

Diagnostic Medical Sonography Annual Assessment Report 2011-12

I. Introduction

The Diagnostic Medical Sonography Program (DMS) began in 1997 and is one of the five Medical Imaging programs offered on the Klamath Falls campus. The DMS program is selective and admits pre-Medical Imaging students into the professional courses at the sophomore level. Due to this selectivity, the program has good graduation retention rates. The spring 2010 graduation of 25 students yielded cohort retention of 100%. Enrollment trends from 2005-2010 show continued growth from 68 to 87 students. The 2011 OIT graduate survey indicated a median entry salary for DMS graduates at \$65,924, with ten graduates reporting. However, the Bureau of Labor Statistics (www.bls.gov) identified Oregon as one of the top 5 paying states with an annual mean wage for Diagnostic Medical Sonographers of \$77,570 in May 2010.

II. Program Purpose, Objectives and Student Learning Outcomes

The Diagnostic Medical Sonography faculty reviewed the program purpose, objectives, and learning outcomes during the fall faculty meeting in September 2011. The faculty reaffirmed the purpose and aligned the Programmatic Student Learning Outcomes assessments with Institutional Student Learning Outcomes.

Diagnostic Medical Sonography Program Purpose

To provide the residents of Oregon, the Pacific Northwest and surrounding regions with graduates possessing knowledge and behaviors to earn Bachelor of Science degrees in Diagnostic Medical Sonography, the clinical skills necessary to become competent, ethical and caring imaging professionals, and the foundation for life-long learning.

Program Educational Objectives

To prepare graduates to:

1. Employ diagnostic sonographic imaging techniques, critical thinking skills, effective communication skills, and professional judgment.
2. Effectively apply ergonomically correct scanning techniques.
3. Successfully complete nationally recognized credential examinations.
4. Develop a dedication to independent life-long learning and professional contribution.

Expected Program Learning Outcomes

Graduates from this program will be able to demonstrate:

1. Effective oral, visual, and written communication skills.
2. The ability to work effectively in teams.
3. The ability to provide basic patient care and comfort while utilizing ethical, professionalism and HIPAA guidelines
4. Knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sonographic imaging.

5. Knowledge and understanding of human physiology, pathology and pathophysiology.
6. Knowledge and understanding of ultrasound physical principles and instrumentation.
7. Knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and image quality.
8. Appropriate ergonomic scanning applications.
9. An understanding of diverse cultural and humanistic traditions in the global society.

Other Learning Opportunities

1. Annual professional meetings and conferences for sonography students include:
 - Society of Diagnostic Medical Sonography (SDMS)
 - American Institute of Ultrasound in Medicine (AIUM)
 - American College of Educators in Radiologic Technology (ACERT)
 - Eugene Ultrasound Society (EUS)
 - Other smaller study groups located in San Francisco Bay Area
 - OIT DMS Sonography Advisory Council annual meeting and Continuing Medical Education opportunity (CME)

The location and financial responsibility remain a challenge for DMS students to attend national conferences. These meetings are held during regularly scheduled instructional terms. The national meetings are frequently held in locations greater than 1,000 miles from Klamath Falls. Students appreciate the networking and educational benefits of attending these meetings. The current junior class engaged in fundraising in order to attend the National SDMS Conference in February 2012.

Competition opportunities are components of the national conferences of SDMS and ACERT. Presently, international trips are unavailable to DMS students.

2. On-line professional learning opportunities for sonography students include:
 - Monthly CME directed readings associated with student SDMS Memberships
 - SDMS Webinars are available to students with SDMS Membership

All DMS students hold student SDMS memberships and are eligible for these opportunities. The DMS faculty encourages students to participate in these offerings not only for educational benefits, but to develop and promote effective life-long learning behaviors.

III. Three-Year Cycle for Assessment of Student Learning Outcomes

The following are the nine main outcomes which will be assessed at a rate of three per year on a three-year cycle, as listed below in Table 1.

Student Learning Outcomes Assessment Schedule		2011-2012	2012-2013	2013-2014
1.	The student will demonstrate effective oral, visual, and written communication skills			X
2.	The student will demonstrate the ability to work effectively in teams		Winter DMS 334	
3.	A. The student will demonstrate an ability to provide basic patient care and comfort while utilizing ethical, professionalism and HIPAA guidelines		Fall DMS 335	
	B. Professionalism		Spring DMS 430	
4.	The student will demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sonographic imaging.	Spring DMS 254		
5.	The student will demonstrate knowledge and understanding of human physiology, pathology and pathophysiology.			X
6.	The student will demonstrate knowledge and understanding of ultrasound physical principles and instrumentation.	Fall DMS 352		
7.	The student will demonstrate knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and image quality.	Winter DMS 353		
8.	The student will demonstrate appropriate ergonomic scanning applications.			X
9.	The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.		Spring DMS 380 & 430	

Table 1. Diagnostic Medical Sonography Assessment Cycle

IV. Summary of 2011-12 Assessment Activities

The DMS faculty conducted formal assessment of three programmatic student learning outcomes (SLO), and two Institutional Student Learning Outcomes (ISLOs) during the 2011-12 academic year.

Student Learning Outcome #4: The student will demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.

The DMS Faculty mapped this outcome to the DMS curriculum. A map of the identified courses is found in Appendix A, Student Learning Outcome-Course Matrices Table 1a and 1b.

Direct Assessment #1

The faculty assessed the SLO #4 by means of a scanning practical in DMS 254 spring 2012. Practical's were assessed via DMS rubric criteria described in Table 2 below. There were 28 sophomore students involved in the assessment.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Correct anatomy	DMS 254 Lab practical	1-4 scale, % at 3 or 4	80 % at 3 or 4	90%
Centered anatomy	DMS 254 Lab practical	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%
Rt/Lt Reversed	DMS 254 Lab practical	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%
Annotation	DMS 254 Lab practical	1-4 scale, % at 3 or 4	80 % at 3 or 4	90%
Identify pathology	DMS 254 Lab practical	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%

Table 2. Direct Assessment Results for SLO in DMS 254, Spring 2012

Students in DMS 254 performed at acceptable levels on items being assessed via practical rubric. The raw data indicates that the target DMS students assessed were proficient in knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sonographic imaging. The goal of this assessment was to determine how well the students would perform scanning patients with minor non-malignant pathology. The students were scored utilizing DMS Practical Rubric. Most of the students comprehended a very thorough understanding of patient anatomy and pathologies involved. The results are summarized in the table seen above. The results concluded that DMS students as performing just at acceptable proficiency. The items reviewed suggest that students still need exposure to additional differential diagnoses and a broader concept of patient presentations.

Direct Assessment #2

The faculty assessed the written component of the SLO outcome in DMS 365 Sonographic Pathology in Fall, 2011 using a rubric described in Table 3 below. There were 24 junior students involved in the assessment.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
US vs CT cross section	DMS 365 matching images	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%
US vs MRI cross section	DMS 365 matching images	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%
US vs NM images	DMS 365 matching images	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%
US vs Xray	DMS 365 matching images	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%
US vs Mammography	DMS 365 matching images	1-4 scale, % at 3 or 4	80 % at 3 or 4	80%

Table 3. Direct Assessment Results for SLO in DMS 365, Fall 2011

The goal for this assessment was to achieve a minimum acceptable performance of 80%. This goal was met. The faculty rated the students by utilizing DMS Rubric. The scores revealed some positive results and deemed the DMS students image interpretation abilities as reaching benchmark expectations.

Direct Assessment #3

To accompany the assessment above, the faculty assessed this outcome in DMS 430 spring 2012 exit survey, by asking the 25 clinical instructors to rate level of competency. There were 25 clinical instructors who completed the assessment. These results are summarized, shown in Table 4 below:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Ability to comprehend radiologist report.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	90%
Ability to review and interpret patient's prior examinations.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	90%
Ability to recognize normal anatomy.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%
Ability to recognize abnormal anatomy.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	85%
Ability to interpret 3D anatomy.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%
Ability to interpret cross-sectional anatomy.	Survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%

Table 4. Indirect Assessment Results for SLO in DMS 430, Spring 2012

The primary assessment method was composite average of a Clinical Site Competency Evaluation. A survey was administered at the conclusion of the DMS class of 2012. It was the desire that students scored at least with an 80% or better. The survey summary results revealed adequate results with students scoring above average in all areas. No follow up recommendations are suggested at this time.

Indirect Assessment

To accompany the assessment above, the faculty indirectly assessed this outcome spring 2012 using a student exit survey. Senior students were asked to rate their level of competency for this outcome. There were 20 students who completed the assessment. These results are summarized, shown in Table 5 below:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.	Student survey	1-3 scale	80 % at 2 or 3	90%

Table 5. Indirect Assessment Results for SLO #4, Spring 2012

A survey was administered at the conclusion of the DMS class of 2012. It was the desire that 80% of the students rate themselves as prepared or highly prepared. The faculty reviewed the survey summary and feel that the results are adequate.

Student Learning Outcome #6: The student will demonstrate knowledge and understanding of ultrasound physical principles and instrumentation.

The DMS Faculty mapped this outcome to the curriculum. A map of the identified courses is found the Appendix A, Student Learning Outcome-Course Matrices Table A3.

Direct Assessment #1

The faculty assessed this outcome in DMS 373 Obstetrical Pathology spring term 2012 using test questions. Five content specific questions were used to evaluate human anatomy knowledge. Students who scored 80% correct have met our expectations for proficiency. Results are shown in Table 6.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Understanding ultrasound physics-Equations	Test Questions	80% of the questions correct	80% of the students with 80% correct	85%
Understanding ultrasound physics-Bio-effects	Test Questions	80% of the questions correct	80% of the students with 80% correct	100%
Understanding ultrasound physics-Doppler	Test Questions	80% of the questions correct	80% of the students with 80% correct	80%

Table 6. Results for SLO in DMS 373, Spring Term 2012

There were 28 DMS students that participated in this activity. Data collection was achieved by means of test question evaluation that pertained to the performance criteria. The exam was timed 50 questions in 50 minutes. Although physics is not a main responsibility of the sonographer, an understanding of ultrasound physics is significant to board exams, patient safety, and other imaging modalities. Results for the students demonstrating proficiency is concluded in the Results Column. The DMS faculty found these results to be acceptable overall. As expected, most DMS students were able to understand human anatomy, pathology, and pathophysiology. There were no specific weaknesses that needed corrective action.

Indirect Assessment #1

To accompany the assessment above, the faculty indirectly assessed this outcome in DMS 430 spring 2012 exit survey, by asking the 29 senior students to rate their level of competency. There were 29 students who completed the assessment. These results are summarized, shown in Table 7 below:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Understanding ultrasound physics-Equations	Student survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	90%
Understanding ultrasound physics-Bio-effects	Student survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	100%
Understanding ultrasound physics-Doppler	Student survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%
Understanding of knowledge and understanding of ultrasound physical principles and instrumentation.	Student survey	1-4 scale, % at 3 or 4	80 % at 3 or 4	95%

Table 7. Indirect Assessment Results for SLO and ISLO in DMS 430, Spring 2012

A survey was administered at the conclusion of the DMS class of 2012. It was the desire that students scored at least with an 80% or better. The survey summary results revealed adequate results with students scoring above average in all areas. No follow up recommendations are suggested at this time.

Student Learning Outcome #7: The student will demonstrate knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and image quality.

The DMS Faculty mapped this outcome to the curriculum. A map of the identified courses is found the Appendix A, Student Learning Outcome-Course Matrices Table A3.

Direct Assessment #1 –JUNIOR LAB Portfolio

The faculty assessed this outcome in DMS 354 Junior Laboratory III spring term 2012. This assessment was administered via a practical rubric. The students were rated on a scale from 1-10; ten being the highest score possible. Twenty-four junior students participated in this assessment. The faculty rated the proficiency of the students using the performance criteria described in Table 8 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Student obtained correct frequency	Practical examination scored with a rubric	1-10	80% with 8 or better	95%
Student selected correct preset	Practical examination scored with a rubric	1-10	80% with 8 or better	100%
Student utilized instrumentation	Practical examination scored with a rubric	1-10	80% with 8 or better	95%

Table 8. Final Examination Results for SLO #7 in DMS 354, Spring 2012

The students performed extremely well with a majority of the students achieving a score of 95% or better. Effective and proper instrumentation are essential to a working sonographer. These students were able to demonstrate effective techniques during a live practical assessment. The goal was that 80% of these students earn at least an 8 out of 10 points possible for each performance criteria. The outcome demonstrated that the students had proper instrumentation and demonstrated overall excellent technical skills.

Indirect Assessment

To accompany the assessment above, the faculty indirectly assessed this outcome spring 2012 using a student exit survey. Senior students were asked to rate their level of competency for this outcome. There were 20 students who completed the assessment. These results are summarized, shown in Table 9 below:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.	Student survey	1-3 scale	80 % at 2 or 3	90%

Table 9. Indirect Assessment Results for SLO #7 Spring 2012

A survey was administered at the conclusion of the DMS class of 2012. It was the desire that 80% of the students rate themselves as prepared or highly prepared. The faculty reviewed the survey summary and feel that the results are adequate.

V. Summary of Student Learning

In a spring faculty meeting, the DMS faculty reviewed the assessment results and reached the following overall conclusions.

Student Learning Outcome #4: The student will demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.

Faculty reviewed the findings to determine if improvements were necessary. At this time no further action is needed.

Strengths: The outcome indicates that the students are competent in the understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.

Weakness: Though students met faculty expectations, the instructor will continue to recommend tools to become lifelong learners, as this appears to be a weakness for students. In addition, the DMS student should be advised they need to keep long term registry reports.

Student Learning Outcome #6: The student will demonstrate knowledge and understanding of ultrasound physical principles and instrumentation.

Strengths: All the results met the minimum acceptable performance levels.

Weakness: Students score at the minimum acceptable range on the assessment tool; however the pass rate for the ultrasound physics course was achieved at 86%. Maybe the physics course itself is a better predictor of actual knowledge.

Actions: No action is needed at this time

Student Learning Outcome #7: The student will demonstrate knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and image quality.

Strengths: DMS students validated outstanding performance in various sonographic instrumentation categories. The performance criterion was stringent. Collected data this year suggests that students can perform the outcome and no further action is required at this time. However, course instructors are strongly encouraged to place additional emphasis on instrumentation topics in course offerings as a handful of post grads are dealing with radiologist reports being dictated incorrectly due to sonographers poor instrumentation habits.

Weaknesses: None at this time.

Actions: No further action required at this time.

Appendix A1

Student Learning Outcome-Course Matrices

Student Learning Outcome #4: The student will demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sono-graphic imaging.

I=Introduce R=Reinforce E=Emphasize

DMS Course	Summer	Fall	Winter	Spring
Sophomore				
DMS 223 Abdominal I		I		
DMS 252 Sophomore Lab I		I		
DMS 224 Abdominal II			R	
DMS 253 Sophomore Lab II			R	
DMS 225 Abdominal III				E
DMS 254 Sophomore Lab III			R	
DMS 234 Pelvic Sonography			R	
Junior				
DMS 315 Sonographic Superficial Structures				
DMS 335 Patient Care				
DMS 352 Junior Lab I				
DMS 316 Survey of VT				
DMS 371 OB Sonography I				E
DMS 353 Junior Lab II				
DMS343 Fetal Echo & Neonatal Sono				
DMS 372 OB Sonography II				E
DMS 354 Junior Lab III				
DMS 365 Sonographic Pathology				E
DMS 388 Extern Prep				
DMS 373 OB Pathology				E
Senior				
DMS 430 I, II, III, IV Externship				

Table A1. Student Learning Outcome #2 -Course Matrix

Identified courses indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced R = Reinforced E = Emphasized

Appendix A2

Student Learning Outcome-Course Matrices

Student Learning Outcome #6: The student will demonstrate knowledge and understanding of ultrasound physical principles and instrumentation.

I=Introduce R=Reinforce E=Emphasize

DMS Course	Summer	Fall	Winter	Spring
Sophomore				
DMS 223 Abdominal I		I		
DMS 252 Sophomore Lab I		I		
DMS 224 Abdominal II			R	
DMS 253 Sophomore Lab II				
DMS 225 Abdominal III				E
DMS 254 Sophomore Lab III				
DMS 234 Pelvic Sonography				
Junior				
DMS 315 Sonographic Superficial Structures				
DMS 335 Patient Care				
DMS 352 Junior Lab I				
DMS 316 Survey of VT				
DMS 371 OB Sonography I				
DMS 353 Junior Lab II				
DMS343 Fetal Echo & Neonatal Sono				
DMS 372 OB Sonography II				
DMS 354 Junior Lab III				
DMS 365 Sonographic Pathology				E
DMS 388 Extern Prep				
DMS 373 OB Pathology				
Senior				
DMS 430 I, II, III, IV Externship				

Table A1. Student Learning Outcome #2 -Course Matrix

Identified courses indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced R = Reinforced E = Emphasized

Appendix A3

Student Learning Outcome #7: The student will demonstrate knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and image quality.

DMS Course	Summer	Fall	Winter	Spring
Sophomore				
DMS 223 Abdominal I		I		
DMS 252 Sophomore Lab I		I		
DMS 224 Abdominal II			R	
DMS 253 Sophomore Lab II			R	
DMS 225 Abdominal III				E
DMS 254 Sophomore Lab III				E
DMS 234 Pelvic Sonography				
Junior				
DMS 315 Sonographic Superficial Structures				
DMS 335 Patient Care				
DMS 352 Junior Lab I				
DMS 316 Survey of VT				
DMS 371 OB Sonography I				
DMS 353 Junior Lab II				
DMS343 Fetal Echo & Neonatal Sono				
DMS 372 OB Sonography II				
DMS 354 Junior Lab III				E
DMS 365 Sonographic Pathology				
DMS 388 Extern Prep				
DMS 373 OB Pathology				
Senior				
DMS 430 I, II, III, IV Externship				

Table A2. Student Learning Outcome # 3 -Course Matrix

Identified courses indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced R = Reinforced E = Emphasized

Appendix B1

Assessment time map combining Institutional Student Learning Outcomes and Programmatic Student Learning Outcomes is found in Table B3.

ISLO with PSLO Coordinating Assessment Cycle

Institutional Student Learning Outcomes	Programmatic Student Learning Outcomes	2011-2012	2012-2013	2013-2014
1. Communication (oral, written, visual)	1. The student will demonstrate effective oral, visual, and written communication skills			X
2. Team and group work	2. The student will demonstrate the ability to work effectively in teams		X	
3. Professionalism and ethical practice	3a. The student will demonstrate an ability to provide basic patient care and comfort while utilizing ethical, professionalism and HIPAA guidelines.		X	
	3b. Professionalism		X	
	4. The student will demonstrate knowledge and understanding of human gross and sectional anatomy relative to normal and abnormal sonographic imaging.	X		
4. Critical Thinking and Problem Solving	5. The student will demonstrate knowledge and understanding of human physiology, pathology and pathophysiology (Extern Case Study)			X
5. Lifelong and independent learning	8. The student will demonstrate appropriate ergonomic scanning applications			X
6. Mathematical Knowledge, skills and application	6. The student will demonstrate knowledge and understanding of ultrasound physical principles and instrumentation.	X		
7. Scientific knowledge and skills in scientific reasoning	7. The student will demonstrate knowledge of sonographic biological effects, proper application of sonographic instrumentation relative to imaging and film quality.	X		
8. Global perspectives and Cultural diversity	9. The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.		X	

Table B3, three year assessment cycle for DMS SLOs and PSLOs