

Radiologic Science Degree Completion Program

2015-2016 Assessment Report

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**Oregon Institute of Technology
Medical Imaging Technology Department
Radiologic Science Degree Completion Program Assessment
2015-2016**

I. Introduction

The Radiologic Science (RDSC) Degree Completion Program began in 1996 and is one of four degree completion programs offered by the Department of Medical Imaging Technology at Oregon Institute of Technology.

The structure of the program allows registered radiologic technologists (RT) to pursue their Bachelor of Science degrees without coming to campus. This is accomplished by using the medical facilities where students are employed (or of their choice) as sites for temporary clinical practice, to fulfill the requirements of courses with labs, and the external capstone course, RDSC 411.

Eighty-nine credits are granted for the core radiography curriculum for registered technologists in good standing with the American Registry of Radiologic Technology (ARRT). A 62 credit block of math, communications, science, and remaining general education credits are taken from OIT for courses available online, or at a college in the student's locale. The remaining block of 50 credits is taken online from OIT.

During the early years of the program enrollment was slow, with little increase. The creation of a dedicated distance education office was greatly beneficial in promoting the program. From the Fall of 2002, through the Fall of 2007, the number of students coming into the program were 8, 8, 8, 12, 25, and 29, respectively. The number of graduates from 2002 through 2006 were 1, 2, 3, 1, and 4, respectively. As of spring, 2011, eight were notified of being eligible to graduate. Spring of 2012 will see another seven.

II. Mission, Objectives, and Student Learning Outcomes

Radiologic Science Degree Completion Program Mission Statement:

The mission of the Radiologic Science Degree Completion Program is to provide ARRT registered Radiologic Technologists a Bachelor of Science degree from a distance education program that furthers the student's knowledge, clinical practice, and performance of examinations while practicing competent patient care and safety in the advanced modalities of Radiologic Technology.

Program Objectives:

1. Maintain a degree completion curriculum with emphasis on special modalities.
2. Provide a BS degree in Radiologic Science with a core of courses directly applicable to the technologist-student seeking advancement or a leadership role in the profession.
3. Further the distance student's practice of providing compassionate healthcare in the clinical setting
4. Prepare graduates to obtain positions in the advanced modalities, management, sales, applications, education, and other career options available to Bachelor of Science degree graduates.
5. Place students in the clinical setting of various modalities, enabling them to gain hands-on experience and form new networks.
6. Provide a quality degree program that recognizes the achievement of passing the national registry.
7. Address quality of healthcare issues through the continued learning of working professionals.
8. Provide a meaningful capstone experience in one or more advanced imaging modalities.

Student Learning Outcomes:

1. Demonstrate knowledge of concepts & principles associated with the operation of special modality imaging machines & equipment.
2. Identify arteriographic anatomy and cross sectional images of the head, neck, and torso, for specific accuracy and spelling.
3. Demonstrate magnetic field precautions and radiation safety for self, staff, and patients as set forth by the ALARA standards.
4. Demonstrate professional judgment and appropriate interpersonal communication with colleagues and superiors.
5. Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency.
6. Identify major disease processes diagnostic to advanced modality examinations

III. SLO Three Year Assessment Cycle

A three-year cycle for the assessment of the program’s student learning outcomes is shown below in Table 1.

Radiologic Science Outcome Assessment	2013-2014 Term/Course	2014-2015 Term/Course	2015-2016 Term/Course	
1. Demonstrate knowledge of concepts & principles associated with the operation of special modality imaging machines & equipment (Alternates:CT, Mamm, QA)		S		
2. Identify arteriographic anatomy and cross sectional images of the head, neck, and torso, for accuracy and spelling.		F		
3. Demonstrate magnetic field precautions and radiation safety for self, staff, and patients as set forth by the ALARA standards. (Alternates: CT, CIT,Mamm)	W		W	
4. Demonstrate professional judgment and appropriate interpersonal communication with colleagues and superiors.	F		F	
5. Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency	S		S	
6. Identify major disease processes diagnostic to advanced modality examinations		W		

Table 1. Three year Assessment Cycle

IV. 2015 – 2016 Assessment Activities

A. RDSC 354 Mammography, RDSC 411 Externship

Student Learning Outcome #3. Demonstrate magnetic field precautions and radiation safety for self, staff, and patients as set forth by the ALARA standards.

Direct Assessment 1. Relevant questions from RDSC 356, Mammography

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Test I, Q 26	MC question	% correct	75%	100%
Test I, Q 47	MC question	% correct	75%	100%
Test II, Q 10	MC question	% correct	75%	100%
Midterm, Q 21	MC question	% correct	75%	100%
Final, Q 36	MC question	% correct	75%	100%
Final, Q 48	MC question	% correct	75%	100%
Final, Q 41	MC question	% correct	75%	100%
Final, Q 44	MC question	% correct	75%	100%
Final, Q 45	MC question	% correct	75%	100%
Final, Q 52	MC question	% correct	75%	100%
Final, Q 80	MC question	% correct	75%	100%

Table 2. Assessment Results for SLO #3, Winter, Spring 2015-2016,

Indirect Assessment 1: Student comments regarding safety issues taken from course assignments.

Our facility does both Stereotactic and Ultrasound biopsies of the breast. I had always wondered why they would do one versus the other. After talking to one of our Radiologists and 2 of the other techs they all prefer US biopsy if possible. It is much more user friendly and done in "live" time, there is no radiation dose, plus the position is easier on the patient. Although the technology to do stereotactic is appreciated, it can be challenging for the patient, techs and the doctor.

The technology behind it is impressive however we have now boost our patient dose up to where it was with analog film. The whole push behind digital was to decrease the annual dose to our patients and technology has brought us there again. I see this decreasing in the future, either by design or limiting the amount of slices through the breast.

I am doing a presentation on the importance of BSE and annual mammography screening to our clerical staff. I am hoping to give them knowledge not only for our patients but for their own personal health and safety as well.

Indirect Assessment 2: Self-assessment of this outcome was also conducted on the exit survey, which was worded the same as the outcome.

Exit survey results: 2 respondents: Highly prepared 2/2

Indirect Assessment 3: Incidents or safety violations (if any) reported by student or clinical staff in RDSC 411, clinical practice.
No incidents or violations were reported.

Indirect Assessment 4: Student comments taken from *Discussions*, in Mammography reflecting judgment in the manner the course work is approached, and communication required in the course that addresses the outcome. **See appendix B**

Strengths, Weaknesses, Actions.

Indicators are positive.

B. Fall, Winter, Spring 2015-2016, RDSC 411: Externship

Student Learning Outcome #4. Demonstrate professional judgment and appropriate Interpersonal communication with colleagues and superiors.

Direct Assessment: Clinical Instructor’s professional evaluations: RDSC 411, Externship. Two students were evaluated, three times each during the term, resulting in 6 professional evaluations of affective attitudes and behaviors. Items that pertained to professional judgment and appropriate communication are as follows. There were no comments specific to these items.

Performance Criteria	Assessment Method	Measurement Scale	Min. Acceptable Performance	Results 1 st evals / 2 nd evals
7. Judgment/ critical thinking	% score or comments	% score	80%	90 (x2), 100 (x4)
8. Professional ethics	% score or comments	% score	80%	90 (x1), 100 (x5)
10. Attitude toward criticism	% score or comments	% score	80%	90 (x2), 100 (x4)
11. Attitude assigned tasks	% score or comments	% score	80%	90 (x2), 100 (x4)
15. Interpersonal relationships-patients	% score or comments	% score	80%	90 (x01), 100 (x6)
16. Interpersonal relationships-all staff	% score or comments	% score	80%	100 (x6)

Table 3. Assessment Results for SLO #4 in RDSC 411 Fall, Winter, Spring, 2015-2016

Indirect Assessment 1: Exit survey results of 2 respondents

Performance Criteria	Assessment Method	Measurement Scale	Minimum Performance	Results
Demonstrate professional judgment and appropriate interpersonal communication with colleagues and superiors	Self assessment	High proficiency, Proficiency, Some proficiency, No proficiency	Proficiency	High 2/2 Proficiency 0 Some 0 No 0
Oral communication	Self assessment			High 1/3 Proficiency 2/3 Some 0/3 No 0/3
Written communication	Self assessment			High 1/3 Proficiency 2/3 Some 0/3 No 0/3
Professionalism	Self assessment			High 2/3 Proficiency 1/3 Some 0/4 No 0/4

Table 4. Assessment Results for SLO #4, Fall, Winter, Spring 2015-2016

Indirect Assessment 2: See Appendix C. Student comments taken from the weekly journal of anecdotal reports in RDSC 411, regarding clinical practice in Mammography, CT, and MRI, reflecting judgment in the manner the course work is approached, and communication required in the course that addresses the outcome.

Strengths, Weaknesses, Actions: Samples show no deficiencies warranting attention.

C. Winter and Spring 2015-16, RDSC 354 Mammography, RDSC 411 Externship

Student Learning Outcome #5. Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency

Direct Assessment 1: Relevant questions from tests in RDSC 354

Fifteen questions directly related to positioning were selected for sampling. One student.

Performance Criteria	Assessment Method	Measurement Scale	Min. Acceptable Performance	Results
Test 1 Q.1	MC	% Correct	75 %	100%
Test 1 Q.2	MC	% Correct	75 %	100%
Test 1 Q.5	MC	% Correct	75 %	100%
Test 1 Q.16	MC	% Correct	75 %	100%
Test 1 Q.22	MC	% Correct	75 %	100%
Test 1 Q.1	MC	% Correct	75 %	100%
Test 1 Q.27	MC	% Correct	75 %	100%
Test 1 Q.29	MC	% Correct	75 %	0%
Test 1 Q.43	MC	% Correct	75 %	0%
Test 1 Q.47	MC	% Correct	75 %	100%
Test II Q.19	MC	% Correct	75 %	100%
Test II Q.32	MC	% Correct	75 %	0%
Test II Q.50	MC	% Correct	75 %	100%
Test II Q.53	MC	% Correct	75 %	100%
Test II Q.55	MC	% Correct	75 %	100%

Table 5. Assessment Results for SLO #5 in Mammography 2015-2016

Indirect Assessment 1: Exit survey results, 2 respondents

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Demonstrate knowledge of concepts & principles associated with the operation of special modality imaging machines & equipment.	Self-assessment	Highly prepared, Prepared, Inadequately prepared	Prepared	High 2/2 Prepared 0 Inadequate 0
Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency	Self-assessment		Prepared	High 2/2 Prepared 0 Inadequate 0
Curriculum provides sufficient depth of information about specific topics	Self-assessment	Strongly agree Agree Disagree, Strongly disagree	Agree	Strongly agree 2/2 Agree 0 Disagree 0 Strongly Disagree 0
Curriculum provides opportunities for hands-on experiences	Self-assessment		Agree	Strongly agree 2/2 Agree 1/0 Disagree 0 Strongly Disagree 0
Curriculum provides provides sufficient opportunity to experience other modalities	Self-assessment		Agree	Strongly agree 2/2 Agree 0 Disagree 0 Strongly Disagree 0

Table 6. Assessment Results for SLO #5, Fall, Winter, Spring 2015-2016

Indirect Assessment 2: See Appendix D. Student comments taken from the weekly journal of anecdotal reports in RDSC 411, reflecting progress in CT, MRI and mammography.

Strengths, Weaknesses, Actions.

Samples show no deficiencies warranting attention

Student learning outcomes have been mapped to the curriculum as shown in Appendix A.

V. Summary of Student Learning Outcomes

The program faculty conducted formal assessment of three student learning outcomes during 2015-2016.

A. Fall, Winter, Spring 2015-2016, RDSC 411: Externship and RDSC 354 Mammography

Student Learning Outcome #4. Demonstrate professional judgment and appropriate interpersonal communication with colleagues and superiors.

No actionable deficiencies noted.

B. Winter 2013, RDSC 354: Mammography and RDSC 411 Externship

Student Learning Outcome #3. Demonstrate magnetic field precautions and radiation safety for self, staff, and patients as set forth by the ALARA standards.

No actionable deficiencies noted.

C. Spring 2013, RDSC 354 Mammography, RDSC 411 Externship

Student Learning Outcome #5. Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency

No actionable deficiencies noted.

Changes Resulting from 2014-2015 Assessment

No need for changes were noted.

VI. ESLO: Diverse Perspectives

Understanding of diverse perspectives to improve interactions with others.

Obesity

As the average weight of people was rising nationally, manufacturers of imaging equipment responded by altering equipment to accommodate them. Four years ago Merrill's *Atlas of Radiographic Positioning*, the premier text in the field, was the first to introduce a chapter on the challenges of imaging obese patients. As a group of people who may be mocked or disrespected, student comments regarding their experiences working with obese patients reflects attitudes and professional practice.

The following student comments on the topic of imaging obese patients were taken from the RDSC 411: externship, RDSC 356: MRI, and RDSC 365: QA/QC. These comments were not solicited from an assignment on obesity. They were captured from *Discussions* in Blackboard, as excerpts from weekly progress reports and assignments relative to clinical experience in general. Not knowing how many such comments there would be risked possible failure with this approach, but past history made it likely to yield a reasonable number.

Unsolicited Student Comments

May not be suitable for patients too large to fit into machine; not suitable for patients with metal implants. There is variable technical failure rate due to obesity, bowel gas and vessel tortuosity

Not diagnostic on patients with large body habitus.

Large patients are definitely a challenge. Today we had a patient with a "stated" weight of 367 and was adamant about getting an MRI done of his L-spine. The family was even making jokes about "greasing him up", (which I found very sad).

I work with a single phase CR and large patients pose a problem with resolution and adipose tissue overlying the hip joint.

The most common artifact I see unfortunately is pressure artifact. I work with company that solely does portable exams and sometimes the ordering physicians and nurses think we are miracle workers. So they order abdomen, pelvis, and lumbar xrays on 400-pound patients. Since the exam is portable, I have no xray table so I have to have the patient lie on top of the image receptor. The patient's weight bends the plate and there are circular lines all over the pressure points. Not only is it very frustrating to not get a diagnostic image, but you need a chiropractic appointment after too!

For instance, due the the mobile x-ray machine's low maximum KVP and MAS stations, underexposure artifacts we common on exams which typically required higher technique, namely abdominal, lumbar spine, pelvic and hip exams. This was especially true on patients of particularly large body habitus. This would be visually represented as images would have low contrast, blurry, and of little diagnostic value.

Other than that, we had an order for an inpatient (375-lb) for a L-spine. Spent 35 minutes getting him to the MRI suite and then he decided to start freaking out! Ummm, yes, we all called it beforehand, however the patient and his family were very insistent. I was eager for that challenge, but knew it probably would not happen.

However, our second exam was a patient who was 255 lb and we had to do a lot of patient prep for comfort, but all went well with the exam.

The other new exam for me was a forearm (PIN). This gentleman was 355 lb. We had to position supine with his hand up over his head and anchor the arm. It was pretty tricky to track because of the angle he was holding the arm due to his obesity. We were pretty sure he would not tolerate the exam and it would have to be terminated. Wow, this guy was a trooper and held it until we were finished. The images turned out great and we were able to see the occlusive mass around the radial end of the nerve bundles.

The next series we did was a routine hand on a 600 lb. patient. She was very uncooperative with us and was in a lot of pain (although there was no pathology in her hand)... We received a an order for a knee series on the same 600 lb. patient. We rolled her on her side so her doctor could look at her infected bed sores. It was hard to find her patella and once we did it was hard to get her centered. It took a massive exposure of 100 kVp and 40 mAs. That technique had to be increase quite a bit for the lateral knee. After we finished she defecated in her bed and filled the ED with a foul odor for over a half hour.

The next patient was for an abdomen. The patient was rather large, and very wide. Due to this more images were needed to show all the anatomy of interest.

The next patient had an insulin needle break in her abdomen so they were looking for the needle. The patient was quite large so they were having a hard time finding anything.

I had another really large patient for a knee, and I used the older knee coil, with the large knee protocol I have been experimenting with. No artifacts noted (wraparound artifact from the thigh) on the images, so I plan to utilize this protocol often now!

Appendix A SLO-Curriculum Matrix

Course	Term	SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6
BIO 335 x-sec	3		X				
BIO 336 Patho	F						X
RDSC 326 CIT	S	X	X	X			
RDSC 354 Mamm	S	X		X		X	
RDSC 355 CT	F	X		X		X	
RDSC 356 MRI	W	X		X			
RDSC 365 QA	S	X					
RDSC 366 R path	S						X
RDSC 411 extern	3				X	X	

Appendix B

Student Learning Outcome #3. Demonstrate magnetic field precautions and radiation safety for self, staff, and patients as set forth by the ALARA standards.

Indirect Assessment 4: Student comments taken from *Discussions*, in Mammography reflecting judgment in the manner the course work is approached, and communication required in the course that addresses the outcome.

We had a major fail as after starting to fluoro we looked over and the Anesthesiologist had forgotten to put his apron on, luckily we caught it early in the case and saved him radiation exposure. Good point made though, check everyone out before you start to make sure they are protected.

The 11:30 pt had a pacemaker, so she called upstairs in case he showed up there instead of the MOB. He did go to the main department and it was only due to the tech she'd spoken to overhearing a conversation that he wasn't scanned. He'd checked "No" for pacemaker on the screening form (which is all they would go by at that time), but when questioned in person, he said, "Oh yes, I have a pacemaker right here!" (pointing to his left chest) When it comes to MR, it's safety first for me!

That one was a challenge with all the metal artifact, and the patient was super anxious, as there was also a history of anaphylactic reaction to CT dye. Thankfully, the patient had no adverse reactions to the MRI contrast.

A patient came in for a femur mri with and without contrast for a mass. The patient, however, was an 80 year old diabetic with a GFR of only 26, so I did not inject dye. The mass was easily palpable and mobile, and very heterogeneous in appearance. I followed up on the report, and the radiologists determination was that it was likely a benign lipoma.

I was able to let Kris take a look at the special project I have been working on. I wanted her opinion on the format I was using to display examination parameters, etc. She was impressed with what I had done so far, so I will continue on with that process. I have a long way to go! I try to record the exam parameters as I am scanning, but there are many interruptions throughout the day, and the patients are my main focus! I have been staying late each day to work a little bit uninterrupted. This seems to be the best way for me to make steady progress.

Appendix C

Student Learning Outcome #4. Demonstrate professional judgment and appropriate interpersonal communication with colleagues and superiors.

Indirect Assessment 2: Student comments taken from the weekly journal of anecdotal reports in RDSC 411, regarding clinical practice in Mammography, CT, and MRI, reflecting judgment in the manner the course work is approached, and communication required in the course that addresses the outcome.

“I know inside that I apply a level of professionalism to my job that few other technologists ever even stop to think about.”

It is interesting after speaking with one of our breast radiologists how the importance/ role of MRI Breast has decreased over the last few years with the introduction of breast tomosynthesis....

Our Radiologist said that they do have the software to create the 2D views in post processing. They can also bypass tomo and perform the standard 2D views, there are several factors that go into that decision and they are still trying to work that part of it out. He believes using less compression is a misconception, with a longer exposure compression is more crucial to tomo to avoid motion in the breast and due to the thin slices it is more evident....

This is what our Radiologist had to say about it. He believes it should be used on all dense breast patients, and does not see the benefit with fatty breast. He hopes the Radiologist could play a more active role in deciding what type of exam the patient should have. He said the cysts that are in the 4-6 mm range are missed on tomosynthesis and motion is now a greater factor than before due to exposure time. One thing that remains the same with mammography is the importance of compression. Even being able to take thin slices he finds the exams lacking if the technologist fails to apply adequate compression.

There have been a few interesting cases this week. During a routine brain scan for seizure, I noted a large abnormality on the right side of patient's neck. I contacted the radiologist for instructions on how to proceed. We added a T2 FS COR pre contrast in addition to the routine protocol. The radiologist was very happy

that I called him before dismissing the patient, so that we could get everything he needed for interpreting the abnormality.

The wrist exams can sometimes be a challenge. Ideally, the best image is obtained by having the area of interest in the isocenter of the magnet. This isn't always easily achieved with an extremity. Depending on the patient's flexibility and condition, I try to get them to lie prone on the table (sort of superman style) with the arm outstretched into the coil. This strains the shoulder quite a bit after 30-45 minutes, making images really susceptible to motion artifact. That is exactly what happened with this particular patient. She started out really great, and the images were perfectly clear. As time went on, her arm started to fall asleep, and the motion was very evident on the images. There are definitely other ways to position the patient, and other coils to utilize. It is always kind of a trial and error, and see how it goes type of situation.

I really do appreciate your patience with my progression through the course. While I felt that this was indeed a challenging experience getting started with online courses, I feel it was a rewarding one as well. This course taught me that with hard work I can definitely push myself to reach my goals.

This week was spent discussing the clinical requirements with the Director of the Cardiac Cath Lab and Interventional Radiology areas. We discussed how to integrate myself into the different cases, who I would be working with and what kind of cases I should learn. My next step is to meet with the Education Coordinator for the hospital, who is on vacation until Monday. I will get her sign off, complete the paperwork and then start scheduling time within the department to start my learning, which should be right after the holiday.

I met with the Cath Lab/Angio Director and the Tech that will be supervising me. We discussed what types of cases I would be learning/involved in and some of the types of skills I will be learning. There are several different roles within the Cath Lab/Angio cases, you can scrub in, be a monitoring Tech, or be a circulating Tech. So many opportunities ahead. I will start my time with them next week, they are very busy so I should have no problem getting cases for my clinical.

It is nerve racking, and intense definitely. The Cardiologists have been great to work with luckily, and the Cath Lab Techs/RNs have been patient as well. I am lucky for sure, I know it could have been much worse as I felt like a fish out of water my first days in there. I have next week and I should complete my remaining cases.

This week, I have been keeping really busy. I have a fairly good start on the journal article critique assignment. I came up with a few relevant questions to ask the

radiologists and the staff at the sites that I visit. Hopefully, I can get their feedback throughout the next week or two, and I will be able to wrap that up soon.

I am proud to say I was the second one to do that, yay me! It was amazing though, really. I have a new appreciation for the Cath Lab/Angio Lab and I do believe in a prior life I was a Cath Lab Tech! I had a great crew of people to work with, they were so very patient and understanding with me. We got along so well, which is part of the battle sometimes. I will actually miss my time in the lab, but back to my management career. Maybe someday I will be the Manager of the Cath Lab, that is an exciting prospect.

It's been a crazy week. I gained some important experience with troubleshooting, and spent a great deal of time working with service engineers. There were two days of problems on the scanner. First, there was a strange problem with the site location displaying incorrectly on patient images. The odd thing was that it was only incorrect on any images sent via our advanced viewing/post processing application. Our field service engineer, other techs, applications techs had never heard of this occurring. We did a bit of searching in service mode and tried numerous system shut down and reboots. The error did not clear until the next day, and we still have no explanation! The next day, we were unable to scan due to a low water/temperature warning. WE added a gallon of distilled water to the pump in the equipment room(which generally does the trick), and were still unable to scan. After a few more calls to service and maintenance reps, and a little more investigating, it was determined there was a leak of some kind of lubricant from the back of one of the pumps. The floor was a mess. Luckily our driver had a bit of antifreeze, and he was able to add that to the lower pump to get us up and running for the day.

Thank you for your guidance through this and the opportunity to learn a new modality, learning is always a great thing. Interestingly, we are going through a route restructuring, so we will be adding a new site. Tomorrow is the first day. The site is also ACR accredited, so I will be working with applications technologists to submit exams, paperwork, continuing education information, etc. to gain this certification. This will be an excellent learning experience for me! I have experience gaining CT accreditation, but I have never gone through the process for MRI. I will be sure to update in my weekly discussions how this is going.

I interviewed a variety of staff technologists and spoke to one of our radiologists regarding the journal article assignment, and I got some really interesting feedback. I have a bunch of notes down. This weekend, I hope to get a chance to sit down and make some sense of it all. They brought up a lot of aspects that I hadn't thought of, so I'm happy they were willing to offer their time and opinions.

I was able to work with Kris, and we went through a lot of examination parameters, and reviewed many of the recent cases I had scanned. She noted that there was a significant wrap artifact occurring on my axial spine exams, so I have a game plan to remedy that now. I had been seeing wrap artifact on some knee exams of patients with large thighs, and have since figured out how to correct that. Next time I have a spine patient, I may have to play around a little with the protocols and save a new exam card.

I got a big chunk of work done on my project this week. I have been plugging away as much as possible with recording examination parameters and planning images. I like how it is coming along. It is painstaking to input all the data, but it will be such a nice reference once it's complete, and it will be easy to go in and make changes if needed.

Second, it was reported that the MIP images we send on MRA head and neck exams are rotating in the incorrect direction per radiologist preference. This proves to be more interesting, and is going to take a little investigating to figure out how to correct. Sometimes, we have to log into service mode on the scanner, and change the actual image display direction for sending to PACS, otherwise, no matter how they display on our system, they won't "hold position" when sending to the facility. Needless to say, we are still working on this one.

I was invited to a BRACCO lunch-&-learn on MultiHance contrast. It seems the other HCA/Health One facilities in the Denver metro region have already gone to this contrast, so it was good to know its benefits since we apparently will be doing the same. It seems that MultiHance attaches to and affects proteins, which creates higher relaxivity immediately and it lasts longer. I have been lacking in any real knowledge about gadolinium contrast, so that aspect was invaluable. It felt good to be included in the group and the Domino's pizza was superb!

Appendix D

Student Learning Outcome #5. Perform clinical examinations in Computed Tomography, Magnetic Resonance, Arteriography, and Mammography or Quality Assurance at the level of competency

Indirect Assessment 2: Student comments taken from the weekly journal of anecdotal reports in RDSC 411, reflecting progress in CT, MRI and mammography.

On Tuesday, I was with a tech at the outpatient clinic and I was able to participate in two brain exams without contrast and a lumbar spine. On that scanner, I am pretty close to being able to comp a standard brain study. I need to practice starting IV's/doing butterfly injections for when there are outpatient cases with contrast because the tech must do the IV/injection (inpatients have IV's already from the RN that is taking care of them). On Wednesday, I was with a tech on the inpatient scanner and I was able to assist with some stroke sets (MRI brain, MRA brain, MRA neck). The tech taught me how to set up the power injector and how to set up the timing for when to start injecting. I also was shown how to do the reconstructions/cutouts of the subtracted vasculature from the angio scans. The software to do the cutouts is pretty amazing because you can rotate the vessels in any direction and be able to crop out exactly what you want to get the best reconstructions. I need to study up a little bit on vascular anatomy so I know what I am looking for though so that I can include the proper anatomy.

This week was a busy one on Monday. We had a Abd/Pel Arterial study, 3 Abd/Pel with and without, a head and a chest. The nice thing was being able to work with many different techs and learn how they do the exams differently. I always like to work with as many different techs as I can because each has a bit different way of doing things that may or may not work for me. It is good to be back to school and getting close to graduating! Welcome back everyone!

This was a busy week- we had 3 abd/pel with & without contrast; PE chest; Sinuses; Head; a peds abd/pel with & without contrast; and a C-spine. I need to actually do the exams (under supervision) to really understand them and feel competent on them.

A better week and crazy busy! We did 4 heads; a renal stone study; 3 abd/pel- 1 with & 1 without contrast & 1 with & without; 4 chests without; and a C-spine. Wednesday was really crazy- we had 2 scheduled in the morning but the ER blew up about the time I got in at 9 and we wer running all day.

I spent 6 hours today in our mammography department. The tech that I was with said it was a good day for it because I got to observe several different things.

First I performed the QC on the radiologist computer screen. Our rads visit twice a week and this task is to be performed prior to their arrival.

The mamm techs at our facility also perform DEXA bone density scans. I performed the first 2 of the day with assistance.

I observed 3 mamms and performed with assistance a fourth. The first was a regular annual screening, the second was a unilateral exam with implants and the third was a screening + diagnostic. I was able to follow this patient into ultrasound for followup. The radiologist was great about explaining the exam to the patient and afterwards the ultrasound tech explained to me what she saw and why it was important to alert the rad. It

was fascinating because what she saw was hardly visible on the mamm images. It's great to see two modalities working for the good of the patient!

And lastly, I attempted to perform a screening mamm. It has been a few weeks since I completed 5 exams for my mammography course so I was very out of practice. Thankfully, the patient was understanding.

At the beginning of the week, with a relief tech, I got to observe a screening (potential diagnostic). I followed the patient from the screening into ultrasound. Afterwards I got to watch the radiologist ultrasound the patient and discuss treatment plans. We were unable to perform some of those tests at our facility.

I observed a patient with implants. And was able to perform 2 mammography exams with help. I was doing pretty well with exams while trying for my comps in mamm class but having a month off... I was having difficulty getting patients positioned. Definitely need more consistent practice.

I got 6 DEXA exams under my belt this week. The lead tech returned today and allowed me to perform the second one on my own. Thankfully the exam went well. I was slightly perplexed when running the analysis when the tech pointed out that the patient had 6 lumbar discs. :)

Got to spend a full day in the mamm department with the lead tech. I performed 4 mamms and 2 DEXA exams by myself. The tech stayed in the room with me during the mamms but allowed me to fiddle through the DEXAs on my own. I'm gaining more confidence every day and I'm grateful that my patients have been so gracious. The tech was even impressed with my progress... I have personal space issues.

I like being able to sit and chat with my DEXA patients. Certainly a different concept from x-ray and CT that I'm used to. I've got another day tomorrow but there doesn't seem to be much on the schedule. At least I can perform QC on the equipment and rad computer.

I'm only able to get into the mamm department one day a week but I got a solid 6 hours in today. I performed 4 mamm exams and comped two. I also performed a DEXA scan with help. After scanning the patient's hips, I got an error message about the lesser trochanters being too much in profile. The lead tech showed me how to correct the positioning and I got a great scan afterwards.

There was also a patient on the ultrasound schedule for a breast US but not on the mamm schedule for a diagnostic. Both the US tech and patient were gracious enough to let me observe the procedure. The tech explained her findings to me, thankfully a simple cyst, and how she was able to flatten and elongate the cyst for a better image. I also learned

that fluid filled cysts are black on ultrasound! Ultrasound is so much different from plain radiography and CT but I'm glad I'm getting exposure to it.

Slow week for me in mammography. I was able to do four screening mamms and 3 DEXA exams. The tech says that I'm doing great and should consider signing off exams to prepare for the registry. Hadn't actually considered this modality before now but I'm getting more used to being in someone else's personal space. I need 25 observed exams before I can start performing the next 75 on my own. I'm at 15 now.

Yea! Last week! I got in a few more mamms yesterday. I am close to the 25 needed to start doing them unobserved. Think I might continue on in this modality

Week 4 was finally pretty interesting, and I made quite a bit of progress. I was able to spend several days, for a total of 20'ish hours, in the Cath Lab and Angio Suite this week. I saw several cases and achieved 3 comps. There are several different roles the Technologist can have during a procedure, including scrubbing in on the case, circulating or monitoring. The entire team was very good at explaining to me during the procedure what was going on and allowing me to get "hands on". From room set up to finding the right wire they needed off the shelf and handing the sterile device to the doctor, and getting the patient on and off the table and tucked away in their recovery room...I had some full days of learning.

My first case I was actually involved in was a cardiac cath with stent placement. The patient was sedated but awake during the procedure, he needed lots of encouragement to lie still along with sips of water along the way for his dry mouth. I was able to work as the circulator during this case, which meant watching the patient carefully and grabbing the supplies they needed during the procedure. Finding the exact catheter they need in a room full of different sizes, shapes and names was not easy. But I learned the difference very quick. It is fascinating that this patient came in for an outpatient procedure, the heart cath, they found the stenosis and within 30 minutes had it fixed with a stent. Just like that, a life was saved. The most interesting part was the guidewire that has the ultrasound probe on the end, called the Ivus, that they feed into the vessel to see the stenosis. The before the stent pictures compared to the after stent pictures are amazing! A 23 mm stent was placed on this case, pretty big one.

My second case was a pacemaker insertion. I greeted the patient, got her on the table and settled and helped the Anesthesiologist set up. Then I was the monitor Tech on this case, with my Mentor Technologist of course sitting right beside me. There is so much to monitoring! I recorded when they made every advancement in the room with catheters, cuts, etc. The system is pretty automated with drop downs to record what and when, but wow you have to be on your toes to keep up. Tense moments when they "test" the pacemaker too, they actually throw the patient into defib and see if the pacemaker will react. Basically they kill the patient and see if the device will save her, scary.

My third case I worked on was a limb salvage case. This is a diabetic patient that lost his toe last week due to loss of blood circulation. They are now trying to save the foot. They

went in with a catheter that has a vibration device on the tip that when fed into the stenotic vessel will break up the material and open the vessel for blood flow. They did this from the tip of the foot all the way up to the groin. He actually had a stent in that had collapsed, so they were able to open this up again with this device. The device rep. was present, guiding the doctor the entire way. I was able to circulate on this case again, and much of my time spent was holding the patient's arms down (a very important job). The patient was sedated but combative and kept breaking the sterile field. We would tie his hands down but somehow he would break free at the worst possible moments. So finding guide wires and tending to the patient was my main focus on this procedure. Full blood flow was restored to this patient's foot during this procedure, fingers crossed it stays open and his foot is saved.

I plan on scrubbing into a case next week, taking on that role. A big step for me, wish me luck.

Wow, busy week in the Cath Lab. Good for me! I was able to complete 5 cases this week. I scrubbed in with my mentor as well, that is a tense role. I have to say, I like circulating the best. Running around grabbing supplies and such, that was where I felt the most comfortable.

We did a couple of pacemakers, insertion and battery change. One pacemaker case our patient almost went into respiratory arrest with the anesthesia before we even started, he had to be intubated.

Heart caths are my favorite cases I have determined. They are fast, less than 30 minutes usually with the doctor in the room, and so fun to watch. Instantly they can identify a problem and fix it with a stent. One of our patients had a pretty large stenosis at the LAD and had to go to surgery for the fix, it was too close to the Aorta to put a stent in without blocking off the circumflex and causing more issues. They call that "The Widow Maker" because if it went he would most likely not survive it.

Week 7 was interesting in the Cath Lab. I was able to complete three cases this week, I only have one more to go. The lab was short on Techs this week so it was a bit hectic, and I tried to stay out of the way most of the time. But I was able to get hands on when it slowed down a bit. I am really good at finding the right catheter or device, which is not easy, and handing over the sterile device. These supplies can cost thousands, so lots of pressure when are trying to keep it sterile and not ruin it. For me anyway, the regular Techs make it look so easy but trust me that it is not!

Yay! I did my final comp today in the Cath Lab. It was a long EP Ablation case, took about 3 hours. Very intense case too, they have to find just the right spot to ablate to stop the heart fluttering. But my mentor Tech was very good and very patient with me.

Also, we scanned a patient's lumbar spine for chronic pain. The patient had a history of surgery, with rods and screws implanted. There was a great deal of artifact on the images due to the metal. I compensated for this by increasing the turbo factor x2

and doubling the bandwidth to minimize artifact as much as possible. Also, I did not run any fat saturated sequences, which is normally a part of the routine lumbar imaging. Something I learned this week is that I need to run a T2* sequence for any patient history of trauma on brain scans. It always amazes me that things like this come up, even after I have been learning MRI for a few years now. I am always learning new things. The rads like this sequence, because it is a "hemo" sequence. I will have another full day of exams to log tomorrow as well.

I am still learning all of the ACR requirements for submitting phantom and patient images. I spent a lot of time reviewing this information today, and I completed one phantom scan, but I'm finding it a challenge to get the phantom exactly level. In this mobile environment, there are many factors involved, and if the truck isn't exactly level, I have to physically shove paper/gauze/etc. around the phantom to "try" to get it to look level on the screen. It is proving to be time consuming, and may require several attempts to get it "just right." I definitely don't want the submission to fail. We have to submit patient images on four modules also, including MS Brain, TIA Brain, Cspine and Lspine. I am a little confused as to how to log the technical information on the forms, as it asks for many different variations of the FOV, based on phase and frequency directions. I will have to rely on my applications technologist to help me understand this process.

I was able to scan a couple MR arthroscopy cases this week. I did another abdomen MR for a soft tissue mass. It was only a follow up, so the radiologist didn't require contrast, as is normally indicated any time we look at a mass. Everything else this week was fairly routine. I continue to log my exams on the ARRT website as I go. I believe I am now at around 43 repetitions of the 125 needed.

I had the opportunity to work with another applications technologist this week. I had some questions about minimizing wrap artifact on patients with very large knees and thighs. I tried the obvious fix, to increase FOV and add saturation pulse/rest slab. That helped slightly, but did not clear the artifact completely. Patients with this body habitus generally do not fit into the routine knee coil, so we have to improvise. I was using a surface extremity coil, which typically works well for me. However, the wrap artifact has occurred a couple times. I wondered about switching

the foldover direction(phase direction), and he said that would probably help. He also said to make sure the number of scan acquisitions is set to 3, which allows for 100% phase oversampling. He suggested trying the older knee coil we have onboard, as it will fit a larger patient, rather than using a surface coil. He had really great suggestions, and I hope to never see the wrap artifact again!

I needed help with identifying some of the parameters, as they were not labeled the same as our system, and I did not want to make any mistakes. We went through display parameters such as the frequency and phase FOV, and the frequency and phase matrices. I took a few notes, so that I will be clear knowing that the foldover direction is the phase direction. For example, in the case of the T2 SAG sequence we were planning, the foldover was foot to head, so the phase direction was foot to head. The frequency direction is the opposite, which would be anterior to posterior. The only other choice would be right to left, but that doesn't make sense, because it is a sagittal sequence. I look forward to applying this knowledge to the other scans I'm doing. It was a good learning experience for me.

I also scanned a humerus for a possible biceps tendon rupture. The biceps tendon was best visualized on the sagittal sequences, and you could see that it had almost a "zig-zag" appearance. I have yet to follow up on this one, as it will be interesting to see whether the tendon is torn, or just stretched, etc. I did another abdomen exam for a follow up liver mass noted on a recent CT scan. The suspicion was that it was a hemangioma, so I had to run a series of timed imaging post contrast injection. The patient was very cooperative, so the images turned out really nice this time! I also had a patient come in for an MRI IAC exam for imbalance issues. It was a week with a lot of variety and a lot of challenges.

I scanned a very nice cspine exam that should be a good candidate for the ACR recertification submission. We have been saving the possible submission cases in a queue file until March 4th, which is the deadline for application. So far I have parameters logged and images saved for a lumbar spine and a cspine. We still need to get a really good MRI Brain for MS and an MRI Brain for TIA. The phantom scan passed, which is great news!

I have now logged around 50-some procedures on the ARRT website, out of the 125 repetitions I need. I am definitely making progress with that.

I did a really beautiful abdomen MRI this week. It was a follow up for liver lesions, so the patient knew the routine and was super cooperative. She was also a smaller frame. The area of interest is likely a benign hemangioma, and if things were unchanged, I don't think she will require any additional follow up. Since we have had a few abdomen scans on the schedule lately, we have had the opportunity to tweak the protocol a lot, and it goes so much better when we have less changes to make! I'm pretty happy with that. Also, I feel a lot more comfortable performing these exams. I used to get a little anxious about them.

This same site also had me review scan parameters to see if we qualify to perform brain studies for a clinical trial. This involved, going through several sequences, and each specific exam parameter to make sure we can "match" exactly to the scan parameters used at other sites. I spent a lot of time on this, and I saved a new exam card specific to this clinical trial, just in case a patient is scheduled at our site. The information was relayed to the department manager that we are able to match the clinical trial parameters with our system.