest • Cervical spine • Lumbar spine • Shoulder W/ axillary view OR Y-view (trauma) 	Suggested CC's <ul style="list-style-type: none"> • Thoracic Spine • Ribs • Sinuses • Hip - not previously comped on • Shoulder -not previously comped on 	Suggested CC's <ul style="list-style-type: none"> • Barium Enema • Ped. Competency • Surgical Checklist • Special Procedures checklist • Pediatric Chest • Headwork 	Suggested CC's <ul style="list-style-type: none"> • CT checklist • CT Worksheet • Trauma-adult lower Ext.-must include XTL • Terminal Competency

The above chart in semester 1-6 are suggestions only. Semester 1 and 6 has specific requirements.

Semester 2 - 5 require specific numbers rather than exams. Students may progress more rapidly in the CC areas as their ability allows, but **MUST** complete the minimum requirements to advance to the next semester.

All 39 exams must be completed prior to Program Directors signature for National credentialing examination.

20 of the 30 electives must also be completed prior to graduation and **CANNOT** be simulated.

Initial CC's should be 1st year student appropriate. 2nd and 3rd CC must be at a higher level of difficulty.

Meeting the HGTC program requirements satisfies the ARRT requirements and program requirements.

Sem 1- Thorax, Abdomen and Upper Limb covered in class.

Sem 2- Lower Limb, Pelvis/Hip, shoulder, Spine covered in class.

Clinical Evaluation Outcomes

PREPARATION
Select appropriate cassettes- OR - able to correctly prepare X-ray tube and IR for body habitus
Prepare room and obtain necessary supplies- set up console
Provide clean and orderly work area
* Evaluate the request (orders) for exam and pt information, inquires and documents relevant history
PATIENT CARE METHODS
* Verify correct patient I.D
* Follow Standard Precautions
Assist patient to and from exam room and demonstrates concern for patient comfort/modesty
Explain exam to patient-age appropriate
* Check for possible pregnancy in females age 10-60
Check for and remove any non-diagnostic material from area of interest
Assist, monitor and communicate with patient through exam while maintaining modesty.
* Utilizes radiation protection for all involved persons
POSITIONING SKILLS - PROJECTION AP/PA
* Correctly position anatomic area
* Direct CR appropriately
Align tube, part and film
* Correctly place lead marker on film and it is visible on image
* Correctly collimates
* Select appropriate technique Mandatory- Kvp-___ MAS-___ Able to set CONSOLE -
POSITIONING SKILLS - PROJECTION Lateral
* Correctly position anatomic area
* Direct CR appropriately
Align tube, part and film
* Correctly place lead marker on film and it is visible on image
* Correctly collimates
* Select appropriate technique Mandatory- Kvp-___ MAS-___ Able to set CONSOLE
SKILLS SECTION
Gives proper breathing instructions for all proj's - "double inspiration"
Complete position within 2.5 minutes for all projections
Make exposures while observing patient for all projections
Utilize proper SID for ALL projections
* Identify all views correctly
* Able to identify all anatomy
Properly annotates and orients images
IMAGE EVALUATION - ALL PROJECTIONS
All images free of visible motion
* All anatomy included on all images
* Knows how to determine if patient is correctly positioned.
Able to determine that proper exposure factors used

* Failure to demonstrate any starred item results in a score of 79%

Student Site Orientation

Student _____ Site _____

	Student Initial	CI Signature	Date
Grading Explanation			
Required Paperwork			
Department Tour			
Rad. Rooms -equipment -control panel -supply area			
Dressing Area			
Reading Rooms			
Main Supply Area			
File Room			
Pt. Hold Areas			
Drug Cart/s			
O2 Locations			
Emergency Shut-offs			
Other Departments Tour: ER, OR, ICU, Admissions, Outpatient Lab, CT, MRI			
Department Protocol Handouts			
Student Parking Instructions			

Codes	Organization "Nickname"	Action Ex-How to call	
Cardiac and-or Respiratory Arrest			
Fire			
Severe Storm			
Bomb Threat			
Baby/Child Abduction			
Trauma			

What does R.A.C.E stand for?

Name of disinfectant used to clean x-ray equipment.

What does HIPAA stand for?

Equipment Competency Form

Student _____ Date _____

Clinical Site _____ Evaluator _____

The student was able to demonstrate mastery of the following area-specific skills: (to be done for each radiographic room)

COMPETENCY AREA	YES	NO
CONTROL PANEL / CONSOLE		
1. The student was able to locate and identify the kVp selector		
2. Given a specific kVp, the student was able to correctly set the indicated value		
3. The student was able to locate and identify the mAs selector.		
4. Given a specific mAs , the student was able to accurately set the indicated value.		
5. The student was able to locate and identify the phototimer.		
6. Given a specific chamber to select, the student was able to accurately manipulate the phototimer to select the indicated cell(s).		
7. The student was able to correctly identify the rotor and exposure switch.		
8. The student was able to rotor and make an exposure.		
9. The student was able to locate and identify the overload reset.		
TABLE		
1. The student was able to identify the control for moving the table top.		
2. The student was able to correctly move the table from left-to-right.		
3. The student was able to correctly move the table top from inferior to superior.		
4. The student was able to identify the control for table angle.		
5. Given a specific degree of angle, the student was able to accurately angle the table to that given angle.		
6. The student was able to remove the foot rest.		
7. The student was able to replace the footrest, ensuring it was locked in place.		
BUCKY TRAY		
1. The student was able to open the table bucky tray.		
2. The student was able to open the upright bucky tray		
3. Given a cassette of any size, the student was able to insert and lock it into bucky.		
4. The student was able to close the bucky tray completely.		
5. The student was able to remove the cassette from the bucky tray.		

COLLIMATOR	YES	NO
1. Identify collimator controls		

2. Manipulate collimator to varying cassette and/or IR sizes		
DETENT	YES	NO
1. Center the tube to the upright bucky – detent. 40 inches		
2. Center the tube to the upright bucky- detent – 72 inches		
3. Center the tube to the table bucky – detent- 40 inches.		
4. The student was able to determine 40 inches from tube to table-top.		

Comments- remarks should be written for any NO check-marks.
Any no check-marks will result in a "re-comp" for that area/room.

Evaluator

Student Signature

Comments

Clinical Competency Evaluation

GENERAL RADIOGRAPHY

Examination _____ Clinical Site _____

PREPARATION	
Select appropriate cassettes- OR- able to correctly prepare X-ray tube and IR for body habitus	
Prepare room and obtain necessary supplies- set up console	
Provide clean and orderly work area	
* Evaluate the request (orders) for exam and patient information, inquires and documents relevant history	
PATIENT CARE METHODS	
* Verify correct patient I.D	
* Follow Standard Precautions	
Assist patient to and from exam room and demonstrates concern for patient comfort/modesty	
Explain exam to patient-age appropriate	
* Check for possible pregnancy in females age 10-60	
Check for and remove any non-diagnostic material from area of interest	
Assist, monitor and communicate with patient through exam while maintaining modesty.	
* Utilizes radiation protection for all involved persons	
POSITIONING SKILLS - PROJECTION AP/PA	
* Correctly position anatomic area	
* Direct CR appropriately	
Align tube, part and film	
* Correctly place lead marker on film and it is visible on image	
* Correctly collimates	
* Select appropriate technique Mandatory- Kvp-___ MAS-_____	
Able to set CONSOLE - (Indicate in comments)	
POSITIONING SKILLS - PROJECTION Lateral	
* Correctly position anatomic area	
* Direct CR appropriately	
Align tube, part and film	
* Correctly place lead marker on film and it is visible on image	
* Correctly collimates	
* Select appropriate technique Mandatory- Kvp-___ MAS-_____	
Able to set CONSOLE	
SKILLS SECTION	
Gives proper breathing instructions for all proj's - "double inspiration"	
Complete position within 2.5 minutes for all projections	
Make exposures while observing patient for all projections	
Utilize proper SID for ALL projections	
* Identify all views correctly	
* Able to identify all anatomy	
Properly annotates and orients images	
IMAGE EVALUATION - ALL PROJECTIONS	
All images free of visible motion	
* All anatomy included on all images	
* Knows how to determine if patient is correctly positioned.	
Able to determine that proper exposure factors used	

Failure to demonstrate any star item result in automatic score of 79%. Must be re-comped and both scores averaged for final grade. (((Techniques are required for all exams-even with DR and CR equipment.)))

CLINICAL COMPETENCY EVALUATION

CONTRAST RADIOGRAPHY

Student _____ Date _____ Grade _____

Examination _____ Site _____

PREPARATION	YES	NO
1. Select appropriate cassettes (if applicable)		
2. Technical factors set for fluoro.- control panel- KVP-_____MAS-_____		
3. Spot film/digital imaging ready for exposure		
4. Prepare room and obtain necessary equipment		
*5. Contrast Media ready for administration		
6. Locate emergency supplies		
*7. Evaluate the request/orders for procedure and documents history		

PATIENT CARE METHODS	YES	NO
* 8. Verify correct ID of patient		
9. Assess patient condition		
10. Assist pt. to and from room		
11. Explain exam and risks to patient-age appropriate		
* 12. Check for possible pregnancy in females age- 10-60		
* 13. Document clinical and allergy history		
14. Complete consent form as required		
15. Check for and remove any non-diagnostic material from area.		
16. Assist pt. throughout exam while maintaining modesty		
* 17. Follow standard precautions		
18. Monitor and communicate with pt. throughout exam		
19. Demonstrate consideration for pt. comfort		
* 20. Utilize proper radiation protection for all involved		
21. Explain post-exam instructions to patient		

POSITIONING SKILLS	YES	NO	YES	NO	YES	NO
22. Correctly position anatomical area						
23. Direct central ray correctly						
24. Use proper alignment, SID and collimation						
25. Gives proper breathing instructions						
* 26. Correctly place lead markers on film						
27. Selects appropriate techniques						
28. Makes exposure while observing patient						
29. Completes position within 2 ½ minutes						

AP/PA

Lat

Obl

IMAGE EVALUATION	YES	NO	YES	NO	YES	NO
30. Image free of visible motion						
* 31. Identify views correctly						
* 32. Identify eval. criteria and related anatomy						
* 33. All anatomy included						
34. Technique adequate to demonstrate part						
35. Patient ID clearly visible						
36. Lead marker visible						

*Failure to perform the starred items results in immediate 79%

Total Possible Points

1 projection – 36 points	100%-96%- A
2 projections- 50 points	95%-90%- B
3 projections- 64 points	84%-89%- C
4 projections- 78 points	83%-80%- D
5 projections- 92 points	79%-0- F

- **This form will not be accepted unless all sections are completed, including titles, signatures and comments.**
- **Must include techniques used**

Rev 3/09 ms

CLINICAL COMPETENCY EVALUATION
PEDIATRIC RADIOGRAPHY

Student _____ Date _____ Grade _____

Exam _____ Pediatric- up to 3 years old Site _____

PREPARATION	YES	NO
1. Select appropriately sized cassettes		
2. Prepare physical facilities and obtain necessary equipment		
3. Provide clean and orderly work area		
*4. Evaluate request/orders for procedure and patient information		

PATIENT CARE METHODS	YES	NO
*5. Verify ID of child with guardian		
6. Call child by name and establish rapport		
7. Assess the child's physical condition and developmental age		
8. Assist child to and from radiographic room		
9. Explain exam to child- age appropriate		
10. Provide explanation to child's guardian		
*11. Document clinical history		
12. Check for and remove non-diagnostic material		
13. Assist child through exam while maintaining modesty		
*14. Follow standard precautions		
15. Monitor and communicate with child and guardian throughout exam		
16. Demonstrate empathy for child's comfort		
*17. Set correct technique MAS-_____ KvP-_____		
*18. Utilize shielding for <u>all</u> involved		
19. Ensure child safety by providing adult supervision at all times		
20. Return child to guardian		

POSITIONING SKILLS	YES	NO	YES	NO	YES	NO	YES	NO
21. Position area correctly								
22. Direct CR correctly								
23. Utilize proper SID								
24. Align tube, part and film								
25. Give proper breathing instructions								

*26. Correctly place lead markers								
27. Properly collimate								
28. Make exposure while observing child								

IMAGE EVALUATION	YES	NO	YES	NO	YES	NO	YES	NO
29. Image free of motion								
*30. All anatomy included								
31. Lead marker visible								
*32. Identify views correctly								
*33. Identify EC -from Merrills								
*34. Technique adequate to demo. part								
35. Patient ID clearly visible								

* Failure to demonstrate starred items results in automatic 79%

Evaluator

Student Signature

Comments

100-96%- A

95%-90%- B

84%-89%- C

83%-80%- D

79-0= F

***This form will not be accepted unless all sections are completed, including titles, signatures and comments.**

Rev. 07-10 ms

Mobile Radiography Competency

Student _____ Date _____ Grade _____

Examination _____ Site _____

PREPARATION	YES	NO
*1. Identifies correct patient and exam according to requisition.		
2. Locates and drives the mobile unit to the patients room		
3. Politely asks visitors to wait outside the room.		
4. Introduces self to patient and explains the procedure.		
*5. Correctly ID's the patient.		
6. Obtains and documents the history prior to exam.		
*7. Inquires about possible pregnancy in females. Age- 10-60		
8. Removes all radiopaque foreign bodies.		
9. Respects patient modesty and provides comfort to the patient.		
10. Examines patient and selects appropriate cassette.		
11. Adjusts the patient into the correct position for the procedure.		
12. Able to manipulate the machine with ease.		
13. Positions the machine correctly at patient bedside.		
14. Instills confidence in pt by exhibiting self-confidence throughout exam.		
*15. Provides radiation protection for self and all involved.		
16 . Leaves room and patient neat and comfortable.		

POSITIONING	YES	NO
1. Places the cassette properly.		
2. Centers the tube to the cassette correctly.		
3. Adjusts the tube to the proper SID.		
*4. Correctly places lead marker on cassette to not obstruct anatomy.		
5. Lead marker correctly shows on image.		
6. Correctly collimates at minimum to the cassette size.		
7. Stands at least 6 feet away during exposure.		
8. Gives proper breathing instructions.		
*9. Sets the proper exposure factors. kVp-_____ MAS-_____		
10. Completes the exam within a reasonable time frame.		
11. Returns the mobile unit to the proper place and charges the unit.		
12. Correctly identifies (flashes) image.		

IMAGE EVALUATION	YES	NO
1. Image free of visible motion		
* 2. Identify views correctly		
* 3. All anatomy included		
* 4. Know Eval Crit. and related anatomy		
5. Properly annotates and orients image		
6. Proper exposure factors used		
7. Patient ID clearly visible		

Total Possible Points: 35

- 100%-96% = A**
- 95-90% = B**
- 84-89% = C**
- 83-80% = D**
- 79-0% = F**

Evaluator

Student Signature

Comments

Special Procedure CHECKLIST

Student _____ Date _____ Grade _____

Examination _____ Site _____

GENERAL	YES	NO
Evaluation of request		
Set up of room.		
Gather appropriate cassettes.		
Place/remove headboard, shoulder/knee brace as needed.		
Gather appropriate supplies as needed.		
** Set a tray using sterile technique.		
Prepare Contrast Media for administration. Name of contrast _____		
Identify patient and place on table.		
Explain procedure.		
Check chart for consent form.		
Assist MD with needle puncture maintaining sterile technique.		
Change films and assist patient with positioning.		
Inform patient of post-procedure instructions.		
Fill out necessary paperwork as per procedure protocol.		
Follow Standard precautions.		

Evaluator _____

Student Signature _____

Comments

Pass _____ Fail _____

CHECKLIST FOR SURGERY / C-Arm- Orthopedic

Student _____ Date _____ Grade _____

Procedure Performed _____ Site _____

GENERAL	YES	NO	
Wear appropriate apparel for O.R (shoe cover, mask, scrubs, head cover)			
* Provide radiation protection for all involved in procedure.			
Verify pregnancy status in females.			
Locate sterile field in OR and demonstrate proper sterile techniques.			
Demonstrates proper loading of film in designated darkroom.			
Complete request with appropriate information (fluoro.time, films, etc.)			
Disinfect mobile unit regarding fluids post OR procedure.			
Demonstrate operation of C-Arm.			
Turn fluoro on/off.			
Properly set control panel for fluoro.			
Properly set control panel for spot films.			
Correctly connect TV monitor and Mobile C-Arm.			
Accurately load patient information into TV monitor.			
Store and retrieve image from disk drive.			
Produce permanent film from stored image.			
Place C-Arm tube in vertical position.			
Place C-Arm tube in horizontal position			
Skillful operation of all locks.			
Application of C-Arm drapes.			

MUST: State size of film (if applicable) and average technique for common OR exams on average patient:

Briefly describe procedure performed-

Lateral C-Spine-_____

Lateral L-Spine-_____

Hip-_____

Wrist-_____

Knee-_____

CHECKLIST FOR SURGERY / C-Arm- Non-Orthopedic

Student _____ Date _____ Grade _____

Procedure Performed _____ Site _____

GENERAL	YES	NO
Wear appropriate apparel for O.R (shoe cover, mask, scrubs, head cover)		
* Provide radiation protection for all involved in procedure.		
Verify pregnancy status in females.		
Locate sterile field in OR and demonstrate proper sterile techniques.		
Demonstrates proper loading of film in designated darkroom.		
Complete request with appropriate information (fluoro.time, films, etc.)		
Disinfect mobile unit regarding fluids post OR procedure.		
Demonstrate operation of C-Arm.		
Turn fluoro on/off.		
Properly set control panel for fluoro.		
Properly set control panel for spot films.		
Correctly connect TV monitor and Mobile C-Arm.		
Accurately load patient information into TV monitor.		
Store and retrieve image from disk drive.		
Produce permanent film from stored image.		
Place C-Arm tube in vertical position.		
Place C-Arm tube in horizontal position		
Skillful operation of all locks.		
Application of C-Arm drapes.		

MUST: State size of film (if applicable) and average technique for common OR exams on average patient:

Briefly describe procedure performed

CLINICAL Competency EVALUATION: Arthrogram/ Myelogram

Student _____ Date _____ Grade _____

Examination _____ Site _____

PREPARATION	YES	NO
1. Select appropriate cassettes (if applicable)		
*2. Technical factors set for fluoro.- control panel- KVP- _____ MAS- _____		
3. Spot film/digital imaging ready for exposure		
4. Prepare room and obtain necessary equipment		
*5. Contrast Media ready for administration		
6. Locate emergency supplies		
*7. Evaluate the request for procedure and documents history		

PATIENT CARE METHODS	YES	NO
* 8. Verify correct ID of patient		
9. Assess patient condition		
10. Assist pt. to and from room		
11. Explain exam and risks to patient-age appropriate		
* 12. Check for possible pregnancy in females age- 10-60		
* 13. Document clinical and allergy history		
14. Complete consent form as required		
15. Check for and remove any non-diagnostic material from area.		
16. Assist pt. throughout exam while maintaining modesty		
* 17. Follow standard precautions		
18. Monitor and communicate with pt. throughout exam		
19. Demonstrate consideration for pt. comfort		
* 20. Utilize proper radiation protection for all involved		
21. Explain post-exam instructions to patient		

POSITIONING SKILLS	YES	NO	YES	NO	YES	NO
22. Correctly position anatomical area						
23. Direct central ray correctly						
24. Use proper alignment, SID and collimation						
25. Gives proper breathing instructions						

* 26. Correctly place lead markers on film						
27. Selects appropriate techniques						
28. Makes exposure while observing patient						
29. Completes position within 2 ½ minutes						

IMAGE EVALUATION	YES	NO	YES	NO	YES	NO
30. Image free of visible motion						
* 31. Identify views correctly						
* 32. Identify eval. criteria and related anatomy						
* 33. All anatomy included						
34. Technique adequate to demonstrate part						
35. Patient ID clearly visible						
36. Lead marker visible						

*Failure to perform the starred items results in immediate 79%

Evaluator

Student Signature

Comments

Total Possible Points

- 100%-96% = A
- 95%-90% = B
- 84%-89% = C
- 83%-80% = D
- 79%-0 = F

- This form will not be accepted unless all sections are completed, including titles, signatures and comments.
- Must include techniques used.

Special Procedure Competency

***For "Special Exams" Performed In General Rad Department- Ex. ERCP, Cysto Study, Hysterosalpingogram, Etc

Student _____ Date _____ Grade _____

Examination _____ Site _____

GENERAL	YES	NO	N/A
Evaluation of request			
Set up of room.			
Gather appropriate cassettes.			
Place/remove headboard, shoulder/knee brace as needed.			
Gather appropriate supplies as needed.			
Set a tray using sterile technique.			
Prepare Contrast Media for administration. Name of contrast _____			
Identify patient and place on table.			
Explain procedure.			
Check chart for consent form.			
Assist MD with needle puncture maintaining sterile technique.			
Change films and assist patient with positioning.			
Inform patient of post-procedure instructions.			
Fill out necessary paperwork as per procedure protocol.			
Follow Standard precautions.			
Performs images as / if instructed			

Pass-(all Yes/NA checks)-100% _____ Fail-(any No checks)-79% _____

Evaluator _____

Student Signature _____

Comments _____

Clinical Competency Evaluation – Sterile Tray/ Technique

Student _____ Date _____ Grade _____

Examination _____ Site _____

Final Grade- P-100% / F-0

A. Prepare a sterile tray properly, as described below:	Yes	No
1. Wash hands thoroughly		
2. Check tray label and expiration date		
3. Place on clean cart; have extra supplies near to add to tray		
4. Open 1 st corner away from you, 2 nd side corners from center, and last toward you		
5. Do not touch the inside parts of the tray		

B. Add extra supplies to the sterile tray properly, as described below:	Yes	No
1. Gather extra supplies (syringes, needles, etc) and add to the tray		
2. Grasp the outside wrapper of the sterile package and peel open; do not touch the inside of the wrapper or the item		
3. "Drop" items into the sterile tray without touching the tray or item		
4. Discard the outside wrapper		

C. Add sterile solutions to the sterile tray properly, as described below:	Yes	No
1. Gather liquids (contrast, medications, etc) to add to the tray		
2. Verify the contents of the bottle, and check expiration date		
3. Remove seal and cap from bottle correctly		
4. Pour solution slowly and in the correct position		
5. Discard remaining fluid and bottle, after procedure complete		

D. Open and apply sterile gloves properly, as described below:	Yes	No
1. Wash hands thoroughly		
2. Remove outer and inner glove wrapper		
3. Identify right and left glove		

4. With non-dominant hand, grasp inside cuff of glove and properly apply glove to hands		
5. Interlock fingers of glove to ensure proper fit		

E. Dispose of sterile gloves properly, as described below:	Yes	No
1. Grasp outside of the cuff, with the other gloved hand		
2. Pull glove off, turning inside out, discard in trash		
3. Slide fingers underneath cuff and pull of remaining glove and discard		
4. Wash hands		

Pass / Fail- _____

RT(R) Signature _____

Student Signature

CLINICAL COMPETENCY EVALUATION: Computerized Tomography

Student _____ Date _____ Grade _____

Examination _____ Site _____

ROOM PREPARATION	N/A	YES	NO
1. CT room ready prior to patient entering.(cleanliness, orderly)			
2. Gantry and table set up correctly.			
3. Table at correct height.			
4. CM prepared and ready.			
5. Console properly set up for patient and exam.			
6. Injector armed			

PATIENT CARE	N/A	YES	NO
1.Communicate (as needed) with patient during exam.			
2. Patient ID'd correctly prior to exam			
3. Patient sufficiently monitored during exam.			
4. Compassion shown to patient throughout exam.			
5. Explain exam to patient			

PACS	N / A	YES	NO
1. Images correctly saved to PACS			
2. Patient history entered correctly and thoroughly.			
3. Images saved and correctly sent to PACS.			

WORK PERFORMANCE	N/A	YES	NO
1. Correctly zeroes out machine			
2. Patient positioned correctly			
3. Shielding used appropriately			
4. Correct use of workstation			
5. Correctly manipulates gantry			
6. Scout images manipulated correctly			
7. Exam ended			
8. Images sent			
9. Patient released correctly			

TERMINAL COMPETENCY Explanation

Failure to demonstrate the following objectives, when applicable, indicates incompetence and an automatic failure will be recorded.

1. Verify correct identification of the patient.
2. Record LMP and/or check for possible pregnancy in females of childbearing age (according to department protocol).
3. Document clinical history relevant to examination.
4. Follow Standard precautions.
5. Correctly place lead identification markers on film.
6. Utilize lead shielding when appropriate.

- I. **PREPARATION:** evaluation of room preparation, selection of appropriate cassettes and review of requisition for pertinent information.

3 points

room clean and properly prepared

correct size and # of cassettes selected

No Improvement Needed

requisition thoroughly reviewed

2 points

minor negligence in room preparation

most films selected appropriately in size and number

Improvement Needed

requisition not thoroughly checked

1 point

major negligence in room preparation

incorrect film sizes chosen

Marginally Acceptable

requisition glanced at

0 point

gross negligence

Unacceptable

- II. **PATIENT CARE:** evaluation of assessment of patients condition, assistance and consideration during procedure, explanation of procedure and removal of possible film artifacts.

3 points

excellent evaluation and communication

No Improvement Needed

2 points

minor negligence

Improvement Needed

1 point

major negligence

Marginally Acceptable

0 point

gross negligence

Unacceptable

III. **POSITIONING AND TECHNICAL SKILLS:** evaluation of Instructions given; correct positioning, central ray direction and alignment; use of collimation; proper exposure factors set.

3 points

___ exact positioning and angulation

___ less than 1" misalignment of film, part or CR

No Improvement Needed

___ beam limited to area of interest

2 points

___ minor inaccuracy of positioning or angulation

___ more than 1- 2" misalignment of film, part or CR

Acceptable

___ inaccurate collimation

1 point

___ major error in positioning and/or angulation

___ more than 2" misalignment of film, part or CR

Marginally Acceptable

___ poor collimation

0 point

___ gross error in positioning and/or angulation

___ misalignment of film, part or CR (enough to clip anatomy)

Unacceptable

___ no collimation or over collimation to obscure area of interest

IV. **IMAGE EVALUATION-** evaluation of overall density and contrast, ability to identify proper evaluation criteria

3 points

___ evaluation criteria properly identified per view

___ good understanding of contrast and density

No Improvement Needed

___ all areas of interest well visualized

2 points

___ minor error in identifying evaluation criteria per view

___ minor misconceptions of contrast and density

Acceptable

1 point

___ major errors in identifying evaluation criteria

___ major misconceptions of contrast and density

Marginally Acceptable

0 points

___ no correct identification of evaluation criteria

___ no understanding of contrast and density

Unacceptable

Terminal Competency based on 6-9 projections. Grading scale:

A: 92-100

B: 84-91

C: 76-83

D: 68-82

Evaluation.

F: 0-67

*Students must receive a C or better to pass the Terminal Competency

* All TC grades will be averaged for Final Grade.

TERMINAL COMPETENCY EVALUATION

Student _____ Date _____ Grade _____

Examination _____ Site _____

I. **Preparation**- 0-3 points total for entire study _____total points

II. **Patient Care**- 0-3 points total for entire study _____total points

III. **Positioning and Technical Skills** _____total points

EXAMS 1. _____ 2. _____ 3. _____

Proj.1 _____pts. Proj.1 _____pts. Proj. 1 _____pts.

Proj.2 _____pts. Proj.2 _____pts. Proj. 2 _____pts.

Proj.3 _____pts. Proj.3 _____pts. Proj. 3 _____pts.

IV. **Image Evaluation** _____total points

Proj.1 _____pts Proj.1. _____pts Proj. 1. _____pts.

Proj.2 _____pts. Proj.2. _____pts. Proj. 2. _____pts.

Proj.3 _____pts. Proj.3. _____pts. Proj. 3. _____pts.

TOTAL POINTS/PERCENTAGE/GRADE: Add total from I., II.,III., and IV. then divide by total possible points for final grade.

<u>60 points</u>	<u>54 points</u>	<u>48 points</u>	<u>42 points</u>
59-98%	53-98%	47-98%	41-97%
58-97%	52-96%	46-96%	40-95%
57-95%	51-94%	45-94%	39-93%
56-93%	50-93%	44-92%	38-90%
55-92%	49-91%	43-90%	37-88%
54-90%	48-89%	42-88%	36-86%
53-88%	47-87%	41-85%	35-83%
52-86%	46-85%	40-83%	
51-85%	45-83%		
50-83%			

Scale:	92-100	A
	84-91	B
	76-83	C
	68-83	D
	0-67	F

Professional Development

Professional Evaluations will be a portion of the semester final grade for ALL clinical rotations.

PD's are due on specific dates.

If a PD is submitted late, and is un-excused, the grade will be counted as a 0.

Weekly progress sheets must be submitted to assigned technologist at beginning of each week.

Students may view progress sheets at conclusion of semester, if requested.

1st through 6th semester **Professional Evaluation** outcomes

1. Preparation for Exam / Procedure
a. Room correctly prepared for procedure / exam
b. MD orders and department request verified; patient history researched and properly recorded; Pregnancy status verified
2. Communication- Verbal
a. Speaks clearly, appropriately and with sufficient volume
b. Properly addresses patients, ie. NO "pet names"
3. Communication - Non-Verbal
a. Demonstrates positive non-verbal communication
b. Hides personal feelings and frustrations from patient, CI, RT, MD, etc.
4. Relationship with Patient
a. Responsive to physical and emotional needs of patient
b. Courteous to all patients, regardless of race, culture or creed
c. Establishes good rapport with patient throughout procedure
d. Maintains patient dignity
e. Maintains patient modesty throughout procedure and in hallways, and patient rooms
5. Safety
a. Safe and efficient use of all equipment
b. Does not leave patient unattended
c. Maintains correct guard rail and lock position on stretchers, wheelchair locks, foot stools, etc.
d. Effective patient transfer technique
e. Proper handling of IV equipment, all lines, and Oxygen- per site protocol

6. Confidentiality
a. Maintains all HIPAA guidelines set forth at site
b. Properly identifies patient using correct Patient Identifiers
7. Infection Control
a. Follows appropriate Standard Precaution guidelines
b. Properly cleans room and equipment before and after exams
8. Radiation Protection
a. Utilizes radiation protection effectively for the patient, every time. This includes lead shielding, collimation and repeats.
b. Utilizes radiation protection for self and others involved in the study, every time.
9. Accountability
a. Dressed according to HGTC dress code and prepared with required supplies, Ex. ID, dosimeter, lead markers, etc.
b. On-time and in assigned area at designated start time. Stays with assigned tech.
10. Initiative
a. Displays enthusiasm about Medical Imaging
b. Willingness to participate / volunteer at all times
c. Seeks information about new/ unknown topics
d. Shows interest in performing assigned tasks and clinical education
e. Uses down-time wisely
11. Team Participation
a. Works well with others and helps out when able, Ex. stock, clean, preparation, transport, etc.
b. Uses tact, courtesy and cooperation with the Healthcare team
12. Integrity
a. Takes responsibility for own work, actions, mistakes and behavior; Performs tasks assigned to them
b. Refrains from negative talk about any hospital site, and / or any college policy, any personnel and procedure. Refrains from personal conversation at inappropriate times or location.

13. Attitude
a. Recognizes supervisory role of CI, site RT's, MD's and administrators. Accepts advice and / or criticism respectfully.
b. Maintains composure in all situations
14. Communication with Healthcare Team
a. Demonstrates ability to communicate and interact with Healthcare team (CI, MD, RT, RN, etc) in a respectful manner
b. Does not let personal feelings interfere with positive daily interaction with the Healthcare team
15. Equipment Use
a. Control panel usage is suitable for level (Sr, Jr)
b. Junior- Knows KVP range and sensor cells for learned procedures. Knows approximate MAS for procedures.
b. Senior- Can identify approximate MAS based on body habitus and pathology, and is able to completely set-up control panel for procedures- focal spot size, sensor cells, KVP and approximate MAS for procedures.
16. Performance of Exams / Procedures
a. Able to efficiently perform exams Ex. positioning, equipment use, and post-imaging procedure
b. Works independently with minimal repeat exposures
c. Able to modify routine projections, based on level (Junior/ Senior)
17. Images Correctly Marked
a. Lead markers used correctly
b. Lead markers show on images
18. Knowledge of Daily Operations
a. Knows the protocol / operation of imaging- obtains request, locates and returns patient to correct location
b. Properly answers the department phone- IF applicable - and directs calls appropriately
19. Utilization of Suggestions
a. Applies advice and suggestions from RT's
b. Able to continuously improve upon learned procedures based on RT suggestions
20. Progress
a. Student is ready, willing and able to perform
b. Completes each projection / image in a timely manner

In addition to the required PD evaluation Sheets, weekly progress sheets must be completed by the staff technologists and clinical preceptors at the sites. These will help with constructive input from all rotations throughout the department.

These forms are required weekly by every student and CP's will instruct the student on which technologist should be completing them. Once completed, the forms will go directly to the CP and will be used in tallying the PD Evaluation sheet, which is part of the student's final grade.

These forms are helpful to the students in addressing a weakness or strengths. The student does not have weekly access to the results but may, upon request meet with the CC and review them, or request to view them at the end of the grading semester.

- Please be aware that the progress sheets are for weekly assessment and the PD Evaluations are the forms that are used for the final grade. You will receive a schedule of due dates for your PD Evaluations.

It is your responsibility to carry your Clinical Handbook to your clinical rotations and have copies of all required updated Paperwork.

- Please, Also be aware that changes can be made to any/all paperwork at any time. In this event the students will be informed, as will the staff at your clinical sites.

Venipuncture Policy

1. The college lecture portion of venipuncture is taught in Positioning II, however, affiliates may require additional in-house training before the student is allowed to attempt the procedure on patients.

2. When a student is performing venipuncture, a qualified staff member must be present in the room for the entire procedure, from the needle stick through the complete injection of contrast medium. Qualified staff may include physicians, nurses, or radiographers who have been certified competent in venipuncture through regular hospital procedures.

3. At no time is a student to be left alone in a radiographic room during venipuncture or the injection of contrast medium. This rule applies even after the student has obtained competence.

4. A student is normally permitted only one stick per patient. At the hospital's discretion, a supervising staff member may authorize an additional attempt by the student. Under no circumstances is a student permitted a third attempt at a needle stick.

5. The Venipuncture Competency Form is the form that will be used to verify competency. The form must be signed by the Clinical Instructor and kept on file with the Clinical Coordinator.

6. The hospital may add additional venipuncture policies or requirements, as deemed necessary and students are required to abide by all policies.

VENIPUNCTURE COMPETENCY

Student _____ Date _____ Grade _____

Examination _____ Site _____

Evaluator: Each student must successfully perform venipuncture on THREE (3) separate patients before attempting this competency.

Reminder: Students are never to inject contrast without a technologist present in the room.

Practice #1 _____ #2 _____ #3 _____

Competency PASS _____ REPEAT _____

SKILL	S	U
Identify location of crash cart		
Assemble all necessary materials prior to beginning venipuncture		
Identify patient		
Explain procedure to the patient		
Obtain allergy history and consent form		
Select proper contrast material		
Select proper needle/infusion set		
Wash hands		
Apply gloves		
Skin prep with alcohol, circular motion		
Apply tourniquet for venipuncture		
Select optimum vessel		
Insert butterfly at 10-15 degree angle, bevel up		
Obtain flashback of blood into tubing/syringe		
Secure needle with tape		
Release tourniquet		
Inject contrast		
Observe for extravasation		
Observe for adverse effects		
Remove needle and apply pressure to site		
Dispose of infusion set properly		
Apply pressure dressing to venipuncture site		
Remove gloves and wash hands		

Students must be able to progress in clinical rotation by completing the expected requirements. Students who have not completed the minimum requirements for the semester will be graded accordingly. For example a student needing five Competencies and five Professional Developments, and has only completed three Competencies, will receive zeros for the two not completed and the grades will be averaged. If the student has not completed enough Competencies to attain a grade of "C" or above, they will fail the clinical requirement of the program.

If the student has not completed all required competencies, but has high enough grades from the other competencies to pass, the student will be given that grade, but will also be placed on Clinical Probation and will receive a written warning stating that all of the previous missed competencies must be completed by the following semester. Students may choose to attend clinic over breaks, during daytime hours to catch up with clinical work.

Students may not receive more than one Clinical Probation letter. A second Clinical Probation will result in dismissal from the program.

Students who have not completed the required work during their last semester, will follow the same policy. If the student's averaged grade is a "C" or above they must complete all unfinished competencies within two weeks of graduation. If the student does not finish the required work within two weeks, they will "fail" the last clinical semester.

Aug 09

ARRT Requirements

Student _____

THORAX	Date	Date
Chest, Routine- PA/Lat m		
Chest- AP & lat - WC m		
Chest- AP & lat- stretcher m		
Chest, Lateral decubus e		
ST Neck e		
Ribs (uni or bilat) m		
Sternum e		
EXTREMITIES	Date	Date
Finger m		
Thumb e		
Hand m		
Wrist m		
Forearm m		
Elbow m		
Humerus m		
Shoulder, axillary view m		
Foot m		
Feet- weight bearing e		
Ankle m		
Lower leg m		
Knee m		
Knees wt bearing e		
Patella m		
Femur m		
Trauma- up. Ext.-non-shoulder m		
Trauma- low. Ext-adult m		
Scapula e		
Clavicle e		
AC joints e		

Trauma shoulder-y view m		
Toes e		
Os Calcis e		
HEAD & NECK	Date	Date
Facial bones e		
Nasal bones e		
Sinuses m		
Skull m		
Orbits e		
Zygoma/ arches e		
Mandible e		
Panorex e		
PEDIATRICS- (0-3 y/o)	Date	Date
Chest m		
Upper extremity m		
Lower extremity m		
Abdomen e		
Mobile study e		

SPINE & PELVIS	Date	Date
Cervical spine m		
XTL C-spine m		
C-Sp flex/ ext e		
Thoracic spine m		
Lumbar spine m		
L-Sp flex/ext e		
Pelvis m		
Hip w/ frog m		
AP & XTL hip m		
Scoliosis Study e		
Sacrum & Coccyx e		
SI joints e		
ABDOMEN / GI	Date	Date
KUB m		

Abdomen Series	m		
Abdomen.- decubes m			
UGI Series	m		
Sm.Bowel Series	m		
Esophagus study	m		
BE- w/ air	m		
BE- w/out air	e		
IVU	m		
MOBILE/SURGICAL		Date	Date
Portable Chest	m		
Port. Abdomen- adult m			
Port. Orthopedic- adult m			
Myelogram	e		
Arthrogram	e		
CystoStudy/ERCP/hyster-non OR			
↑ Spec Proc checklist	m		
Surg checklist/C-arm ortho m			
Surg checklist.C-arm non O m			
Sterile Technique/tray m			
Venipuncture Comp e			
Terminal Comp	m		
CT Head	e		
CT Abd w/o contrast	e		
CT Neck w/ contrast	e		
CT Chest w/contrast	e		
CT Pelvis w/ contrast	e		

CT CC's do not count in final # of electives

APPENDIX

A

Rev 4-2021 dg

Primary Certification and Registration Didactic and Clinical Competency Requirements

Radiography

1. Introduction

Candidates for certification and registration are required to meet the Professional Education Requirements specified in the *ARRT Rules and Regulations*. *ARRT's Radiography Didactic and Clinical Competency Requirements* are one component of the Professional Education Requirements.

The requirements are periodically updated based upon a [practice analysis](#) which is a systematic process to delineate the job responsibilities typically required of radiographers. The result of this process is a [task inventory](#) which is used to develop the clinical competency requirements (see section 4 below) and the content specifications which serve as the foundation for the didactic competency requirements (see section 3 below) and the examination.

2. Documentation of Compliance

To document that the Didactic and Clinical Competency Requirements have been satisfied by a candidate, the program director (and authorized faculty member if required) must sign the ENDORSEMENT SECTION of the *Application for Certification and Registration* included in the *Certification and Registration Handbook*.

Candidates who complete their educational program during 2017 or 2018 may use either the 2012 Didactic and Clinical Competency Requirements or the 2017 requirements. Candidates who complete their educational program after December 31, 2018 must use the 2017 requirements.

3. Didactic Competency Requirements

The purpose of the didactic competency requirements is to verify that individuals had the opportunity to develop fundamental knowledge, integrate theory into practice and hone affective and critical thinking skills required to demonstrate professional competency. Candidates must successfully complete coursework addressing the topics listed in the [ARRT Content Specifications](#) for the Radiography Examination. These topics would typically be covered in a nationally-recognized curriculum such as the ASRT Radiography Curriculum. Educational programs accredited by a mechanism acceptable to ARRT generally offer education and experience beyond the minimum requirements specified here.

4. Clinical Competency Requirements

The purpose of the clinical competency requirements is to verify that individuals certified and registered by the ARRT have demonstrated competency performing the clinical activities fundamental to a particular discipline. Competent performance of these fundamental activities, in conjunction with mastery of the cognitive

knowledge and skills covered by the radiography examination, provides the basis for the acquisition of the full range of procedures typically required in a variety of settings.

Demonstration of clinical competence means that the candidate has performed the procedure independently, consistently, and effectively during the course of his or her formal education. The following pages identify the specific procedures for the clinical competency requirements. Candidates may wish to use these pages, or their equivalent, to record completion of the requirements. The pages do NOT need to be sent to the ARRT.

4.1 General Performance Considerations

4.1.1 Patient Diversity

Demonstration of competence should include variations in patient characteristics such as age, gender, and medical condition.

4.1.2 Simulated Performance

The ARRT requirements specify that certain clinical procedures may be simulated as designated in the specific requirements below. Simulations must meet the following criteria:

- The candidate must simulate the procedure on another person with the same level of cognitive, psychomotor, and affective skills required for performing the procedure on a patient. Examples of acceptable simulation include positioning another person for a projection without actually activating the x-ray beam and performing venipuncture by demonstrating aseptic technique on another person, but then inserting the needle into an artificial forearm or suitable device;
- The program director must be confident that the skills required to competently perform the simulated procedure will transfer to the clinical setting, and, if applicable, the candidate must evaluate related images.

4.1.3 Elements of Competence

Demonstration of clinical competence requires that the program director or the program director's designee has observed the candidate performing the procedure independently, consistently, and effectively during the course of the candidate's formal educational program.

4.2 Radiography-Specific Requirements

As part of the educational program, candidates must demonstrate competence in the clinical activities identified below:

- Ten mandatory general patient care activities;
 - 37 mandatory imaging procedures;
- 15 elective imaging procedures selected from a list of 34 procedures;
- One of the 15 elective imaging procedures must be selected from the head section; and

- Two of the 15 elective imaging procedures must be selected from the fluoroscopy studies section, one of which must be either upper GI or contrast enema.

These clinical activities are listed in more detail in the following sections.

4.2.1 General Patient Care

Candidates must be CPR certified and demonstrate competence in the remaining nine patient care activities listed below. The activities should be performed on patients whenever possible, but simulation is acceptable.

General Patient Care Procedures	Date Completed	Competence Verified By
CPR Certified		
Vital Signs – Blood Pressure		
Vital Signs – Temperature		
Vital Signs – Pulse		
Vital Signs – Respiration		
Vital Signs – Pulse Oximetry		
Sterile and Medical Aseptic Technique		
Venipuncture		
Transfer of Patient		
Care of Patient Medical Equipment (e.g., Oxygen Tank, IV Tubing)		

4.2.2 Imaging Procedures

Candidates must demonstrate competence in all 37 procedures identified as mandatory. Procedures should be performed on patients whenever possible. A maximum of eight mandatory procedures may be simulated if demonstration on patients is not feasible.

Candidates must demonstrate competence in 15 of the 34 elective procedures. Candidates must select at least one of the 15 elective procedures from the head section. Candidates must select either upper GI or contrast enema plus one other elective from the fluoroscopy section as part of the 15 electives. Elective procedures should be performed on patients whenever possible. If demonstration on patients is not feasible, electives may be simulated.

Institutional protocol will determine the positions and projections used for each procedure. Demonstration of competence must include:

- patient identity verification
- examination order verification;
 - patient assessment;
 - room preparation;
 - patient management;
 - equipment operation;
 - technique selection;
 - patient positioning;
 - radiation safety;
- imaging processing; and
 - image evaluation.

4.2.2 Imaging Procedures (continued)

Radiographic Imaging Procedures	Mandatory or Elective		Date Completed	Patient or Simulated	Competence Verified By
	Mandatory	Elective			
Chest and Thorax					
Chest Routine	✓				
Chest AP (Wheelchair or Stretcher)	✓				
Ribs	✓				
Chest Lateral Decubitus		✓			
Sternum		✓			
Upper Airway (Soft-Tissue Neck)		✓			
Upper Extremity					
Thumb or Finger	✓				
Hand	✓				
Wrist	✓				
Forearm	✓				
Elbow	✓				
Humerus	✓				
Shoulder	✓				
Trauma: Shoulder or Humerus (Scapular Y, Transthoracic or Axial)*	✓				
Clavicle	✓				
Scapula		✓			

AC Joints		✓			
Trauma: Upper Extremity (Non Shoulder)*	✓				
Lower Extremity					
Toes		✓			
Foot	✓				
Ankle	✓				
Knee	✓				
Tibia-Fibula	✓				
Femur	✓				
Trauma: Lower Extremity*	✓				
Patella		✓			
Calcaneus		✓			

condition.

4.2.2 Imaging Procedures (continued)

Radiographic Imaging Procedures	Mandatory or Elective		Date Completed	Patient or Simulated	Competence Verified By
	Mandatory	Elective			
Head – Candidates must select at least one elective procedure from this section.					
Skull		✓			
Paranasal Sinuses		✓			
Facial Bones		✓			
Orbits		✓			
Zygomatic Arches		✓			
Nasal Bones		✓			
Mandible		✓			
Temporomandibular Joints		✓			
Spine and Pelvis					

Cervical Spine	✓				
Thoracic Spine	✓				
Lumbar Spine	✓				
Cross-Table (Horizontal Beam) Lateral Spine (Patient Recumbent)	✓				
Pelvis	✓				
Hip	✓				
Cross-Table (Horizontal Beam) Lateral Hip (Patient Recumbent)	✓				
Sacrum and/or Coccyx		✓			
Scoliosis Series		✓			
Sacroiliac Joints		✓			
Abdomen					
Abdomen Supine (KUB)	✓				
Abdomen Upright	✓				
Abdomen Decubitus		✓			
Intravenous Urography		✓			

4.2.2 Imaging Procedures (continued)

Imaging Procedures	Mandatory or Elective		Date Completed	Patient or Simulated	Competence Verified By
	Mandatory	Elective			
Fluoroscopy Studies – Candidates must select either upper GI or contrast enema plus one other elective procedure from this section.					
Upper GI Series, Single or Double Contrast		✓			
Contrast Enema, Single or Double Contrast		✓			
Small Bowel Series		✓			
Esophagus (NOT Swallowing Dysfunction Study)		✓			

Cystography/Cystourethrography		✓			
ERCP		✓			
Myelography		✓			
Arthrography		✓			
Hysterosalpingography		✓			
Mobile C-Arm Studies					
C-Arm Procedure (Requiring Manipulation to Obtain More Than One Projection)	✓				
Surgical C-Arm Procedure (Requiring Manipulation Around a Sterile Field)	✓				
Mobile Radiographic Studies					
Chest	✓				
Abdomen	✓				
Orthopedic	✓				
Pediatric Patient (Age 6 or Younger)					
Chest Routine	✓				
Upper Extremity		✓			
Lower Extremity		✓			
Abdomen		✓			
Mobile Study		✓			
Geriatric Patient (At Least 65 Years Old and Physically or Cognitively Impaired as a Result of Aging)					
Chest Routine	✓				
Upper Extremity	✓				
Lower Extremity	✓				

APPENDIX

B

ARRT Content Specifications- Radiography Examination

Radiography Examination

The purpose of *The American Registry of Radiologic Technologists® (ARRT®) Radiography Examination* is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of radiographers. Using a nationwide survey, the ARRT periodically conducts a practice analysis to develop a task inventory which delineates or lists the job responsibilities typically required of radiographers.¹ An advisory committee then determines the knowledge and cognitive skills needed to perform the tasks on the task inventory and these are organized into the content categories within this document. The document is used to develop the examination. The results of the most recent practice analysis have been applied to this document. Every content category can be linked to one or more activities on the task inventory. The complete task inventory is available at arrt.org.

The following table presents the four major content categories covered on the examination, and indicates the number of test questions in each category. The remaining pages list the specific topics addressed within each category, with the approximate number of test questions allocated to each topic appearing in parentheses.

This document is not intended to serve as a curriculum guide. Although ARRT programs for certification and registration and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

Content Category	Number of Scored Questions ²
Patient Care	33
Patient Interactions and Management	
Safety	53
Radiation Physics and Radiobiology ³ Radiation Protection	
Image Production	50
Image Acquisition and Technical Evaluation Equipment Operation and Quality Assurance	
Procedures	64

Total 200

¹ A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents and reviewers.

² Each exam includes an additional 20 unscored (pilot) questions.

³ SI units will become the primary (principle) units of radiation measurement used on the radiography examination in 2017.

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Patient Care (33)

1. Patient Interactions and Management (33)

- A. Ethical and Legal Aspects
 - 1. patient's rights
 - a. informed consent (*e.g., written, oral, implied)
 - b. confidentiality (HIPAA)
 - c. American Hospital Association (AHA) Patient Care Partnership (Patient's Bill of Rights)
 - 1. privacy
 - 2. extent of care (e.g., DNR)
 - 3. access to information
 - 4. living will, health care proxy, advanced directives
 - 5. research participation
 - 2. legal issues
 - a. verification (e.g., patient identification, compare order to clinical indication)
 - b. common terminology (e.g., battery, negligence, malpractice, beneficence)
 - c. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
 - d. restraints versus immobilization
 - e. manipulation of electronic data (e.g., exposure indicator, processing algorithm, brightness and contrast, cropping or masking off anatomy)
 - 3. ARRT Standards of Ethics
- B. Interpersonal Communication
 - 1. modes of communication
 - a. verbal/written

- b. nonverbal (e.g., eye contact, touching)
 - 2. challenges in communication
 - a. interactions with others
 - 1. language barriers
 - 2. cultural and social factors
 - 3. physical or sensory impairments
 - 4. age
 - 5. emotional status, acceptance of condition
 - b. explanation of medical terms
 - c. strategies to improve understanding
 - 3. patient education
-
- a. explanation of current procedure (e.g., purpose, exam length)
 - b. verify informed consent when necessary
 - c. pre- and post-examination instructions (e.g., preparation, diet, medications and discharge instructions)
 - d. respond to inquiries about other imaging modalities (e.g., CT, MRI, mammography, sonography, nuclear medicine, bone densitometry regarding dose differences, types of radiation, patient preps)
 - C. Physical Assistance and Monitoring
 - 1. patient transfer and movement
 - a. body mechanics (e.g., balance, alignment, movement)
 - b. patient transfer techniques
 - 2. assisting patients with medical equipment
 - a. infusion catheters and pumps
 - b. oxygen delivery systems
 - c. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
 - 3. routine monitoring
 - a. vital signs
 - b. physical signs and symptoms (e.g., motor control, severity of injury)
 - c. fall prevention
 - d. documentation
 - D. Medical Emergencies
 - 1. allergic reactions (e.g., contrast media, latex)
 - 2. cardiac or respiratory arrest (e.g., CPR)
 - 3. physical injury or trauma
 - 4. other medical disorders

(e.g., seizures, diabetic reactions)

*The abbreviation "e.g.," is used to indicate that examples are listed in parentheses, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)

Patient Care (continued)

- E. Infection Control
 - 1. cycle of infection
 - a. pathogen
 - b. reservoir
 - c. portal of exit
 - d. mode of transmission
 - 1. direct
 - a. droplet
 - b. direct contact
 - 2. indirect
 - a. airborne
 - b. vehicle borne–fomite
 - c. vector borne–mechanical or biological
 - e. portal of entry
 - f. susceptible host
 - 2. asepsis
 - a. equipment disinfection
 - b. equipment sterilization
 - c. medical aseptic technique
 - d. sterile technique
 - 3. CDC Standard Precautions
 - a. hand hygiene
- b. use of personal protective equipment (e.g., gloves, gowns, masks)
 - c. safe injection practices
 - d. safe handling of contaminated equipment/surfaces
 - e. disposal of contaminated materials
 - 1. linens
 - 2. needles
 - 3. patient supplies
 - 4. blood and body fluids
- 4. transmission-based precautions
 - a. contact
 - b. droplet
 - c. airborne
- 5. additional precautions
 - a. neutropenic precautions (reverse isolation)
 - b. healthcare associated (nosocomial) infections

F. Handling and Disposal of Toxic or Hazardous Material

- 1. types of materials
 - a. chemicals
 - b. chemotherapy
- 2. safety data sheet (e.g., material safety data sheets)

G. Pharmacology

- 1. patient history
- a. medication reconciliation (current medications)
 - b. premedications
 - c. contraindications
- d. scheduling and sequencing examinations
 - 2. administration
 - a. routes (e.g., IV, oral)
- b. supplies (e.g., enema kits, needles)
 - 3. venipuncture
 - a. venous anatomy
 - b. supplies

- c. procedural technique
- 4. contrast media types and properties (e.g., iodinated, water soluble, barium, ionic versus non-ionic)
- 5. appropriateness of contrast media to exam
 - a. patient condition
(e.g., perforated bowel)
 - b. patient age and weight
 - c. laboratory values
(e.g., BUN, creatinine, GFR)
- 6. complications/reactions
 - a. local effects
(e.g., extravasation/infiltration, phlebitis)
 - b. systemic effects
 - 1. mild
 - 2. moderate
 - 3. severe
 - c. emergency medications
 - d. radiographer's response and documentation

Safety (53)

1. Radiation Physics and Radiobiology (22)

- A. Principles of Radiation Physics
 - 1. x-ray production
 - a. source of free electrons (e.g., thermionic emission)
 - b. acceleration of electrons
 - c. focusing of electrons
 - d. deceleration of electrons
 - 2. target interactions
 - a. bremsstrahlung
 - b. characteristic
 - 3. x-ray beam
 - a. frequency and wavelength
 - b. beam characteristics
 - 1. quality
 - 2. quantity
 - 3. primary versus remnant (exit)
 - c. inverse square law
 - d. fundamental properties (e.g., travel in straight lines, ionize matter)
 - 4. photon interactions with matter
 - a. Compton effect
 - b. photoelectric absorption
 - c. coherent (classical) scatter
 - d. attenuation by various tissues

1. thickness of body part
2. type of tissue (atomic number)

B. Biological Aspects of Radiation

1. SI units of measurement (NCRP #160)
 - a. absorbed dose (Gy)
 - b. dose equivalent (Sv)
 - c. exposure (C/kg)
 - d. effective dose (Sv)
 - e. air kerma (Gy)
2. radiosensitivity
 - a. dose-response relationships
- b. relative tissue radiosensitivities (e.g., LET, RBE)
 - c. cell survival and recovery (LD₅₀)
 - d. oxygen effect
3. somatic effects
 - a. short-term versus long-term effects
 - b. acute versus chronic effects
 - c. carcinogenesis
- d. organ and tissue response (e.g., eye, thyroid, breast, bone marrow, skin, gonadal)
 4. acute radiation syndromes
 - a. hemopoietic
 - b. gastrointestinal (GI)
 - c. central nervous system (CNS)
 5. embryonic and fetal risks
 6. genetic impact
 - a. genetically significant dose
 - b. goals of gonadal shielding

(Safety continues on the following page.)

Safety (continued)

2. Radiation Protection (31)

- C. Minimizing Patient Exposure
1. exposure factors
 - a. kVp
 - b. mAs
 - c. automatic exposure control (AEC)
 2. shielding
 - a. rationale for use
 - b. types
 - c. placement
 3. beam restriction
 - a. purpose of primary beam restriction

- b. types (e.g., collimators)
 - 4. filtration
- a. effect on skin and organ exposure
- b. effect on average beam energy
- c. NCRP recommendations

(NCRP #102, minimum filtration in useful beam)

- 5. patient considerations
 - a. positioning
 - b. communication
 - c. pediatric
 - d. morbid obesity
- 6. radiographic dose documentation
- 7. image receptors
- 8. grids
- 9. fluoroscopy
 - a. pulsed
 - b. exposure factors
 - c. grids
 - d. positioning
 - e. fluoroscopy time
- f. automatic brightness control (ABC) or automatic exposure rate control (AERC)
 - g. receptor positioning
 - h. magnification mode
 - i. air kerma display
 - j. last image hold
 - k. dose or time documentation
 - l. minimum source-to-skin distance (21 CFR)
- 10. dose area product (DAP) meter

D. Personnel Protection (ALARA)*

- 1. sources of radiation exposure
 - a. primary x-ray beam
 - b. secondary radiation
 - 1. scatter
 - 2. leakage
 - c. patient as source
- 2. basic methods of protection
 - a. time
 - b. distance
 - c. shielding
- 3. protective devices
 - a. types
 - b. attenuation properties
- c. minimum lead equivalent (NCRP #102)
- 4. special considerations
 - a. mobile units
 - b. fluoroscopy
 - 1. protective drapes
 - 2. protective Bucky slot cover
 - 3. cumulative timer
 - 4. remote-controlled fluoroscopy
- c. guidelines for fluoroscopy and mobile units (NCRP #102, 21 CFR)
 - 1. fluoroscopy exposure rates (normal and high-level control)

- 2. exposure switch guidelines
- 5. radiation exposure and monitoring
 - a. dosimeters
 - 1. types
 - 2. proper use
 - b. NCRP recommendations for personnel monitoring (NCRP #116)
 - 1. occupational exposure
 - 2. public exposure
 - 3. embryo/fetus exposure
 - 4. dose equivalent limits
- 5. evaluation and maintenance of personnel dosimetry records
- 6. handling and disposal of radioactive material

* (August 24, 2016) Note: Although it is the radiographer's responsibility to apply radiation protection principles to minimize bioeffects for both patients and personnel, the ALARA concept is specific to personnel protection and is listed only for that section.

Image Production (50)

1. Image Acquisition and Technical Evaluation (21)

- A. Selection of Technical Factors Affecting Radiographic Quality Refer to *Attachment C* to clarify terms that may occur on the exam. (X indicates topics covered on the examination.)

	1. Receptor Exposure	2. Contrast	3. Spatial Resolution	4. Distortion
a. mAs	X			
b. kVp	X	X		
c. OID		X (air gap)	X	X
d. SID	X		X	X
e. focal spot size			X	
f. grids*	X	X		
g. tube filtration	X	X		
h. beam restriction	X	X		
i. motion			X	
j. anode heel effect	X			
k. patient factors (size, pathology)	X	X	X	X
l. angle (tube, part, or receptor)			X	X

- B. Technique Charts
 - 1. anatomically programmed technique
 - 2. caliper measurement
 - 3. fixed versus variable kVp
 - 4. special considerations
 - a. casts
 - b. pathologic factors
 - c. age (e.g., pediatric, geriatric)
 - d. body mass index (BMI)
 - e. contrast media
 - C. Automatic Exposure Control (AEC)
 - 1. effects of changing exposure factors on radiographic quality
 - 2. detector selection
 - 3. anatomic alignment
 - 4. exposure adjustment (e.g., density, +1 or -1)
 - D. Digital Imaging Characteristics
 - 1. spatial resolution (equipment related)
 - a. pixel characteristics (e.g., size, pitch)
 - b. detector element (DEL) (e.g., size, pitch, fill factor)
 - c. matrix size
 - d. sampling frequency
 - 2. contrast resolution (equipment related)
 - a. bit depth
 - b. modulation transfer function (MTF)
 - c. detective quantum efficiency (DQE)
 - 3. image signal (exposure related)
 - a. dynamic range
 - b. quantum noise (quantum mottle)
 - c. signal to noise ratio (SNR)
 - d. contrast to noise ratio (CNR)
 - E. Image Identification
 - 1. methods (e.g., radiographic, electronic)
 - 2. legal considerations
- (e.g., patient data, examination data)

(Image Production continues on the following page.)

Image Production (continued)

2. Equipment Operation and Quality Assurance (29)

F. Imaging Equipment

1. components of radiographic unit (fixed or mobile)
 - a. operating console
 - b. x-ray tube construction
 1. electron source
 2. target materials
 3. induction motor
 - c. automatic exposure control (AEC)
 1. radiation detectors
 2. back-up timer
 3. exposure adjustment (e.g., density, +1 or -1)
 4. minimum response time
 - d. manual exposure controls
 - e. beam restriction
2. x-ray generator, transformers and rectification system
 - a. basic principles
 - b. phase, pulse and frequency
 - c. tube loading
3. components of fluoroscopic unit (fixed or mobile)
 - a. image receptors
 1. image intensifier
 2. flat panel
 - b. viewing systems
 - c. recording systems
- d. automatic brightness control (ABC) or automatic exposure rate control (AERC)
 - e. magnification mode
 - f. table
4. components of digital imaging
 - a. CR components
 1. plate (e.g., photo-stimulable phosphor (PSP))
 2. plate reader
 - b. DR image receptors
 1. flat panel
 2. charge coupled device (CCD)
 3. complementary metal oxide semiconductor (CMOS)
 5. accessories
 - a. stationary grids
 - b. Bucky assembly
 - c. compensating filters

G. Image Processing and Display

1. raw data (pre-processing)
 - a. analog-to-digital converter (ADC)
 - b. quantization
- c. corrections (e.g., rescaling, flat fielding, dead pixel correction)
 - d. histogram
2. corrected data for processing
 - a. grayscale
 - b. edge enhancement
 - c. equalization
 - d. smoothing

- 3. data for display
 - a. values of interest (VOI)
 - b. look-up table (LUT)
- 4. post-processing
 - a. brightness
 - b. contrast
 - c. region of interest (ROI)
 - d. electronic cropping or masking
 - e. stitching
- 5. display monitors
- a. viewing conditions (e.g., viewing angle, ambient lighting)
 - b. spatial resolution (e.g., pixel size, pixel pitch)
 - c. brightness and contrast
- 6. imaging informatics
 - a. DICOM
 - b. PACS
 - c. RIS (modality work list)
 - d. HIS
 - e. EMR or EHR

(Image Production continues on the following page.)

Image Production (continued)

- H. Criteria for Image Evaluation of Technical Factors
 - 1. exposure indicator
 - 2. quantum noise (quantum mottle)
 - 3. gross exposure error

(e.g., loss of contrast, saturation)

 - 4. contrast
 - 5. spatial resolution
 - 6. distortion (e.g., size, shape)
 - 7. identification markers

(e.g., anatomical side, patient, date)

 - 8. image artifacts
 - 9. radiation fog
- I. Quality Control of Imaging Equipment and Accessories
 - 1. beam restriction
 - a. light field to radiation field alignment
 - b. central ray alignment
 - 2. recognition and reporting of malfunctions
 - 3. digital imaging receptor systems
 - a. maintenance (e.g., detector calibration, plate reader calibration)
 - b. QC tests (e.g., erasure thoroughness, plate uniformity, spatial resolution)
 - c. display monitor quality assurance (e.g., grayscale standard display function, luminance)
 - 4. shielding accessories

(e.g., lead apron, glove testing)

Procedures (64)

This section addresses imaging procedures for the anatomic regions listed below. Questions will cover the following topics:

1. Positioning (e.g., topographic landmarks, body positions, path of central ray, immobilization devices, respiration).
2. Anatomy (e.g., including physiology, basic pathology, and related medical terminology).
3. Procedure adaptation (e.g., body habitus, body mass index, trauma, pathology, age, limited mobility).
4. Evaluation of displayed anatomical structures (e.g., patient positioning, tube-part-image receptor alignment).

The specific radiographic positions and projections within each anatomic region that may be covered on the examination are listed in *Attachment A*. A guide to positioning terminology appears in *Attachment B*.

1. Head, Spine and Pelvis Procedures (18)

- A. Head
 1. skull
 2. facial bones
 3. mandible
 4. zygomatic arch
 5. temporomandibular joints
 6. nasal bones
 7. orbits
 8. paranasal sinuses
- B. Spine and Pelvis
 1. cervical spine
 2. thoracic spine
 3. scoliosis series
 4. lumbar spine
 5. sacrum and coccyx
 6. myelography
 7. sacroiliac joints
 8. pelvis and hip
 9. hysterosalpingography

2. Thorax and Abdomen Procedures (21)

- C. Thorax
 1. chest
 2. ribs
 3. sternum
 4. soft tissue neck

- D. Abdomen and GI Studies
 - 1. abdomen
 - 2. esophagus
 - 3. swallowing dysfunction study
 - 4. upper GI series, single or double contrast
 - 5. small bowel series
 - 6. contrast enema, single or double contrast
 - 7. surgical cholangiography
 - 8. ERCP

- E. Urological Studies
 - 1. cystography
 - 2. cystourethrography
 - 3. intravenous urography
 - 4. retrograde urography

3. Extremity Procedures (25)

- F. Upper Extremities
 - 1. fingers
 - 2. hand
 - 3. wrist
 - 4. forearm
 - 5. elbow
 - 6. humerus
 - 7. shoulder
 - 8. scapula
 - 9. clavicle
 - 10. acromioclavicular joints
- G. Lower Extremities
 - 1. toes
 - 2. foot
 - 3. calcaneus
 - 4. ankle
 - 5. tibia/fibula
 - 6. knee/patella
 - 7. femur
 - 8. long bone measurement
- H. Other
 - 1. bone age
 - 2. bone survey (e.g. metastatic, child abuse)
 - 3. arthrography

Attachment A Radiographic Positions and Projections

- 1. **Head, Spine and Pelvis**
 - A. **Head**
 - 1. Skull

- a. AP axial (Towne)
 - b. lateral
- c. PA axial (Caldwell)
 - d. PA
- e. submentovertex (full basal)
 - a. PA axial (Haas)
- b. trauma cross-table (horizontal beam) lateral
 - c. trauma AP axial (reverse Caldwell)
 - d. trauma AP
 - e. trauma AP axial (Towne)
 - 2. Facial Bones
 - a. lateral
 - b. parietoacanthial (Waters)
 - c. PA axial (Caldwell)
 - d. modified parietoacanthial (modified Waters)
 - e. trauma acanthioparietal (reverse Waters)
 - 3. Mandible
 - a. axiolateral oblique
 - b. PA
 - c. AP axial (Towne)
 - d. PA axial
 - e. PA (modified Waters)
 - f. submentovertex (full basal)
 - 4. Zygomatic Arch
 - a. submentovertex (full basal)
 - b. parietoacanthial (Waters)
 - c. AP axial (modified Towne)
 - d. oblique inferosuperior (tangential)
 - 5. Temporomandibular Joints
 - a. axiolateral oblique (modified Law)
 - b. axiolateral (modified Schuller)
 - c. AP axial (modified Towne)
 - 6. Nasal Bones
 - a. parietoacanthial (Waters)
 - b. lateral
 - c. PA axial (Caldwell)
 - 7. Orbits
 - a. parietoacanthial (Waters)
 - b. lateral
 - c. PA axial (Caldwell)
 - d. modified parietoacanthial (modified Waters)
 - 8. Paranasal Sinuses
 - a. lateral, horizontal beam
 - b. PA axial (Caldwell), horizontal beam
 - c. parietoacanthial (Waters), horizontal beam
 - d. submentovertex (full basal), horizontal beam

- e. open mouth parietoacanthial (Waters), horizontal beam

B. Spine and Pelvis

- 1. Cervical Spine
 - a. AP axial
 - b. AP open mouth
 - c. lateral
- d. cross-table (horizontal beam) lateral
 - e. PA axial obliques
 - f. AP axial obliques
 - g. lateral swimmers
 - h. lateral flexion and extension
 - i. AP dens (Fuchs)
- 2. Thoracic Spine
 - a. AP
 - b. lateral, breathing
 - c. lateral, expiration
- 3. Scoliosis Series
 - a. AP or PA
 - b. lateral
- 4. Lumbar Spine
 - a. AP

- b. PA
 - c. lateral
 - d. L5-S1 lateral spot
 - e. posterior oblique
 - f. anterior oblique
- e. AP axial L5-S1
- a. AP right and left bending
 - b. lateral flexion and extension
 - 5. Sacrum and Coccyx
 - a. AP axial sacrum
 - b. AP axial coccyx
 - c. lateral sacrum and coccyx, combined
 - d. lateral sacrum or coccyx, separate
 - 6. Myelography
 - 7. Sacroiliac Joints
 - a. AP
 - b. posterior oblique
 - c. anterior oblique
 - 8. Pelvis and Hip
 - a. AP hip only
 - b. cross-table (horizontal beam) lateral hip
 - c. unilateral frog-leg, non- trauma
 - d. axiolateral inferosuperior, trauma (Clements- Nakayama)
 - e. AP pelvis
 - f. AP pelvis, bilateral frog-leg
 - g. AP pelvis, axial anterior pelvic bones (inlet, outlet)
 - h. anterior oblique pelvis, acetabulum (Judet)
 - 9. Hysterosalpingography

1. Thorax and Abdomen

A. Thorax

- 1. Chest
 - a. PA or AP upright
 - b. lateral upright
 - c. AP lordotic
 - d. AP supine
 - e. lateral decubitus
 - f. anterior and posterior obliques
- 2. Ribs
 - a. AP and PA, above and below diaphragm
 - b. anterior and posterior obliques
- 3. Sternum
 - a. lateral
 - b. RAO
- 4. Soft Tissue Neck
 - a. AP upper airway
 - b. lateral upper airway

B. Abdomen and GI Studies

- 1. Abdomen
 - a. AP supine
 - b. AP upright
 - c. lateral decubitus
 - d. dorsal decubitus
- 2. Esophagus
 - a. RAO
 - b. left lateral
 - c. AP
 - d. PA
 - e. LAO
- 3. Swallowing Dysfunction Study
- 4. Upper GI series*
 - a. AP scout
 - b. RAO
 - c. PA
 - d. right lateral
 - e. LPO
 - f. AP

5. Small Bowel Series
 - a. PA scout
 - b. PA (follow through)
 - c. ileocecal spots
6. Contrast Enema*
 - a. left lateral rectum
 - b. left lateral decubitus
 - c. right lateral decubitus
 - d. LPO and RPO
 - e. PA
 - f. RAO and LAO
 - g. AP axial (sigmoid)
 - h. PA axial (sigmoid)
 - i. PA post-evacuation
7. Surgical Cholangiography
8. ERCP

*single or double contrast

C. Urological Studies

1. Cystography
 - a. AP
 - b. LPO and RPO
 - c. lateral
 - d. AP axial
2. Cystourethrography
 - a. AP voiding cystourethrogram female
 - b. RPO voiding cystourethrogram male
3. Intravenous Urography
 - a. AP, scout, and series
 - b. RPO and LPO
 - c. post-void
4. Retrograde Urography
 - a. AP scout
 - b. AP pyelogram
 - c. AP ureterogram

2. Extremities

A. Upper Extremities

- I. Fingers
 - a. PA entire hand
 - b. PA finger only
 - c. lateral
- d. medial and/or lateral oblique
 - e. AP thumb
- f. medial oblique thumb
 - g. lateral thumb
1. Hand
 - a. PA
 - b. lateral
 - c. lateral oblique
2. Wrist
 - a. PA
 - b. lateral oblique
 - c. lateral
- d. PA-ulnar deviation
- e. PA axial (Stecher)
- f. tangential carpal canal (Gaynor-Hart)
 3. Forearm

- a. AP
 - b. lateral
 - 4. Elbow
 - a. AP
 - b. lateral
 - c. lateral oblique
 - d. medial oblique
 - e. AP partial flexion
 - f. trauma axial laterals (Coyle)
 - 5. Humerus
 - a. AP
 - b. lateral
 - c. neutral
 - d. transthoracic lateral
 - 6. Shoulder
 - a. AP internal and external rotation
 - b. inferosuperior axial (Lawrence)
 - c. posterior oblique (Grashey)
 - d. AP neutral
 - e. scapular Y
7. Scapula
- a. AP
 - b. lateral
8. Clavicle
- a. AP
 - b. AP axial
 - c. PA axial
9. Acromioclavicular Joints – AP Bilateral With and Without Weights

B. Lower Extremities

- 1. Toes
 - a. AP, entire forefoot
 - b. AP or AP axial toe
 - c. oblique toe
 - d. lateral toe
- e. sesamoids, tangential
- 2. Foot
 - a. AP axial
 - b. medial oblique
 - c. lateral oblique
 - d. lateral
- e. AP axial weight bearing
- f. lateral weight bearing
- 3. Calcaneus
 - a. lateral
 - b. plantodorsal, axial
 - c. dorsoplantar, axial
- 4. Ankle
 - a. AP
 - b. mortise
 - c. lateral
 - d. medial oblique
 - e. AP stress views
 - f. AP weight bearing
 - g. lateral weight bearing
- 5. Tibia/Fibula
 - a. AP
 - b. lateral
- 6. Knee/patella
 - a. AP
 - b. Lateral
 - c. AP weight bearing
 - d. lateral oblique
 - e. medial oblique
- f. PA axial-intercondylar fossa (Holmblad)
- g. PA axial-intercondylar fossa (Camp Coventry)
- h. AP axial-intercondylar fossa (Béclère)
 - i. PA patella

- j. tangential (Merchant)
- k. tangential (Settegast)
- l. tangential (Hughston)
- 7. Femur
 - a. AP
 - b. lateral
- 8. Long Bone Measurement
 - c. **Other**
 - 1. Bone Age
 - 2. Bone Survey
 - 3. Arthrography

Attachment B Standard Terminology for Positioning and Projection

Radiographic View: Describes the body part as seen by the image receptor or other recording medium, such as a fluoroscopic screen. Restricted to the discussion of a *radiograph* or *image*.

Radiographic Position: Refers to a specific body position, such as supine, prone, recumbent, erect or Trendelenburg. Restricted to the discussion of the *patient's physical position*.

Radiographic Projection: Restricted to the discussion of the *path of the central ray*.

POSITIONING TERMINOLOGY

A. Lying Down

- 1. *supine* - *lying on the back*
- 2. *prone* - *– λψινη φαχε δοωνωαρδ*
- 3. *decubitus* - *lying down with a horizontal x-ray beam*
- 4. *recumbent* - *lying down in any position*

B. Erect or Upright

- 1. *anterior position* - *facing the image receptor*
- 2. *posterior position* - *facing the radiographic tube*

C. Either Upright or Recumbent

- 1. *oblique torso positions*

a. *anterior oblique* (facing the image receptor)

- i. *left anterior oblique (LAO)* *body rotated with the left anterior portion closest*

to the image receptor

- ii. *right anterior oblique (RAO)* *body rotated with the right anterior portion*

closest to the image receptor

b. posterior oblique (facing the radiographic tube)

- i. *left posterior oblique (LPO)* body rotated with the left posterior portion

closest to the image receptor

- ii. *right posterior oblique (RPO)* body rotated with the right posterior portion

closest to the image receptor

2. oblique extremity positions

a. lateral (external) rotation from either prone or supine, outward rotation of the extremity

b. medial (internal) rotation from either prone or supine, inward rotation of the extremity

ARRT Standard Definitions

Digital Radiography	<p>Digital Radiography includes both computed radiography and direct radiography</p> <p><u>Computed Radiography (CR)</u> systems use storage phosphors to temporarily store energy representing the image signal. The phosphor then undergoes a process to extract the latent image.</p> <p><u>Direct Radiography (DR)</u> systems have detectors that directly capture and readout an electronic image signal.</p>
Spatial Resolution	The sharpness of the structural edges recorded in the image.
Receptor Exposure	The amount of radiation striking the image receptor.
Brightness	Brightness is the measurement of the luminance of an area in a radiographic image displayed on a monitor. It is calibrated in units of candela (cd) per square meter
Contrast	<p>Contrast is the visible difference between any two selected areas of brightness levels within the displayed radiographic image. It is determined primarily by the processing algorithm (mathematical codes used by the software to provide the desired image appearance). The default algorithm determines the initial processing codes applied to the image data.</p> <p><u>Grayscale</u> refers to the number of brightness levels (or gray shades) visible on an image and is linked to the bit depth of the system.</p> <p><u>Long Scale</u> is the term used when slight differences between gray shades are present (low contrast) but the total number of gray shades is great.</p> <p><u>Short Scale</u> is the term used when considerable or major differences between gray shades are present (high contrast) but the total number of gray shades is small.</p>
Dynamic Range	The range of exposures that may be captured by a detector.
Receptor Contrast	The fixed characteristic of the receptor. Most digital receptors have an essentially linear response to exposure. This is impacted by contrast resolution (the smallest exposure change or signal difference that can be detected). Ultimately, contrast resolution is limited by the quantization (number of bits per pixel) of the analog-to-digital convertor.
Exposure Latitude	The range of exposures which produces quality images at appropriate patient dose.
Subject Contrast	The magnitude of the signal difference in the remnant beam as a result of the different absorption characteristics of the tissues and structures making up that part.

APPENDIX

C

HGTC STUDENT BACKGROUND CHECK, DRUG SCREENING & IMMUNIZATION/HEALTH TRACKING PACKET

Criminal Background Checks: To comply with the requirements of accrediting organizations, clinical/field placement partners, and State and Federal laws governing licensing, HGTC students are required to have acceptable criminal background checks and/or urine drug screening and/or appropriate health information/immunizations to participate in placement(s) at clinical and field facilities.

Typically, these checks and proof of health information/immunizations must be provided prior to the start of the first semester requiring clinical/field placement.

NOTE: Should your enrollment be interrupted (you miss a semester), new results for background checks, urine drug screening and/or health/immunization will be required.

All fees and costs associated with any checks, screenings or immunization are the responsibility of the student.

Admission to any of the programs listed below is conditional.

Unsatisfactory results on the criminal background check or urine drug screening, or failure to complete any required health/immunization standards WILL prevent enrollment or result in removal from enrollment in the program of study.

Criminal Background Check/Urine Drug

Screening/Immunization Tracker REQUIRED WITHIN

30 DAYS PRIOR TO START of 1st clinical/field class

