A LEADING POLYTECHNIC
COMMITTED TO STUDENT SUCCESS

Medical Radiologic Technology

PLAR (Prior Learning Assessment and Recognition)

Candidate Guide

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Acknowledgements

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The Medical Radiological Technology is dedicated to removing barriers and broadening the access to programs at NAIT. NAIT recognizes that knowledge and skills are gained through a variety of processes including life and work experiences that may align with courses within our programs. We are committed to supporting a community in which learners will receive appropriate credit or recognition for prior learning.

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Web ready – RPL office	January 14, 2015 (SB)			

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Why consider a PLAR assessment?

Recognition of Prior Learning (RPL) refers to the combination of flexible ways of evaluating peoples' lifelong learning, both formal and informal against a set of established standards. You can receive academic credit for your relevant lifelong learning. The Medical Radiological Technology]" program recognizes prior learning in a number of ways.

We recognize:

- Previous formal learning from a recognized post-secondary institution through transfer of credit and credential recognition.
- Previous non-formal and in-formal learning through a comprehensive prior learning assessment and recognition process (PLAR).

What are the PLAR options?

To be eligible for PLAR, an applicant must have first applied and have been accepted to a NAIT credit program (the non-refundable tuition deposit has been paid). Open Studies students are **not** eligible to apply for PLAR. Please note that your PLAR request will be reviewed within 6 weeks of receipt of the PLAR application form, all supporting documents (in English) and verification of fee payment. Submit your PLAR request early!

Individual Course Challenge

If you have a minimum 600 hours successful experience in the radiography field which may include a clinical portion of a program that has a radiography or diagnostic imaging component and have learned the skills and knowledge for **one or more** of the Medical Radiological Technology courses, you may apply to be assessed for each applicable course. Please note that NAIT has a 50% residency criterion. Applicants can only receive credit for up to 50% of any NAIT credit program (See NAIT Academic Regulations and Procedures under **Residence Requirements**). Students should enrol in their courses until official confirmation has been received that credit was granted.

Fees:

- The PLAR evaluation fee is $150.00 **per** course challenge.
- The course assessment fees must be paid prior to submitting a PLAR request.
- All fees are non-refundable.
- Call NAIT and ask to speak to an Advising Centre Representative at 780-471-6248 or Toll Free at 1-877-333-6248 or AskNAIT@nait.ca

How many courses can be challenged through PLAR in the Medical Radiological Technology program?

Currently we have 02 out of 15 diploma courses with PLAR challenges available. Credit is granted per course – partial credit will not be granted. Please note that NAIT has a 50% residency criterion. Applicants can only receive credit for up to 50% of any NAIT credit program. (See NAIT Academic Regulations and Procedures under **Residence Requirements**)

Is PLAR available at any time of the year?

Contact the program at 780-471-7036 or mrt@nait.ca for more details. Your request will be reviewed within 6 weeks of receipt of the request form, all supporting documents (in English) and verification of fee payment. Submit your PLAR request early!

Please Note: You should enrol in your courses until official confirmation has been received that credit was granted. The program sends an email notification that the application has been processed.

It is the student's responsibility to:
-Contact the program area with any questions or concerns related to the assessment results. Appeal process available.
-Notify the program if they have decided to decline a course credit that has been granted. Any changes must be requested before the add/drop deadline.

Which courses are PLAR ready?

Medical Radiological Technology Program Profile			
COURSE CODE	**COURSE NAME**	**PLAR Challenge(s) *available* through program**	**PLAR Challenge(s) *not available***
RSCH1100	Research in Healthcare		X
MRAD1161	Radiographic Imaging of the Chest and Abdomen		X
MRAD1170	Patient Management and Legislated Safety I		X
RADI1130	Image Acquisition and Quality Management	✓	
RADI1160	Radiographic Imaging of the Appendicular Skeleton	✓	
IPHE1201	Interprofessional Healthcare Education		X
MRAD1230	Specialized Imaging Units and Quality Management Program		X
MRAD1260	Radiographic Imaging of the Axial Skeleton		X
MRAD1270	Specialized Radiographic Imaging		X
MRAD1290	Clinical Applications I		X
MRAD1390	Clinical Applications II		X

Note No Level 2 courses are available for PLAR at the present time.

For assistance contact NAIT and ask to speak to an Advising Centre Representative at 780-471-6248 (Toll Free: 1-877-333-6248) or askNAIT@nait.ca

Is it easier to challenge a course through PLAR – OR – take the course?

Neither is easier. By using PLAR you may reduce the repetition of studying information that you already know. The PLAR process allows you to demonstrate knowledge you already have.

PLAR is not an easy way to certification, rather a “different" way to obtain certification. Your personal level of skill and experience will dictate which courses you choose to challenge. The self-audit section found later in this guide will help you to decide if you have a good match of skill and knowledge for a specific course.

Methods of assessing prior learning

Assessment methods measure an individual’s learning against course learning outcomes. The assessment methods listed below are the ones most commonly used, but other forms of flexible assessment may be considered. These assessments may include one or a combination of the following assessment tools:

- Product validation and assessment
- Challenge exam
- Standardized tests
- Performance evaluations (including skill demonstrations, role plays, clinical applications, case studies)
- Interviews and oral exams
- Equivalency (evaluations of learning from non-credit training providers)
- Evidence or personal documentation files (providing evidence of learning from life and work experiences and accomplishments)

If I live out of town, do I have to travel to the NAIT main campus to do PLAR?

Depending on the mode of assessment, there may be times that you will need to meet with the program on campus. However, we will try to keep travel to a minimum.

What services or resources can I access if I have a disability?

Identify any possible needs related to your disability during your PLAR Audit meeting with the program. If you have a disability and want to know more about what services or resources you may be able to access for your PLAR assessment, please contact Services for Students with Disabilities.

Are there other methods to gain NAIT course credits for prior learning?

Transfer Credit and Credential Recognition

Yes, NAIT may grant credit for previous post-secondary training from a recognized institution that is similar in content, objectives, and evaluation standards to NAIT training. Transfer of credit is different from the PLAR process. Transfer credit and credential recognition guidelines may be found at: http://www.nait.ca/86612.htm

Please Note: This process should be completed prior to your PLAR challenge. If these credits cannot be used for transfer credit or credential recognition, you may be able to use these accredited courses as part of your evidence for your PLAR challenge.

If more information is required, please contact:

- A NAIT Advising Centre Representative at 780-471-6248 (Toll Free: 1-877-333-6248) or email AskNAIT@nait.ca
- Program Advanced Credit contact (www.nait.ca under programs & courses and contacts)

What are the implications of receiving PLAR or Transfer Credit for my full time student status?

While RPL can mean fewer classes to take and pay for, students should be aware that the definition of full-time status for Financial Aid may be different than NAIT's definition of full-time status. Questions regarding financial assistance should be directed to the NAIT Financial Aid Office. A student who qualifies for advanced credit should review the NAIT Academic Regulations and Procedures, Academic Honors and if necessary, seek further consultation with Advising or Program staff since eligibility for semester honors, Dean's Honor Roll, an honors diploma/certificate or awards may be affected.

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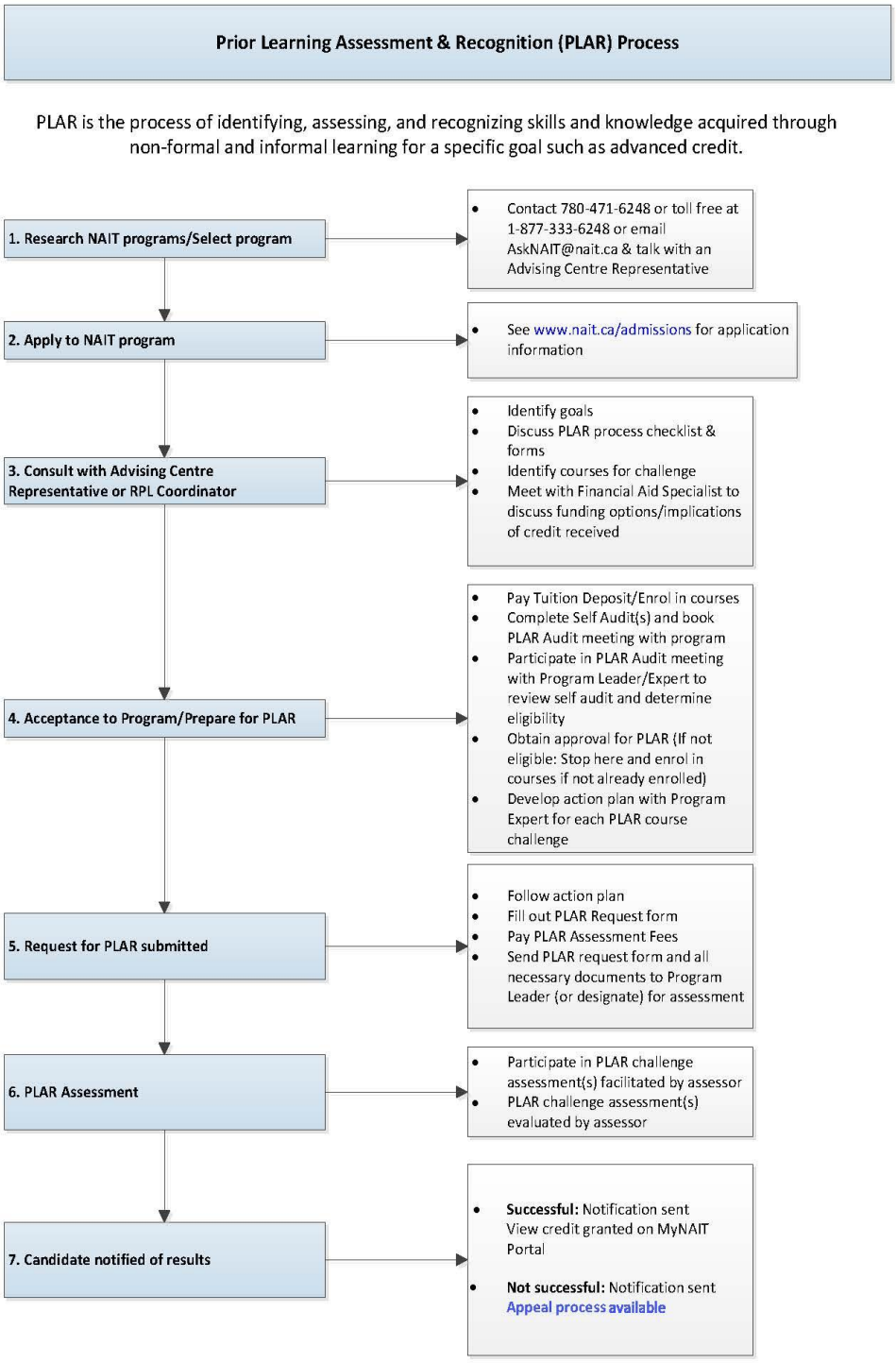
The PLAR Process



Revised January 5, 2015

Guiding principles for developing a PLAR evidence file

1. As you begin the PLAR process you will be advised if any evidence is required. This will be identified in your action plan. Check with the PLAR designated contact (see program home page Advanced Credit Contact) for your program **before** you begin to gather evidence.
2. Evidence must be valid and relevant. Your evidence must match the learning outcomes identified for each course.
    - It is your responsibility to create, collect and compile relevant evidence – if required.
3. Learning must be current within the last 5 years.
4. The evidence should demonstrate the skills and knowledge from your experiences.
5. The learning must have both a theoretical and practical component.

Types of evidence

There are three types of evidence used to support your PLAR request:

1. Direct evidence – what you can demonstrate for yourself.
2. Indirect evidence – what others say or observe about you.
3. Self-evidence – what you say about your knowledge and experience.

Ensure that you provide full evidence to your [Medical Radiological Technology Program] PLAR assessor so that your prior learning application is assessed appropriately. Well organized, easy to track evidence will also ensure that none of the evidence is missed or assessed incorrectly.

Here are some examples of evidence that you may be requested to submit as part of your evidence file (if required):

- workplace validations
- program validations

All documents that are submitted to NAIT may be returned to the student after the final results have been given and the advanced credit appeal deadline of 10 days has passed. A copy of transcripts and certificates may be included in your evidence file, but original transcripts that were submitted at the time of application to NAIT will be available online. Be prepared to show original parchments at the PLAR audit meeting for validation.

How long will it take to prepare evidence for PLAR?

Since the requirements are different for each course, and each candidate has different experiences, the amount of time it takes to prepare your evidence will vary.

Steps to complete a self-audit

1. Read through the levels of competence as listed below.

Mastery:	I am able to demonstrate the learning outcome well enough to teach it to someone else.
Competent:	I can work independently to apply the learning outcome.
Functional:	I need some assistance in using the outcome.
Learning:	I am developing skills and knowledge for this area.
None:	I have no experience with the outcome.

Learning outcomes

For each learning outcome listed, please self-evaluate your competency levels and record in the appropriate column for each self-audit.

2. Take a few minutes and read through the following self-audit for each course you are interested in as a PLAR candidate.

3. Check your level of competence as you read through each of the learning outcomes for each course. The information will help you in your decision to continue with your PLAR application.

4. In order to be successful in a PLAR assessment, your abilities must be at the competent or mastery level for the majority of the learning outcomes **(at least 80%)**. Some things to consider when determining your level of competence are:

   - How do I currently use this outcome?
   - What previous training have I had in this outcome: workshops, courses, on-the-job?
   - What personal development or volunteer experience do I have in this area?

   Be prepared to explain the reason you chose this level if asked by an assessor.

5. Bring the completed self-audit to a consultation meeting with the program head or faculty member in **Step 4** – of *The PLAR Process* for prior learning assessment. Select **Program Advanced Credit Contact (PLAR)** to book consultation.

Self-audit Guide(s)

RADI 1160 Radiographic Imaging of the Appendicular Skeleton

Students learn radiographic positioning techniques of the appendicular skeleton in a laboratory setting. Radiographic images will be produced using anthropomorphic phantoms. Students will critique radiographic images which include identifying soft tissues, skeletal structures and recognizing pathologies associated with the long bones and joints

Credit unit(s): 4.50
Equivalent course(s):
Prerequisite(s): (MRAD1170, RADI1130)

RADI 1160 Radiographic Imaging of the Appendicular Skeleton **Mastery:** I am able to demonstrate it well enough to teach it to someone else. **Competent:** I can work independently to apply the outcome. **Functional:** I need some assistance in using the outcome. **Learning:** I am developing skills and knowledge for this area. **None:** I have no experience with the outcome.	**Mastery**	**Competent**	**Functional**	**Learning**	**None**
1. • Produce radiographic images of the upper limb					
2. •Identify bony anatomy of the upper limb					
3. •Critique radiographic images of the upper limb					
4. Produce radiographic images of the shoulder girdle.					
5. • Identify bony anatomy of the shoulder girdle					
6. Critique radiographic images of shoulder girdle					
7. Produce radiographic images of the lower limb.					
8. Identify bony anatomy of the lower limb.					
9. •Critique radiographic images of lower limb					
10. Produce radiographic images of the pelvic girdle.					
11. Identify bony anatomy of the pelvic girdle.					
12. • Critique radiographic images of pelvic girdle					
13. Differentiate and explain pathologies of the appendicular skeleton visualized on radiographic images of the upper limb.					

RADI 1160 Radiographic Imaging of the Appendicular Skeleton **Mastery:** I am able to demonstrate it well enough to teach it to someone else. **Competent:** I can work independently to apply the outcome. **Functional:** I need some assistance in using the outcome. **Learning:** I am developing skills and knowledge for this area. **None:** I have no experience with the outcome.	**Mastery**	**Competent**	**Functional**	**Learning**	**None**
14. Differentiate and explain pathologies of the appendicular skeleton visualized on radiographic images of the shoulder girdle					
15. Differentiate and explain pathologies of the appendicular skeleton visualized on radiographic images of the • lower limb					
16. Differentiate and explain pathologies of the appendicular skeleton visualized on radiographic images of the • pelvic girdle					

PLAR assessment methods

If you qualify for PLAR, you may be asked to demonstrate your learning in one or more of the following ways. Be prepared to discuss the expectations during a consultation meeting.

Challenge exam

Candidate will be required to pass a 1.5 hour examination with a minimum grade of 60% (C-) achieved in **both** the theory and practical components of the challenge exam. Please note: Prior to the Practical Demonstration, a 30 minute orientation to the equipment will be provided. This will result in a total of a 2 hour time commitment by the candidate.

- Theory Assessment- 1 hour
  The theory assessment will be a combination of multiple choice and short answer theory questions. The questions will be covering the theory for all 5 learning outcome from the course.

- Practical Demonstration- 30 minutes
  The candidate will perform 2 separate demonstrations:
  - Demonstration 1: Upper extremity and Shoulder Girdle.
  - Demonstration 2: Lower Extremity and Pelvic Girdle.
  - Each demonstration will be given a maximum time of 15 minutes to perform.

Resources

Frank, E., Long, B., Smith, B. (2011). Merrill's Atlas of Radiographic Positions and Radiologic Procedures: Evolve Course Guide for
Mosby's Radiography Online: Anatomy & Positioning. (12th ed.). St. Louis, MO: Mosby. ISBN: 978-0-323-07334/set.
Eisenberg, R., & Johnson, N. (2012). Comprehensive Radiographic Pathology. (5th ed.). St. Louis, MO: Mosby. ISBN:
9780323069687.
Derrickson, B., & Tortora, G. (2011). Introduction to the Human Body. (9th.). Wiley

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RADI 1130 Image Acquisition and Quality Management

Students learn the principles, operation, and quality control testing of x-ray generating equipment and image acquisition modalities. Laboratory sessions will provide students experience with using radiographic imaging systems and quality control test tools.

Credit unit(s): 3.00
Equivalent course(s):
Co-requisite(s): MRAD1170

RADI 1130 Image Acquisition and Quality Management **Mastery:** I am able to demonstrate it well enough to teach it to someone else. **Competent:** I can work independently to apply the outcome. **Functional:** I need some assistance in using the outcome. **Learning:** I am developing skills and knowledge for this area. **None:** I have no experience with the outcome.	**Mastery**	**Competent**	**Functional**	**Learning**	**None**
1. Describe the principles of image acquisition.					
• Describe the imaging process					
• Describe the properties of radiation and how they relate to the production of medical images					
• Describe the properties of digital image					
2. Evaluate radiographic image quality.					
• Describe the technological factors that contribute to image quality					
• Describe the patient factors that affect image quality					
3. Operate radiographic equipment and manipulate radiographic image parameters					
• Describe the application of grids					
• Describe anatomically programmed radiography and automatic exposure control					
• post-processing digital image manipulation					
• Identify technical and patient factors causing image artifacts and the corresponding corrective action					
4. Assess quality control criteria on radiographic equipment.					
• Describe generator and x-ray tube function					
• Identify and describe ancillary equipment: collimator and image acquisition system					

PLAR assessment methods

If you qualify for PLAR, you may be asked to demonstrate your learning in one or more of the following ways. Be prepared to discuss the expectations during a consultation meeting.

Challenge exam

Candidate will be required to pass a 1.5 hour examination and achieve 60 % or higher to be successful in the RADI 1130 challenge exam. The theory assessment and the practical assessment marks will be blended for an overall mark. The Challenge Exam for RADI 1130 will consist of two components.

1. Theory Assessment-(See learning outcomes)

2. Practical Demonstration- Quality Control

The weighting on the assessment is defined below.

1. Theory Assessment: 80% of total mark.
2. Practical Assessment: 20% of total mark

Completion Requirements:

Theory Assessment

The theory assessment will be a combination of multiple choice and short answer theory questions. The questions will be covering the theory for all 4 learning outcomes from the course.

Practical Demonstration

- The following pages contain the quality control test that may be used to assess the practical portion of the challenge exam.
- The candidate will perform 2 of the following quality control tests. The test will be randomly chosen just prior to the practical demonstration.
- The candidate will be expected to perform the quality control test given the information provided and answer the corresponding questions.
- The candidate will be allowed 15 minutes to perform each quality control test in the x-ray rooms, and an additional 15 minutes to answer the questions that follow.

The candidate may refer to SC35 Safety Code to answer the acceptance criteria questions. SC35 will be supplied at the time of the assessment.

Health Canada *Safety code 35* (SC35): *Safety procedures for the installation, use and control of X-ray equipment in large medical radiological facilities.* (2008). Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php

Resources

Carlton, R. R., & Adler, A. M. (2013). *Principles of radiographic imaging an art and a science* (5th ed.). Clifton Park, NY: Delmar Cengage Learning.

Carter, C., & Vealé B. (2014). *Digital radiography and PACS*. (2nd ed). St. Louis, MO: Mosby Elsevier.

Fosbinder, R., & Orth, D. (2012). *Essentials of radiologic science*. Philadelphia, PA: Wolters Kluwer Health Lippincott Williams & Wilkins.

Frank, E. D., Long, B. W., & Smith, B. J. (2012). *Merrill's atlas of radiographic positions and radiologic procedures* (12th ed., Vols. 1 - 3). St. Louis, MO: Mosby Elsevier.

Fujifilm *FCR quality assurance program plus: Guidebook for image reader.* (2003). Fuji Photo Film Co., Ltd.

Health Canada *Safety code 35* (SC35): *Safety procedures for the installation, use and control of X-ray equipment in large medical radiological facilities.* (2008). Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php

Papp, J. (2011). *Quality management in the imaging sciences*. (4th ed). St. Louis, MO: Mosby Elsevier.

Philips Healthcare *Digital diagnost 2.0 x dual detector TH/VM.* (2009). Koninklijke Philips Electronics N.V.

Radiation protection act, Revised statutes of Alberta 2000 chapter R-2. (2010). Retrieved from http://www.qp.alberta.ca/documents/Acts/R02.pdf

Radiation protection act, Radiation protection regulation, Alberta regulation 182/2003. (2003). Retrieved from http://www.qp.alberta.ca/documents/Regs/2003_182.pdf

Appendix A: Lab Manual RADI 1160

NAIT Diagnostic Imaging	General Lab Guidelines
Attire	• Scrubs (lab coats may be used only in emergency situations) • Closed-toe footwear • Long hair tied back, jewelry kept to a minimum • **NO:** hats, cell phones, iPods, etc.
Radiation Safety	• No radiation exposures will be made to any person • A lab instructor must be present for all exposures • The door to the x-ray room must be closed prior to exposing • OSLDs must be worn in the x-ray lab
General Safety	• As students practice positioning each other, ensure that you take precautions to ensure the safety of your classmates • Handle the x-ray equipment with care, and let your instructor know immediately if something appears unsafe
Handling of Phantoms	• Handle the phantom supplies carefully as they are very expensive • The phantoms will be exposed to produce images, always ensure no person is present in the room prior to exposing
Lab Completion	• Turn off the equipment • Clean the room including the table and/or upright bucky • Return all materials to their original location

Operator's Guide
Radiation Protection during Lab Sessions at NAIT

You Shall…

- Close door to x-ray room before exposing, and lock if required
- Make x-ray exposures only with an instructor present
- Before exposing, check:
  - The x-ray tube direction, angulations, and collimation
  - Recheck the control settings
  - The ready position of the equipment
  - That no one will be exposed
- Make sure that you get a complete exposure by pressing firmly on the exposure switch and holding it in contact position until there is indication of exposure completion
- Shield entrances with uncontrolled access and make sure moveable barriers overlap
- Direct the beam away from entrances or occupied areas, as a generally preferred practice
- During the use of mobile x-ray equipment, use the control booth barrier
- When about to enter the x-ray room check that exposure is not about to be made, enter cautiously and into a shielded area, if possible
- Protect x-ray image acquisition devices from exposure to x-rays; by removing them from the exposing area; by not leaving them where scattered radiation may reach them
- Personal radiation monitor (personnel radiation monitors)
- Damaged personal monitors shall be brought to the attention of the person attending to monitoring service or instructor.
- Wear personal radiation monitor at chest or belt level with monitor facing towards the front
- Wear beneath protective apron if apron required
- Always return to proper location at NAIT after each lab
- Do not take home or wear personal monitor outside of NAIT
- Do not leave personal monitor in x-ray room where accidental exposure may occur
- Return personnel monitor to the storage place at lab completion
- Make the x-ray exposures from within the control booth whenever possible
- Reduce the risks of accidental exposure of classmates by not being hasty with the exposure and checking that no one is about to enter the area just as you are about to expose; by making sure fellow students have left the exposure area in good time
- Inform the instructor of any loose parts, malfunctions or disrepair of lab equipment
- Take extra precautions if **pregnancy is suspected/confirmed**
- Turn x-ray machines "off" when unattended

Image Reader	☐ Enter patient's first and last name ☐ Enter patient's birth date ☐ Select the appropriate examination
Console	☐ Set the proper technique ☐ Select the appropriate image receptor (ex. upright bucky or tabletop, etc.)
Room Set-up	☐ Appropriate cassette ready ☐ Tube aligned ☐ SID set ☐ Supplies ready (markers, sponges, shielding, etc.)
Greeting and Identification	☐ Use a pleasant salutation such as "hello" or "good morning" ☐ Greet the person using their full name and then introduce yourself ☐ State intention, such as "I'm going to be taking your x-rays today" ☐ If necessary, have patient change into a gown, remove jewelry, etc. ☐ In the x-ray room, use two verifiers such as name and DOB ☐ Verify part being imaged "So what are we x-raying today?" ☐ For female patients ask possibility of pregnancy and LMP ☐ Explain the procedure and the approximate length of time ☐ Ask if there are any questions about the procedure
Procedure	☐ Shield the patient where possible ☐ Gently position the patient ☐ Align the tube and cassette so they are centered to the area of interest ☐ Collimate to the appropriate size ☐ Place the marker in the proper location ☐ Check SID
Exposure	☐ Confirm that proper technique was set ☐ Provide patient instructions (hold still, breathing instructions, etc.) ☐ Announce that you are exposing and the room number ☐ Instruct the patient to relax/breathe etc.
Completion	☐ Have the patient wait while you check the images ☐ Critique images ☐ After the images have been checked, dismiss the patient: "We have everything we need so you can go. Your doctor will probably have the report in the next 3-5 business days." ☐ Clean table and/or upright bucky ☐ Return supplies to their original locations

Diagnostic Imaging	Marker Annotation Guidelines	
	Description of Placement	**Exceptions**
R or L	Viewed from the anatomical position with the superior aspect of the part (or body) at the top of the cassette	Fingers, hands, wrists, forearms, toes and feet, for which the marker is placed face-up on the prone position with the distal part to the top
Supine/Posterior Oblique Positions	Lead marker is placed face up on the lateral aspect of the part	
Prone/Anterior Oblique Positions	Lead marker is placed face down on the lateral aspect of the part	Fingers, hands, wrists, forearms, toes and feet, for which the marker is placed face-up on the prone position with the distal part to the top
Lateral Position	Lead marker indicates the side that is closest to the imaging receptor Marker should be demonstrated at the front/anterior of the body	
Oblique Projections	Remember: the R marker always goes on the right side of the body and the L marker always goes on the left side of the body (for spine, an R and an L are both used)	
Lateral Decubitus Position	Lead marker indicates the elevated side. Use an arrow or an 'up' annotation and place on the elevated side.	

*Please remember that these are NAIT guidelines/policies and they may vary at clinical sites

Diagnostic Imaging	**PACTAD Image Critique**
Projection and Position	Which projection is demonstrated? Is the positioning acceptable? • No rotation or tilt • Area of interest positioned appropriately
Annotation	Name and DOB Correct Marker(s) present • Correct marker(s) • Correct orientation and placement
Collimation, Centering, and Cassette/IR	Collimation is evident and appropriately sized X-ray image and IR are both centered to the area of interest Cassette is correct size and proper orientation
Technical and Patient Factors	Exposure is sufficient for adequate penetration of the area of interest Exposure is not too great as to expose the patient to unnecessary radiation (S,EI, or LGM numbers within the appropriate range) No artifacts are present Patient does not require additional projections or positions due to patient factors
Anomalies	Is there any pathology present?
Discern	Is the image ready to be sent to PACS? Is a repeat required? How would you adjust for a repeat?

	PACTAD Critique Checklist: If all checks are filled for a category, the image will be "Diagnostic" for that category	
Projection and Position	☐ Projection identified ☐ No rotation ☐ No tilt ☐ No other positioning error present	☐ Diagnostic ☐ Requires additional action
Annotation	☐ Correct name and DOB ☐ Correct marker ☐ Proper orientation and placement of marker	☐ Diagnostic ☐ Requires additional action
Collimation, Centering, and Cassette	☐ Collimation is evident and appropriately sized ☐ Area of interest is centered to the cassette and the exposure area ☐ Cassette is proper size and orientation	☐ Diagnostic ☐ Requires additional action
Technical and Patient Factors	☐ Exposure is sufficient for adequate penetration of area of interest ☐ Exposure is not too great so as to expose the patient to unnecessary radiation ☐ No artifacts are present ☐ No patient factors warrant additional views	☐ Diagnostic ☐ Requires additional action
Anomalies	☐ No pathologies are present	☐ Diagnostic ☐ Requires additional action
Discern For any category requiring additional action, list the steps you would take.		

RADI1160 Assigned Readings for Merrill's 12th Ed.
All of the pages are in Volume 1.

General Anatomy
Bone Structure, Function, and Classification: pages 75-85
General Terms: pages 85-95

Upper Extremity
Anatomy for Upper Extremity: pages 101-107
Hand: pages 124-131
Fingers: pages 110-115
Thumb: pages 116-117
Wrist: pages 132, 134-136
Scaphoid: pages 138, 140-141
Radius and Ulna: pages 148-150
Elbow: pages 151-155
Elbow fat pads: page 107
Radial Head: pages 160-161
Humerus: pages 167-168
Anatomy for the Shoulder Girdle: pages 175-181
Shoulder (AP): pages 183-187
Shoulder: 188-189, 194-195, 198-201
Clavicle: pages 213-214
Scapula: pages 216-219
Acromioclavicular Joints: pages 209-210

Lower Extremity
Anatomy for the Lower Extremity: pages 228-239
Toes: pages 242-243, 245-249
Foot: pages 252-257, 260-261
Calcaneus: pages 271, 274
Ankle: pages 279-281, 283-285
Tibia/Fibula: pages 290-293
Knee: pages 296-301
Knee (oblique's): pages 304-305
Patella: pages 311-312, 316-317
Intercondyloid Fossa: pages 308-310
Femur: pages 318-321
Anatomy of the Pelvic Girdle: pages 327-333
Pelvis: pages 337-339
Hip: pages 346-351
Acetabulum: pages 356-357
Ilium: pages 361-362

The projections that are in:

- Black are to be done in practical labs and in theory
- Blue are to be tested in theory only and may be demonstrated in class but will not be in labs or on practical assessments

Upper Extremity

Upper Limb Anatomy Merrill's volume 1. Chapter 4: Upper Limb. Section: Anatomy.

- Hand
- Forearm
- Arm
- Upper limb articulations

Finger Merrill's volume 1. Chapter 4: Upper Limb. Section: Digits (Second through Fifth).

- PA projection
- Lateral projection
- PA oblique projection

Thumb Merrill's volume 1. Chapter 4: Upper Limb. Section: First Digit (Thumb).

- AP projection
- PA projection
- Lateral projection
- PA oblique projection

Hand Merrill's volume 1. Chapter 4: Upper Limb. Section: Hand.

- PA projection
- PA oblique projection
- Lateral projection:(fan lateral)
- AP oblique projection (Norgaard method)

Wrist Merrill's volume 1. Chapter 4: Upper Limb. Section: Wrist.

- PA projection
- Lateral projection
- PA oblique projection
- AP oblique projection

Scaphoid Merrill's volume 1. Chapter 4: Upper Limb. Section: Wrist, Scaphoid.

- PA projection: ulnar deviation
- Scaphoid PA Axial projection (Stecher Method)
  - Note: for the PA axial scaphoid we will be practicing both the method with the sponge and the method with a 20 degree proximal tube angle

Forearm Merrill's volume 1. Chapter 4: Upper Limb. Section: Forearm.

- AP projection
- Lateral projection: lateromedial

Elbow Merrill's volume 1. Chapter 4: Upper Limb. Section: Elbow.

- AP projection
- Lateral projection: lateromedial
- AP oblique projection: medial rotation
- AP oblique projection: lateral rotation
- Radial head lateral projection: lateromedial

Elbow Fat Pads Merrill's volume 1. Chapter 4: Upper Limb. Section: Anatomy - Fat Pads.

Humerus Merrill's volume 1. Chapter 4: Upper Limb. Section: Humerus.

- AP projection: upright
- Lateral projection: lateromedial, mediolateral upright

Shoulder Girdle

Anatomy Merrill's volume 1. Chapter 5: Shoulder Girdle. Section: Anatomy

- Shoulder girdle
- Clavicle
- Scapula
- Humerus
- Shoulder girdle articulations

Shoulder Merrill's volume 1. Chapter 5: Shoulder Girdle. Section: Shoulder

- AP projection: external neutral, internal rotation humerus
- Glenoid cavity AP Oblique projection (Grashey method): RPO or LPO position
- Inferosuperior axial projection (Lawrence method)
- Superoinferior axial projection
- Scapular Y PA oblique projection

Scapula Merrill's volume 1. Chapter 5: Shoulder Girdle. Section: Scapula.

- AP projection
- Lateral Projection: RAO or LAO body position

Clavicle Merrill's volume 1. Chapter 5: Shoulder Girdle. Section: Clavicle

- AP projection
- AP axial projection

AC Joints Merrill's volume 1. Chapter 5: Shoulder Girdle. Section: Acromioclavicular articulations

- AP projection: Bilateral (Pearson Method): with and without weights

Lower Extremity and Pelvic Girdle

Anatomy of lower limb Merrill's volume 1. Chapter 6: Lower Limb. Section: Anatomy. Foot

- Leg
- Femur
- Patella
- Knee Joint
- Lower Limb Articulations

Toes Merrill's volume 1. Chapter 6: Lower Limb. Section: Toes

- AP or AP axial projections
- AP oblique projection: medial rotation

- Lateral projection: mediolateral or lateromedial

Foot Merrill's volume 1. Chapter 6: Lower Limb. Section: Foot
- AP or AP axial projection
- AP oblique projection: medial rotation
- Lateral projection: mediolateral

Calcaneus Merrill's volume 1. Chapter 6: Lower Limb. Section: Calcaneus.
- Axial projection: plantodorsal
- Lateral projection: mediolateral

Ankle Merrill's volume 1. Chapter 6: Lower Limb. Section: Ankle.
- AP projection
- Lateral projection: mediolateral
- AP oblique Mortise joint : medial rotation
- AP oblique projection 45 degree: medial rotation

Tibia and fibula Merrill's volume 1. Chapter 6: Lower Limb. Section: Leg.
- AP projection
- Lateral projection: mediolateral

Knee Merrill's volume 1. Chapter 6: Lower Limb. Section: Knee.
- AP projection
- PA projection
- Lateral projection: mediolateral
- AP oblique projection: lateral rotation
- AP oblique projection: medial rotation
- AP standing (weight-bearing)

Intercondylar fossa Merrill's volume 1. Chapter 6: Lower Limb. Section: Intercondylar fossa.
- PA axial (Camp-Coventry Method)
- AP axial (Beclere Method)

Patella Merrill's volume 1. Chapter 6: Lower Limb. Section: Patella.
- PA projection
- Lateral projection: mediolateral
- Tangential projection (Settegast Method)

Femur Merrill's volume 1. Chapter 6: Lower Limb. Section: Femur.
- AP projection
- Lateral projection: mediolateral

Pelvic Girdle

Pelvic Girdle Anatomy Merrill's volume 1. Chapter 7: Pelvis and Upper Femora. Section: Anatomy.
- Hip bone
- Proximal femur
- Articulations of the pelvis
- Pelvis

- Localizing anatomic structures

Pelvis Merrill's volume 1. Chapter 7: Pelvis and Upper Femora. Section: Pelvis.

- AP projection

Hip Merrill's volume 1. Chapter 7: Pelvis and Upper Femora. Section: Hip.

- AP projection
- Lateral projection: mediolateral (Lauenstein and Hickey Methods)
- Axiolateral projection (Danelius-Miller Method) Demonstration in class

REQUIRED LEARNING RESOURCES

Frank, E., Long, B., Smith, B. (2011). Merrill's Atlas of Radiographic Positions and Radiologic Procedures: Evolve Course Guide for

Mosby's Radiography Online: Anatomy & Positioning. (12th ed.). St. Louis, MO: Mosby. ISBN: 978-0-323-07334/set.

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Appendix B: Employer/Program Validation Letter RADI 1160

SCHOOL OF HEALTH SCIENCES

Employer Validation Form

To determine if a candidate has the skills, knowledge and abilities equivalent to the outcomes of the course they are seeking credit for an authentic and reliable assessment must take place. An Employer Validation is an important component of the assessment as it provides an indirect, authenticated account of the employee/candidate's performance in industry.

Employment Information		
Employee/Candidate:		
Employer:		
Address:		
City:	**Prov.:**	**Postal Code:**
Supervisor:		
Phone:	☐ **Full-time** ☐ **Part-time** ☐ **Casual**	
X-ray hours worked per year: **Employer/Supervisor's signature:**	**Dates of Employment:** _____ **to:** _____ (dd/mm/yy) (dd/mm/yy)	
Job description and duties:		

SCHOOL OF HEALTH SCIENCES

The Employer Validation Checklist must be completed by the employee/candidate's direct supervisor.

Employer/Program Validation Checklist			
Please place a ✔ in the box that aligns with the employee/PLAR candidate's abilities/performance for each of the following skills.			
Employee/Candidate:			
Yes – Consistently demonstrates skill to an acceptable level **No –** Rarely demonstrates skill to an acceptable level **N/A-** Not observed	**YES**	**NO**	**NA**
1. Produce and critique radiographic images of the upper limb. (Should include the following components)			
○ Describe general anatomy and radiographic positioning terms			
○ Identify bony anatomy of upper limb			
○ Produce radiographic examinations of the upper limb			
○ Critique radiographic images of the upper limb			
2. Produce and critique radiographic images of the shoulder girdle. (Should include the following components)			
○ Identify bony anatomy			
○ Produce radiographic examinations of the shoulder girdle			
○ Critique radiographic images of shoulder girdle			
3. Produce and critique radiographic images of the lower limb. (Should include the following components)			
○ Identify bony anatomy			
○ Produce radiographic examinations of the lower limb			
○ Critique radiographic images of lower limb			
4. Produce and critique radiographic images of the pelvic girdle. (Should include the following components)			
○ Identify bony anatomy			
○ Produce radiographic examinations of the pelvic girdle			
○ Critique radiographic images of pelvic girdle			
5. Differentiate and explain pathologies of the appendicular skeleton visualized on radiographic images (Should include the following components)			

Appendix C: LAB MANUAL RADI 1130

X-RAY UNIT ORIENTATION LAB

Outcome

1) Identify, locate and operate various features of each of the x-ray units.
2) Locate and identify various cassette sizes.
3) Make exposures with the x-ray unit observing all safety precautions.
4) Process a digital image.

Procedure

1 Turn power on:
- Master control panel
- Main power switch
- On/off switch

2 Allow unit to warm up, realizing that different x-ray units have different methods of indicating readiness. Warm up with 2 warm up exposures in units 2, 3, 4, but this is not required for units 1 & 5.

3 Familiarize yourself with all parts, locks, and accessories of the x-ray unit.

4 For units 2, 3, or 4, find the cassette storage area. Find the computed radiography (CR) cassettes. Which side of the cassette should face the tube?

5 Under supervision,
- Prepare to make exposures as a group of a phantom body part.
- Describe the safety precautions taken when making an exposure.
- Operate the tube movement locks and switches.

6 Process the digital image, and view.

7 Turn x-ray unit power off.

8 For units 1 & 5, set up for a DR (direct exposure) image.

9 Under supervision,
- Prepare to make exposures as a group of a phantom body part.
- Describe the safety precautions taken when making an exposure.
- Operate the tube movement locks and switches.

10 View the digital image.

11. Turn off the x-ray units.

Control Panel

Of particular importance to the operator is the ability to control the amount of x-radiation generated. Basically, three factors must be controlled: 1) Kilovoltage (kVp) 2: Milliamperage (mA), 3) time. Suitable means for selecting these factors are provided on the x-ray control panel. The x-ray units also use anatomical programming to choose the technique for you, as well as automatic exposure control devices (AEC) that also helps regulate radiation exposures.

The On-Off Switch

Pressing the line ON push button energizes selected circuits and puts the control on a “stand-by” basis ready for operation. The pilot light near the ON push button will indicate that electrical power is on. Various electronic devices incorporated in x-ray controls may require a warm-up period; therefore a time delay may be required before the control can be operated. Some signal may be used to indicate that the warm-up period has elapsed.

Pressing the line OFF push button de-energizes the control.

Milliampere (mA) Selector

The mA Selector is simply a convenient way to pre-select milliamperage. The Selector determines the voltage applied to the primary circuit of the x-ray tube filament transformer, and this in turn control the heat of the filament, which in turn determines the number of free electrons available for the production of photons (x-rays).

This sequence of events controls the number (amount) of x-rays produced. Each position of the switch connects a different resistance in the x-ray tube filament transformer primary and thereby provides control.

kVp Selectors

The purpose of this selector is to provide the technologist with a means of selecting the voltage applied to the primary of the high-voltage transformer and thereby the high-voltage to the x-ray tube. This controls the strength of the x-ray beam.

Time Selector

A timer is necessary in order to limit or control x-ray production. This is done by controlling the length of time the primary of the high-voltage transformer is energized.

Using the NAIT Computed Radiography (CR) System (Agfa)

1. Enter patient demographics in CR unit
2. Get a CR cassette from the CR reading unit
3. Erase cassette
    a. Press erase button on reader unit
    b. Insert cassette by placing cassette in CR reading unit as indicated on unit
        a. Place cassette on tray black side up, opening going in first (side with no border)
        b. Push in cassette and then slide cassette to the right all the way
4. Place cassette on table, black side up (orange side down)
5. Put anatomical phantom (hand, foot...) on top
6. Set correct SID, centering point and collimation, etc.
7. Set required technique on control panel
8. Expose
9. Read cassette by placing cassette in CR reading unit as indicated on unit
    a. Place cassette on tray black side up, opening going in first (side with no border)
    b. Push in cassette and then slide cassette to the right all the way
10. Remove cassette when finished
11. Examine CR image on CR unit
12. Examine and evaluate “LGM” number for exposure
13. Manipulate image on CR unit
    a. Invert
    b. Annotate
    c. Add comments to image
    d. Change brightness/contrast
14. Send image to PACS
15. View image on PACS

Using the NAIT Computed Radiography (CR) System (Fuji)

1. Enter patient demographics in CR unit
2. Get a CR cassette from the CR reading unit
3. Hard erase cassette
    1. Press erase button on reader unit twice (for hard erase)
    2. Insert cassette by placing cassette in CR reading unit as indicated on unit
        1. Place cassette on tray gray side up, opening going in first
        2. Slide cassette to the right all the way, push in
4. Place cassette on table, black side up (gray side down)
5. Put anatomical phantom (hand, foot...) on top
6. Set correct SID, centering point and collimation, etc.
7. Set required technique on control panel
8. Expose
9. Bar code cassette
    1. Ensure desired projection/view is turquoise on computer screen
    2. Use barcoding device
10. Read cassette by placing cassette in CR reading unit as indicated on unit
    1. Place cassette on tray gray side up, opening going in first
    2. Slide cassette to the right all the way, push in
11. Remove cassette when finished
12. Examine CR image on CR unit
13. Examine and evaluate “s” number for exposure
14. Manipulate image on CR unit
    1. Invert
    2. Annotate
    3. Add comments to image
    4. Change brightness
    5. Change contrast
15. Send image to PACS
16. View image on PACS

Using the NAIT Direct Radiography (DR) System (Philips)

1. Enter patient demographics in computer
2. Open examination
3. Choose projection/view
4. Put anatomical phantom (hand, foot...) on top of table detector
5. Set correct SID, centering point and collimation, etc.
6. Set required technique on control panel
    1. Manual or APR(Anatomically Programmed Radiography)
7. Expose
8. Examine image on computer screen
9. Examine “EIS” number on-screen for exposure
10. Manipulate image on computer screen
    1. Invert
    2. Annotate
    3. Add comments to image
    4. Change brightness
    5. Change contrast
11. Send image to PACS
12. View image on PACS

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Carter, C., & Veale B. (2014). *Digital radiography and PACS*. (2nd ed). St. Louis, MO: Mosby Elsevier.

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- **The following pages include the possible quality control tests for the practical assessment portion of the challenge exam and the marking rubric**

RADI1130 Practical Assessment

Name:
Date:
Unit:

HVL (HALF VALUE LAYER)

1. Set up the test tool(s).

2. Take exposures at 100 cm SID, 100 mAs, and 80 kV.

Exposure number	Added amount of filtration (Al.)	mR
1	0.0 mm Al	
2	0.5 mm Al	
3	1.0 mm Al	
4	1.5 mm Al	
5	2.0 mm Al	
6	2.5 mm Al	
7	3.0 mm Al	
8	3.5 mm Al	
9	4.0 mm Al	
10	4.5 mm Al	
		NAIT

3. State HVL acceptability at 80 kVp from SC35.

4. What is your conclusion regarding test results?

5. What is the significance should the test fail?

RADI1130 Practical Assessment

Name:
Date:
Unit:

TIMER ACCURACY TEST

1. Set up test tool(s) to determine actual exposure time.

2. Expose at 100 cm SID, 60 kV, and 10 mAs for each of the following times.

Time set	Time obtained
50 ms	
100 ms	
200 ms	
	NAIT

3. State exposure time acceptability from SC35.

4. Determine timer error for all three times using the formula below.

   Formula: $\frac{\text{set time – obtained time}}{\text{set time}} \times 100\ \% =$

5. What is your conclusion regarding test results?

6. What is the significance should the test fail?

RADI1130 Practical Assessment

Name:
Date:
Unit:

REPRODUCIBILITY (COEFFICIENT OF VARIATION)

1. With test tool(s), take **10** exposures at 100 cm SID, 80 kV, and 40 mAs.

Exposure number	Reading	Exposure number	Reading
1	mR	**6**	mR
2	mR	**7**	mR
3	mR	**8**	mR
4	mR	**9**	mR
5	mR	**10**	mR
			NAIT

2. State coefficient of variation and percent of mean acceptability from SC35.

3. We will not be determining coefficient of variation today.

4. Determine percent difference using maximum & minimum values.

Formula: $\frac{\text{(mean value – max. value)}}{\text{mean value}} \times 100 =$

Formula: $\frac{\text{(mean value – min. value)}}{\text{mean value}} \times 100 =$

5. What is your conclusion regarding test results?

6. What is the significance should the test fail?

RADI1130 Practical Assessment

Name:
Date:
Unit:

KVP ACCURACY

1. Set up test tool(s).

2. Expose at the following kV settings using 100 cm SID and 10 mAs.

kV	Results
60 kV	
80 kV	
100 kV	
	NAIT

3. State kV acceptability from SC35.

4. Determine kV accuracy using the formula below.

Formula: $\frac{\text{set kV – obtained kV}}{\text{set kV}} \times 100 =$

5. What is your conclusion regarding test results?

6. What is the significance should the test fail?

RADI1130 Practical Assessment

Name:
Date:
Unit:

MA LINEARITY

1. Set up test tool(s).

2. Using the 100 mA and 200 mA stations, make 3 exposures each at 100 cm (40 inch) SID, 80 kV, and 0.10 seconds (100 ms).

3. Record results on the following chart.

mA	mAs	mR	Average mR	Average mR/mAs
100				
100				
100				
200				
200				
200				
				NAIT

4. Calculate % linearity for entire range (as only two stations used) =

$$\frac{\frac{(\text{maximum mR/mAs} - \text{minimum mR/mAs})}{2}}{\text{average mR/mAs}} \times 100$$

OR

Calculate station to station =

$$|x_1 - x_2| \leq 0.10\,(x_1 + x_2)$$

5. State mA linearity acceptability from SC35.

6. What is your conclusion regarding test results?

7. What is the significance should the test fail?

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Fujifilm *FCR quality assurance program plus: Guidebook for image reader.* (2003). Fuji Photo Film Co., Ltd.

Health Canada *Safety code 35* (SC35): *Safety procedures for the installation, use and control of X-ray equipment in large medical radiological facilities.* (2008). Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php

Johnston, J. N., & Fauber, T. L. (2012). *Essentials of radiographic physics and imaging*. St. Louis, MO: Mosby Elsevier.

McQuillen Martensen, K. (2011). *Radiographic image analysis* (3rd ed). Philadelphia, PA: Saunders Elsevier.

Papp, J. (2011). *Quality management in the imaging sciences*. (4th ed). St. Louis, MO: Mosby Elsevier.

Philips Healthcare *Digital diagnost 2.0 x dual detector TH/VM.* (2009). Koninklijke Philips Electronics N.V.

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Radiation protection act, Radiation protection regulation, Alberta regulation 182/2003. (2003). Retrieved from http://www.qp.alberta.ca/documents/Regs/2003_182.pdf

Level / Criteria	4 Excellent	3 Proficient	2 Adequate	1 Limited	Insufficient	**Total/ Comments:**
Proper use of personal radiation monitor and safety protocols	Preformed testing safely and wore OSLD		Applied one of the two safety requirements. Preformed testing safely but did not wear OSLD, or vice versa.		Did not perform testing safely and did not wear OSLD.	
Proper equipment set up and test tool management to include: control panel and technical factors	Proper set up of test tool and equipment	Some steps missed during initial set up, corrected before exposure	Few steps missed during initial set up and not identified	Multiple steps missed during initial set up and not identified	Could not perform, set up or use test tool correctly	
Proper sequence of procedures to include: locks, collimation, centering	Proper sequencing of procedures		Testing preformed with incorrect sequencing causing a repeat procedure step		Could not perform testing	
Correct recording and analysis of data	All data recorded and analyzed	Most data recorded and analyzed	Partial completion of data and analysis	Only data recorded and not analyzed	No data recorded nor analyzed	
Significance of test procedure	Identified and fully explained testing significance		Provided a singular statement of test significance		None given	
Total score/Total possible score						/ 20

APPENDIX D: Employer/ Program Validation RADI 1130

SCHOOL OF HEALTH SCIENCES
Employer/Program Validation Form

To determine if a candidate has the skills, knowledge and abilities equivalent to the outcomes of the course they are seeking credit for an authentic and reliable assessment must take place. An Employer Validation is an important component of the assessment as it provides an indirect, authenticated account of the employee/candidate's performance in industry.

<table>
<tr><th colspan="4">Employment Information</th></tr>
<tr><td colspan="4">Employee/Candidate:</td></tr>
<tr><td colspan="4">Employer/Program:</td></tr>
<tr><td colspan="4">Address:</td></tr>
<tr><td colspan="2">City:</td><td>Prov.:</td><td>Postal Code:</td></tr>
<tr><td colspan="4">Supervisor:</td></tr>
<tr><td>Phone:</td><td colspan="3">☐ Full-time ☐ Part-time ☐ Casual</td></tr>
<tr><td>Diagnostic imaging hours worked per year:

Employer/Supervisor's signature:</td><td colspan="3">Dates of Employment:

_____ to: _____
(dd/mm/yy) (dd/mm/yy)</td></tr>
<tr><td colspan="4">Job description and duties:</td></tr>
</table>