

Oregon Tech
Medical Imaging Technology Department
Echocardiography Program
2017-2018 Assessment

I. Introduction

Oregon Tech's Bachelor of Science in Echocardiography degree is one of only a few B.S. Degree programs in echocardiography in the United States. Oregon Tech provides didactic instruction, clinical observations, and individual, hands-on training - including basic and advanced training in imaging skills needed *"To prepare competent entry-level adult cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains"*.

Students are required to complete a final 11-month clinical externship at specifically chosen echocardiography laboratories. Externship provides the hands-on training and patient load requirements necessary to meet the prerequisite requirements of the certifying board agency, the American Registry of Diagnostic Medical Sonographers (ARDMS), to be able to sit for the registry exam in adult echocardiography. Occasionally, a student may have the opportunity to complete additional directed clinical externship in pediatric echocardiography, and that, along with further clinical experience acquired in the month's post-graduation, be qualified to sit for the ARDMS pediatric echocardiography registry exam.

The first Oregon Tech cohort for Echocardiography began fall 2008, with 14 students, and additional cohorts of 17 students in the fall of 2009, 20 students in the fall of 2010, 20 students in the fall of 2011, 24 admitted fall 2012, 20 admitted fall 2013, 20 admitted fall 2014, 20 admitted fall 2015, 22 admitted fall 2016, and 20 admitted fall 2017. MIT fall 2018 enrollment in Echocardiography will add the latest cohort of 22 students, with one additional student pending reentry spring 2019.

Upon 2018 graduation, total current enrollment is 59 students, including those anticipated as being accepted for spring 2019 reentry into the Echocardiography Program. All graduates known to have applied for registry exams through either ARDMS or CCI, have passed the Adult Echocardiography Registry, with a 100% first exam pass rate for the class of 2018. Several prior graduates have additionally passed and become registered in Pediatric Echocardiography, and Vascular Ultrasound. 98% of graduates (through the 2018 graduates) have worked or are working as cardiac sonographers, either per diem or in scheduled positions. Annual salaries reported varied from \$62,000 to \$87,000 for FT positions, excluding on-call wages.

One of the major goals of the Echocardiography program (along with Diagnostic Medical Sonography, and Vascular Technology) had been to obtain JRC-DMS/CAAHEP Programmatic Accreditation. The JRC-DMS self-study was submitted fall 2014, the JRC-DMS site visit occurred May 2015, and finalized submission of documentation for the accreditation process was completed by the end of June 2015, and all three ultrasound programs received CAAHEP Initial Accreditation in September 2015.

Retention/Attrition, credentialing success, and placement outcomes for the last three years are reported on the OIT Echocardiography website in Program OUTCOMES:

https://oregontechsfstatic.azureedge.net/sitefinity-production/docs/default-source/academic-excellence/program-outcomes/echo-outcomes-2015-18.pdf?sfvrsn=8d1e7968_2

II. Program Purpose, Educational Objectives, and Student Learning Outcomes

The Echocardiography faculty agreed to adopt the student learning outcomes as suggested by the Joint Review Committee on Education in Diagnostic Medical Sonography (JRCDMS).

Echocardiography Program Purpose

The Oregon Tech Bachelor of Science program in Echocardiography provides students with the knowledge, clinical skills, values and behaviors to become competent cardiac sonographers.

Minimum Expectations: The program will meet the following goal, defining minimum expectations:

"To prepare competent entry-level adult cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains"

Echocardiography Program Educational Objectives

1. The program prepares students to utilize diagnostic techniques, sound judgment and good decision making to provide patient services.
2. The program communicates the importance of becoming credentialed in the profession of echocardiography.
3. The program prepares students who think critically, communicate effectively and exemplify professional ethics.
4. The program conveys the importance of becoming life-long learners and responsible citizens.

Expected Program Student Learning Outcomes

Graduates from this program will be able to:

1. Demonstrate the ability to communicate effectively in oral, written and visual forms.
2. Demonstrate the ability to work effectively in teams.
3. Demonstrate an ability to provide basic patient care and comfort.
4. Demonstrate professional judgment, discretion, and ethics.
5. Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.
6. Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.
7. Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.
8. Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.
9. Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.

Additional Student Learning Opportunities, and Programmatic Input

Students have been encouraged to attend meetings sponsored by northwest regional chapter of the American Society of Echocardiography (the Willamette Valley Society of Echocardiography - WVSE) held quarterly in Portland and to try to attend other regional society conferences held near their externship sites throughout the year. Students will also be made aware of the 2019 ASE Scientific Sessions, scheduled to be held in Portland, June 21-25, 2019.

Clinical Instructor input was accessed through late 2016 conference calls, and discussions covered the logistics of student documentation and updated verbal evaluation of the Trajecsys externship reporting system, areas of didactic concern, modifications to the current externship Competencies, and overall success of the program. Continuing modifications will be directed towards an update of the Competency Evaluations used on externship, better reflecting current practice models, and towards elimination of many of the scoring areas that more properly fit within the Echocardiography Professional Evaluation. CME's will be made available through SDMS for clinical site staff directly involved in the hands-on training for students on their Clinical Externship. Echocardiography Clinical Instructors had the opportunity to attend the spring 2018 Clinical Instructor Workshop, and will again be invited to the 2019 Clinical Instructor Workshop planned spring 2019. All programs benefit from the combined CI inputs and suggestions at the workshops.

The program's Medical Director was frequently updated on the progress of the program's development, and provided input as needed. The Medical Director's overview and assessment of the program was a part of the JRC-DMS accreditation site visit, May 2015. An Advisory Board/Committee meeting was convened spring term 2018 and will again be planned for spring 2019.

Much of the externship assessment material has been incorporated within the Trajecsys reporting system, and full details of all externship scoring is available on-line as needed.

II. Assessments – the 2017-2018 assessments included both Programmatic Student Learning outcomes (PSLO's), and one Essential Student Learning Outcome – ESLO#2.

Note: ESLO#2 is also incorporated within the PSLO #6 in the three-year assessment cycle. The faculty confirmed the assessment cycle planned, as noted in Table 1.

Three-Year Cycle for Assessment - Echocardiography Student Learning Outcomes

Echocardiography Degree Student Learning Outcomes Assessment Schedule	2016-17	2017-18	2018-19	2019-20	2020-21	2021-2022
1. The student will demonstrate the ability to communicate effectively in oral, written and visual forms.	X(1)			X(1)		
2. The student will demonstrate the ability to work effectively in teams.	X(4)			X(4)		
3. The student will demonstrate an ability to provide basic patient care and comfort.		X			X	
4. The student will employ professional judgment and discretion, including ethics.			X(3)			X(3)
5. The student will demonstrate knowledge and understanding of human gross anatomy sectional anatomy and normal and abnormal cardiovascular anatomy.	X			X		
6. The student will demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.		X(2)			X(2)	
7. The student will demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.		X(5)			X(5)	
8. The student will demonstrate knowledge and understanding of clinical echocardiography diagnostic procedures and testing			X			X
9. The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			X(6)			X(6)

Table #1. Echocardiography Degree Assessment Cycle – (number) indicates a PSLO that incorporates proposed ESLO's. The pattern is subject to modification.

IV. Summary of 2017-18 Assessment Activities

A. ESLO #2: Oregon Tech students will engage in a process of inquiry and analysis.

Definition: Inquiry and analysis consists of posing meaningful questions about situations and systems, gathering and evaluating relevant evidence, and articulating how that evidence justifies decisions and contributes to students' understanding of how the world works.

Criteria for Inquiry and Analysis Assessment

- The following are criteria used in the assessment of student work:
 - Identify: Identify a meaningful question or topic of inquiry. □
 - Investigate: Critically examine existing knowledge and views on the question or topic of inquiry. □
 - Support: Collect evidence based on the methodology or principles of discipline. □
 - Evaluate: Critically analyze and distinguish evidence obtained. □
 - Conclude: Come to a judgment based on evidence and understand the limitations and implications of that judgment.
- The Inquiry and Analysis ISLO Assessment was performed during the spring term of the echocardiography junior year. Assignments in utilizing Differential Diagnosis were carried out as part of the Echocardiography Lab Management class (ECHO 385) expectations and grading process, utilizing case studies presented during the Echocardiography Externship Prep (Echo 388) course. See full description of the ESLO design, and the Assessment Rubric (Table A1) in Appendix A.

ESLO #2 2017-2018 Outcomes – Direct Assessment

Performance Criteria	Assessment Method	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Identification	differential diagnosis assignment	1-4 Scale	80% with a score of 3.0 or better	100%
Investigate	. differential diagnosis assignment.	1-4 Scale	80% with a score of 3.0 or better	100%
Support	differential diagnosis assignment..	1-4 Scale	80% with a score of 3.0 or better	100%
Evaluation	differential diagnosis assignment..	1-4 Scale	80% with a score of 3.0 or better	100%
Conclude	differential diagnosis assignment..	1-4 Scale	80% with a score of 3.0 or better	100%

Table #1 - Direct Assessment Assignment (Part 2) - Inquiry and Analysis ESLO - Spring 2018 Echo 385 Outcomes

- The ESLO assignment produced interesting results. Part 1 of the assignment (designing a decision tree) was the part that proved problematic, as students in most cases did not have a reference structure of decisions and outcomes for the subject area they individually chose. On that part, the overall score was 42% receiving scores of 3 or higher.
- However, in Part 2, when participation was more importantly directed towards utilizing their didactic and imaging background within echocardiography, the performance was universally of a much higher level, with completely acceptable performance based on the assignment criteria. Students greatly enjoyed this part. These outcomes were particularly heartening, as they demonstrated retention of programmatic material, and an ability of students to apply/integrate that material in a methodical manner within a clinical situation. They also indicated that the

thought processes that are required within the cardiac sonography profession are actively evolving, and that students are very willing to practice using Inquiry and Analysis, at least in the form of deferential diagnosis assignments.

- Going forward, imaging lab exercises utilizing differential diagnosis will be incorporated on a more frequent basis, providing a real-world setting that can be practiced on campus, prior to the Externship year.

B. Programmatic Student Learning Outcome #3. The student will demonstrate an ability to provide basic patient care and comfort.

The mapping of this outcome in the Echocardiography courses can be found in Appendix B, Student Learning Outcome-Course Matrices Table A1.

Direct Assessment #1

The faculty assessed this outcome in ECHO 225 in spring term 2018 using select questions from various examinations and the Health Insurance Portability and Accountability Act (HIPAA) quiz with sophomore echocardiography and vascular students. The faculty rated the proficiency of students using the performance criteria described in Table #2 below.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Understands Ultrasound Scope of Practice	Exam 1	% Scale per # of questions used	80% with 80% or higher	93.8%
Anticipates/responds to patient needs.	Exam 2	% Scale per # of questions used	80% with 80% or higher	93.8%
Knowledge of Universal Precautions	Exam 3	% Scale per # of questions used	80% with 80% or higher	93.8%
Knowledge of HIPAA Policies	HIPAA Quiz	% Scale per # of questions used	80% with 80% or higher	93.8%

Table #2. PSLO #3, ECHO 225 exam results, Spring 2018

- Students performed above expectations in all categories for PSLO #3. For most students, this course is the first formal introduction to the deeper issues they will face while working with real patients on externship and in full time employment in the echocardiography field. Students usually observe these issues while on campus and during rotations at Sky Lakes Medical Center, but how they will be affected by situations will be determined while on externship and when they are employed.
- As a result of the data, the OIT Echocardiography program faculty has decided to continue the same in-depth coverage in this course to prepare students for the realities they would face in the field.

Direct Assessment #2

The faculty assessed this outcome in ECHO 420 from the 2017-2018 academic year using student competencies for echocardiography as assessed by industry. The faculty rated the proficiency of students using the performance criteria described in Table #3 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Knowledge of Universal Precautions	Student Competency Evaluation #3, a.	1 – 100% Scale	90% with 90% or higher	100%
Anticipates/ responds to patient needs.	Student Competency Evaluation #3, b.	1 – 100% Scale	90% with 90% or higher	100%
Knowledge of HIPAA Policies	Student Competency Evaluation #3, d.	1 – 100% Scale	90% with 90% or higher	100%
Performs Within the Echocardiography Scope of Practice	Student Competency Evaluation #3, e.	1 – 100% Scale	90% with 90% or higher	100%

Table #3. PSLO #3, ECHO 420 extern competencies results

- Students performed above the level of minimum acceptable performance in all criteria.
- As a result of the data from the last cycle where PSLO #3 was assessed, the performance level in this assessment cycle was increased to 90% with a target of 90% performance or higher. Within individual competency scores, there were occasional scores at 85%, but those occurred generally in the first quarter of Externship when students are first introduced to actual hospital in-patient settings. Past the first quarter, scores are universally 90% or higher.

Indirect Assessment #1

The faculty assessed this outcome in ECHO 420 from the student 2017-2018 exit surveys asking them to rate how well the OIT Echocardiography program and their extern site prepared them for this learning outcome #3. The students rated their proficiency using the performance criteria described in Table #4 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Student rating of how OIT prepared them for outcome #3.	Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	84.6%
Student rating of their final proficiency in outcome #3.	Exit survey	1 – 4 Scale	80% with a score of 3.0 or better	100%

Table #4. PSLO #3 ECHO 420 student self-assessment results

- Students rated OIT fairly closely. In some individual cases, the preparation provided by OIT was rated higher than that provided by the externship site. Expected was the reporting that OIT provided only satisfactory preparation (2 out of 13 responses). Since OIT does not have the capability to allow echocardiography students access to direct patient care environments, it is felt that the real world setting is one of the significant benefits to be realized by the externship experience.
- As a result of this assessment activity, the Echocardiography faculty will meet with the patient care management faculty to improve orientation to what will be met in the setting of hospital facilities.
- Additional emphasis on patient care will be provided in the Externship Preparation class during the spring term prior to externship.

C. Programmatic Student Learning Outcome #6: The student will demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.

The Echocardiography faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome in the Echocardiography courses can be found in Appendix B, Student Learning Outcome-Course Matrices Table A2.

Direct Assessment #1

The faculty assessed this outcome in the ECHO 333 course during fall term 2017 using the final practical patient history and physical, the final practical imaging exam, and a final exam of pathology images. The faculty rated the proficiency of students using the performance criteria described in Table #5 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results - % with Target. or higher
Evaluates evidence from patient history and physical	Final Practical	% scale of correct	80% with 80% or higher	100%
Performs appropriate physiological tests	Final Practical	% scale per choices used	80% with 80% or higher	100%
Correctly identifies patient pathology	Pathology images final	0 – 100 %	75% with 75% or higher	100%
Extends/ Identifies protocols as required by findings	Final Practical	% scale per choices used	80% with 80% or higher	100%

Table #5. PSLO #6 ECHO 333 results, fall 2017

- Students performed at the required level of fall term junior clinical experience, in the setting of the Oregon Tech Echocardiography Lab and with the imaging subjects that are available.
- As a result of the data, the current imaging protocols will be continued, and imaging skills built up in the prior year’s imaging courses will be rapidly renewed as students return for fall classes.
- Sophomore imaging assignments for spring quarter will be continued, as there is no dedicated imaging class spring term in the sophomore curriculum. There will also be increased emphasis on incorporation of patient care subject matter within as many of the core courses as possible.
- Results from winter Echo 232 Practical exams (the areas of imaging needing attention) will be reviewed, and addressed early on in the fall Echo 333 Lab sessions to improve imaging proficiency and accuracy.

Direct Assessment #2

The faculty also assessed this outcome in ECHO 420 from the 2017-2018 academic year using student competencies for cardiac ultrasound as assessed by industry. The faculty rated the proficiency of students using the performance criteria described in Table #6 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Evaluates evidence from patient history and physical	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Performs appropriate physiological tests	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Correctly identifies patient pathology	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Extends/ Identifies protocols as required by findings	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%

Table #6. PSLO #6 results for ECHO 420 student competencies.

- Students performed at a high level of clinical performance, reflecting adequate levels of clinical preparation during the on-campus sophomore and junior years.
- As a result of the data, increased use of case studies will be emphasized to increase the confidence needed for students to grow in the areas of critical thinking, and clinical application of didactic knowledge.

Indirect Assessment #1

The faculty assessed this outcome in EHCO 420 from the student 2017-2018 exit surveys asking them to rate how well the OIT Echocardiography program and their extern site prepared them for this learning outcome #6. The student rated their proficiency using the performance criteria described in Table #7 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Student rating of how OIT prepared them for outcome #6	2017-18 Extern Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	100%
Student rating of their final proficiency in outcome #6.	2017-18 Extern Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	100%

Table #7. PSLO #6 results for ECHO 420 student self-assessment

- Students had rated their training as providing satisfactory or better preparation for understanding cardiovascular physiology, pathology, and pathophysiology.
- Compared to the prior 2014-2015 results, the scores from the clinical externship area increased from 94% to 100%. As faculty performed site visits over the intervening years, an emphasis was placed on both increasing exposures to image interpretation by allowing extern students opportunities to sit with the reading physicians during study review, and on increased mentoring on the part of the imaging lab staff.
- The results indicate that those discussions with Clinical Instructors brought positive outcomes.

D. Programmatic Student Learning Outcome #7: The student will demonstrate knowledge of cardiovascular physical principles and instrumentation.

The Echocardiography faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome in the Echocardiography courses can be found in Appendix B, Student Learning Outcome-Course Matrices Table A3.

Direct Assessment #1

The faculty assessed this outcome in MIT 231 course during winter term using final exam questions with sophomore echocardiography students. The faculty rated the proficiency of students using the performance criteria described in Table #8 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Demonstrate understanding of the nature of sound waves	Final Examination Questions	% scale of 3 questions used	75% with 2 or more questions correct	94%
Interpret interaction of ultrasound with various media	Final Examination Questions	% scale of 4 questions used	75% with 3 or more questions correct	82%
Identify component function of the transducer	Final Examination Questions	% scale of 4 questions used	75% with 3 or more questions correct	88%
Apply knowledge of hemodynamic principles	Final Examination Questions	% scale of 3 questions used	75% with 2 or more questions correct	Data not provided by instructor
Apply physical principles to optimize ultrasound images	Final Examination Questions	% scale of 3 questions used	75% with 2 or more questions correct	88%

Table #8. PSLO #7 results for MIT 231 final exam questions, winter 2018

- Students performed at the anticipated level of students in the initial core echocardiography class. While the data was not available for the hemodynamic principles assessment question, it is anticipated that student were at the acceptable level of performance, as the subject area was taught in conjunction with the areas that were provided with a score.
- In the 2014-2015 Assessment Report, the score for “Identify component function of the transducer” had a 78% assessment outcome. Didactic instruction in that subject area was monitored. The outcome is now higher, possibly due to several factors: selection of incoming cohorts being made with higher selection standards, continued emphasis on that teaching module by faculty, and better application/incorporation of sonographic principles and instrumentation within the on campus imaging lab setting.

Direct Assessment #2

The faculty also assessed this outcome in ECHO 420 from the 2017-2018 senior extern year, using cardiac scanning competencies where this outcome is assessed by industry. The faculty rated the proficiency of students using the performance criteria described in Table #9 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Selects appropriate technique(s) for examination	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Adjusts instrument controls to optimize image quality.	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Takes appropriate measurements	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Recognizes and compensates for acoustic artifacts	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%
Minimizes patient exposure to acoustic energy.	Student Competency Evaluation	1 – 100% Scale	80% with a score of 80% or better	100%

Table #9. PSLO #7 results for ECHO 420 student competencies

- Students performed at an extremely high level of proficiency, reflecting the value of the full-time clinical externship experience.
- This is the best possible result, and the quality of the clinical sites that are utilized will continue to be monitored, and applied to new clinical sites as they are added to the Echocardiography program.

Indirect Assessment #1

The faculty assessed this outcome in ECHO 420 from the student 2017-2018 exit surveys asking them to rate how well the OIT Echocardiography program and their extern site prepared them for this learning outcome #7. The students rated their proficiency using the performance criteria described in Table #10 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target Av. or higher
Student rating of how OIT prepared them for outcome #7.	Exit Survey	% scale per category used	80% with a score of 3.0 or better	92.3%
Student rating of their final proficiency in outcome #7.	Exit survey	% scale per category used	80% with a score of 3.0 or better	92.3%

Table #10. PSLO #7 results for ECHO 420 student self-assessment

- It should be noted that the majority of the students, if not all, have already passed the ARDMS Sonography Principles and Instrumentation exam required for taking the Adult Echocardiography Registry Exam.

V. Evidence of Student Learning

During the 2017-2018 academic year, the program faculty formally assessed the student learning outcomes summarized below. Additional details on these assessment activities are documented earlier in this assessment report and are available in programmatic records.

ESLO #2: Oregon Tech students will engage in a process of inquiry and analysis.

Strengths: The assessment exercise mimicked real-world settings, where the initial patient information, combined with the sequence of acquired images presents a evolving set of potential pathologies and diagnoses. As a study progresses, it is inherent in the imaging setting that the cardiac sonographer understands the process of differential diagnosis, utilize this process, and in many cases alter or customize a study as the diagnosis list changes as an exam progresses. The ability to learn this thought pattern prior to Externship takes full advantage of the imaging systems, PACS images, and didactic material provided on campus.

Plans for improvements: Additional differential diagnosis assignments will be incorporated within the junior level Echo 333 and Echo 334 courses, and in Echo 232 it will be presented as a process that is utilized and that may at that earlier setting may help sophomore students sort through why components in an echo exam are arranged the way that they are.

Programmatic Student Learning Outcome #3. The student will demonstrate an ability to provide basic patient care and comfort.

Strengths: As much as is possible, students are exposed to patient care settings within the simulated lab settings on campus. Real world situations are observed during clinical rotations at both Sky Lakes Medical Center, and Klamath Heart Clinic, and are reported on by students as they perform the clinical rotations. For many, this is the first “live” introduction to the medical environment.

Plans for improvement: Based on feedback from clinical externship sites, increase or modify simulated patient care scenarios within the Echo 225 course. Provide new scenarios to students in the Echo 388 Externship Preparation course.

Programmatic Student Learning Outcome #6: The student will demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.

Strengths: The Oregon Tech Echocardiography program’s didactic presentations flex and evolve as ways of assessing cardiovascular physiology, pathology, and pathophysiology with ultrasound grow through both the technological advances in imaging equipment, and through the resultant emerging application of new imaging modalities. The importance of the Externship year is of greatest significance to the success of the program, as reflected in the 100% pass rates on the ARDMS national registry exam in adult echocardiography. Externship puts all of the pieces of the “puzzle” together.

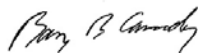
Plans for improvement: Continue to seek input from our clinical externship affiliates during externship site visits. Encourage increased attendance to the annual Clinical Instructor Workshops. Encourage increased attendance on the part of students to the Willamette Valley Society of Echocardiography meetings to be involved in presentations from those very active in the profession: both sonographers, and cardiologists.

Programmatic Student Learning Outcome #7: The student will demonstrate knowledge of cardiovascular physical principles and instrumentation.

Strengths: The didactic course work within the curriculum at OIT is extensive, at the highest level of preparatory learning leading to programmatic success, and is seen in both the recognition of the quality of our students by our clinical externship sites, and in the results from the ARDMS SPI registry exam pass rates – 100%.

Plans for improvement: As familiarity with the current ultrasound platforms increases, incorporate the platforms more directly within the appropriate didactic course lab sessions.

Overall outcomes: The Oregon Tech Echocardiography Program continues to mature, has improving assessment outcomes, and will look forward to growth in terms of both clinical affiliates for externship, and in increased enrollment as much as can be supported by available on-campus, and off-campus staff and facilities, and industry needs.



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Appendix A - 2017-18 Program Assessment Report – Inquiry and Analysis Assessment

2017-2018 Echocardiography Inquiry and Analysis ESLO Assessment

- A. The Inquiry and Analysis ISLO Assessment was applied during the spring term of the echocardiography junior year, as part of the Echocardiography Lab Management class (ECHO 385) expectations and grading process, utilizing case studies presented during the Echocardiography Externship Prep course. While the course content focused largely on Echo Lab Management, the assessment tool builds on the knowledge learned during prior sophomore and junior professional echocardiography classes that examined the echocardiography process, cardiac anatomy and physiology, pathology, and cardiac hemodynamics in the adult patient. This assessment is applicable in this class setting, as graduates may in the future function in a lab management role where they will be asked to lead staff sonographers in more critically learning how to assess data and images in their imaging exams.
- B. The intent, along with continued scanning of adult patients during the term in ECHO 334, is also to maintain both imaging skills, and keep current and utilize the knowledge base previously learned. In addition, the ESLO exercise will reinforce, or in some cases introduce, the practice of viewing/utilizing the echocardiogram as a differential diagnostic procedure.
- C. The concept:
- Physicians have long utilized the method of “differential diagnosis” in systematically narrowing down the disease states responsible for, or contributory to the symptoms a patient presents.
 - In the case of the cardiac sonographer, the actual performance of the imaging exam is in many cases dependent on the recognition by the sonographer, that the initial diagnosis does not “fit” with the images and data that are initially obtained.
 - At this point, the expectation of well-trained sonographers would be that they will apply critical thinking, consciously or subconsciously using the differential diagnosis thought process, and then perform additional (differential) scanning that will provide information that completes the study data needed for the range of diagnoses that match the initial imaging and data obtained.
 - The junior level student in the OIT Echocardiography Program should be able to incorporate the above concepts on a basic level. During the senior year of clinical externship, the student will be building imaging skills and assessment capability, and then begin to incorporate the process of differential thinking and then exam modification needed to obtain adequate diagnostic studies on patients with the increased range of pathologies that present.
- D. The exercises:
- a. Presented as a sequence of 2 homework assignments, with a point value of 50 pts. (10 in part 1, 40 in part 2)
 - b. Part 1 will be an introduction to differential diagnosis, with a simple assignment in preparing a decision tree, using a subject of the student’s choice. This part of the exercise serves as the Support section of the OIT Inquiry and Analysis Performance Criteria.
 - i. **Support:** Students will develop a framework of differential diagnosis for a non-imaging example, identifying and building the skill set needed to answer the appropriate exercise question(s).
 - c. Part 2 incorporates the remainder of the Inquiry and Analysis Performance Criteria, with students incorporating differential diagnosis in the realm of cardiac pathology.

- i. **Identification:** Students will be provided a basic patient scenario, with some amount of clinical information, along with a series of imaging clips. They will be expected to identify the abnormalities seen in these initial images, and list a minimum number of possible causal pathologies that fit the clinical data and imaging provided.
 - ii. **Investigate:** Students will next clarify the additional imaging information, and the views needed, that would narrow down the possible pathologies the study patient could have (and in an actual setting, would obtain those images).
 - iii. **Evaluate:** Students will take into account the initial information, the additional information that they would obtain, and then make an evaluation listing the narrowed number of pathologies that would “fit” diagnoses based on the total data available. This may be presented in narrative form, with rationale.
 - iv. **Conclude:** evaluation of the narrowed number of pathologies that would “fit” the total data available. This may be presented in narrative form, with rationale. Comment must be made as to what changes could be made to the initial protocol used (based on the clips shown), that would have more efficiently obtained all the information needed.
- d. Rubric: (following page)

2017-2018 Echocardiography Inquiry and Analysis ESLO Rubric - Final

	High Proficiency (4)	Proficiency (3)	Developing Proficiency (2)	Limited Proficiency (1)
<p>(1) Performance Criteria</p> <ol style="list-style-type: none"> Clinical Issue Introduction Image Incorporation 	<ol style="list-style-type: none"> Identifies 13 or more of the following possible pathologies or causal factors below: If the student answers with 9 to 10 of the correct factors in the following list: <ul style="list-style-type: none"> Systolic dysfunction Diastolic dysfunction Dilated cardiomyopathy Hypertrophic obstructive cardiomyopathy Aortic valve disease Mitral valve disease Pulmonary embolism Pulmonary hypertension RV pressure overload RV volume overload Tricuspid valve stenosis Acquired pulmonary valve stenosis Congenital heart disease – VSD Congenital heart disease – ASD, PFO Congenital heart disease – Dissecting syndromes CAD 	<ol style="list-style-type: none"> If the student answers with 11 to 14 of the factors listed under "high proficiency" for this row. If the student answers with 7 to 8 of the correct factors in the list under "high proficiency" for this row. 	<ol style="list-style-type: none"> If the student answers with 8-10 of the factors listed under "high proficiency" for this row. If the student answers with 5-6 of the correct factors in the list under "high proficiency" for this row. 	<ol style="list-style-type: none"> If the student answers with 5-7 of the factors listed under "high proficiency" for this row. If the student answers with 3-4 of the correct factors in the list under "high proficiency" for this row.
<p>(2) Investigate</p> <p>Identification of additional information and imaging needed</p>	<p>If the student answers with 4 or 5 of the following causal pathologies:</p> <ul style="list-style-type: none"> Diastolic dysfunction Pulmonary embolism RV pressure overload – undetermined origin CAD Pulmonary hypertension 	<p>If the student answers with 3 of the 5 factors listed under "high proficiency" for this row</p>	<p>If the student answers with 2 of the 5 factors listed under "high proficiency" for this row.</p>	<p>If the student answers with 1 of the 5 factors listed under "high proficiency" for this row.</p>
<p>(3) Support – Initial decision tree</p> <p>Development of methodology utilized in Differential Diagnosis</p>	<p>Differential Diagnosis "Decision Tree" with decision pathways supporting multiple outcomes or decisions that adequately define the question</p>	<p>Differential Diagnosis "Decision Tree" with multiple decision pathways and branches</p>	<p>Differential Diagnosis "Decision Tree" with increased level of development, 3-4 branches</p>	<p>Differential Diagnosis "Decision Tree" with some level of development, 1-2 branches</p>
<p>(4) Evaluation</p> <ol style="list-style-type: none"> Evaluation of data, differential list of remaining possible causative pathologies Evaluation of data and images, determining tests that could be done next, and what would have been the most useful initial images to obtain 	<ol style="list-style-type: none"> If the student correctly evaluates the imaging and clinical data, and has narrowed the possible pathologies to the following: <ul style="list-style-type: none"> Pulmonary hypertension RV pressure overload – undetermined origin Pulmonary embolism Accuracy evaluates data and images and states 2 additional tests that would provide additional important data, prioritizes initial images in different order than presented, states additional imaging windows and views that were not in the initial ones presented. 	<ol style="list-style-type: none"> If the student answers with 3 of the 4 of the correct factors listed under "high proficiency" for this row. Accuracy evaluates data and images and states 2 additional tests that would provide additional important data, prioritizes initial images in different order than presented 	<ol style="list-style-type: none"> If the student answers with 2 of the 4 correct factors listed under "high proficiency" for this row. Accuracy evaluates data and images and states 2 additional tests that would provide additional important data 	<ol style="list-style-type: none"> If the student answers with 1 of the 4 correct factors listed under "high proficiency" for this row. Accuracy evaluates data and images and states 1 additional test that would provide additional important data
<p>(5) Conclude</p> <p>Demonstrates incorporation of clinical data and images into an accurate final diagnosis or set of diagnoses</p>	<p>The student has narrowed the clinical diagnosis down to the correct choice</p>	<p>The student has narrowed the clinical diagnosis down to 2-3 probable choices</p>	<p>The student has narrowed the clinical diagnosis down to several choices that would include the probable one, but has others that fit outside of given data</p>	<p>The student has given a considerable number of potential diagnoses, of which over 50% fit into a range of diagnoses supported by the data</p>

Appendix B - 2017-18 Program Assessment Report – Curriculum Map

Echocardiography B.S.

Curriculum Map

Table A2 Curriculum Map

Three-year Cycle for Assessment of Program Learning Outcomes

STUDENT LEARNING OUTCOME	2016-17	2017-18	2018-19
1. Demonstrate the ability to communicate effectively in oral, written and visual forms.	F, P, C		
2. Demonstrate the ability to work effectively in teams.	F, P, C		
3. Demonstrate an ability to provide basic patient care and comfort.		F, P, C	
4. Demonstrate professional judgment, discretion, and ethics.			F, P, C
5. Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.	F, P, C		
6. Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.		F, P, C	
7. Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.		F, P, C	
8. Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			F, P, C
9. Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			F, P, C

***Assessment of Program Student Learning Outcomes (2 Directs, 1 Indirect)**

***Assessment of Communication Essential Student Learning Outcome (1 Direct Oral, 1 Direct Written)**

F - Foundation

P - Practice

C - Capstone

Freshman Year

N/A

Sophomore Year

	BIO 220	BIO 346	BIO 347
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.			
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.	F	F	F
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.		F	F
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.			
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.			

	ECHO 225	ECHO 231	ECHO 232
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.	F	F	P
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.	F	F	P
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.		F	P
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.		F	P
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.		F	P
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			F
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.			

	ECHO 320	ECHO 332	MIT 231
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.			
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.		P	
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.	P		
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.			F
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.	F		
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.			

	MIT 232	PHY 217	WRI 227
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.			F
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.			
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.			
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.	P	F	
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.			

Junior Year

	CHE 360	ECHO 321	ECHO 325
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.		P	P
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.		P	F
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.		P	F
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.		P	
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.		P	
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.		P	P
OIT-ESLO 2016-17.1.B Communicate effectively in writing.		P	P

	ECHO 333	ECHO 334	ECHO 376
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.	P	P	
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.	P		
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.	P	P	
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.	P	P	F
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.			F
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.			
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.			

	ECHO 385	ECHO 388	SPE 321
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.	P	P	F
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.	P		F
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.			
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.			
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.			
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.	F	P	
OIT-ESLO 2016-17.1.A Communicate effectively orally.			
OIT-ESLO 2016-17.1.B Communicate effectively in writing.	P		
	Business Elective Upper Division	Communication Elective	Humanities Elective
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.	P	P	
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.			
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.			
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.			
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.			
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.			
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.			
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.			
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			F, P
OIT-ESLO 2016-17.1.A Communicate effectively orally.		F, P	
OIT-ESLO 2016-17.1.B Communicate effectively in writing.		P	

Senior Year

	ECHO 420	Student Exit Survey
OIT-BECH 2016-17.1 Demonstrate the ability to communicate effectively in oral, written and visual forms.	C	C
OIT-BECH 2016-17.2 Demonstrate the ability to work effectively in teams.	C	C
OIT-BECH 2016-17.3 Demonstrate an ability to provide basic patient care and comfort.	C	C
OIT-BECH 2016-17.4 Demonstrate professional judgment, discretion, and ethics.	C	C
OIT-BECH 2016-17.5 Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.	C	C
OIT-BECH 2016-17.6 Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.	C	C
OIT-BECH 2016-17.7 Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.	C	C
OIT-BECH 2016-17.8 Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.	C	C
OIT-BECH 2016-17.9 Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.	C	C
OIT-ESLO 2016-17.1.A Communicate effectively orally.	C	C
OIT-ESLO 2016-17.1.B Communicate effectively in writing.	C	C