



DMS-540: INTRODUCTION TO VASCULAR IMAGING (FORMERLY DMS-140)

Effective Term

Fall 2026

BOT Approval Date

01/15/2026

Discipline

DMS - Diagnostic Medical Sonography

Course Number

540

Course Title

Introduction to Vascular Imaging (formerly DMS-140)

Short Title

Intro to Vascular Imaging

Credit Status (CB 04)

D - Credit - Degree applicable

Units

Lecture Units

2.00

Total Units

2.00

Hours

Lecture Contact Hours

32-36

Out of Class Hours Lecture

64-72

Total Contact Hours

32 - 36

Total Out of Class Hours

64 - 72

Total Student Learning Hours

96 - 108

Distance Education

No

Catalog Description

This course provides the sonography student with an introduction to vascular scanning and evaluating hemodynamics (blood flow) within the body; specifically the carotid artery, and the arteries and veins of the extremities. The course will introduce duplex imaging in the normal vessel and the expected outcomes when scanning a diseased or stenotic vessel and venous disease processes. The student will learn to correlate related diagnostic imaging procedures (angiogram, MRA and CT) with the sonographic appearances. (formerly DMS-140)



Requisites

Prerequisite(s)

Prerequisite(s) (must be taken before)

DMS-500 (with a grade of C or better) or Diagnostic Medical Sonography Graduate or Registered Technologist through ARDMS or Registered Technologist through CCI or Registered (sonography) Technologist through ARRT.

Codes

TOP Code (CB 03)

1227.00* - *Diagnostic Medical Sonography

CIP Code

51.0910 - Diagnostic Medical Sonography/Sonographer and Ultrasound Technician.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Diagnostic Medical Technology	End

Learning Objectives

Learning Objectives

Learning Objective

1. Produce a complete patient history that relates to the requested examination and evaluate any lab data pertaining to a vascular exam.
2. Evaluate scanning protocols, patient position, scanning planes, transducer selection, and machine controls for vascular scanning.
3. Demonstrate proper annotation for carotid artery and the vessels of the extremities using proper protocol and terminology.
4. Document and record technical remarks on a sonographers worksheet, using the appropriate sonography terminology and accurately reporting velocity measurements and pathology of the blood flow within an arterial or venous system.
5. Examine and identify abnormal findings for arterial obstruction and venous disease.
6. Identify normal anatomy and pathology of the carotid, venous, and arterial extremity systems.
7. Incorporate AIDET while conducting a proper patient interview to ascertain patient history and record current complaints, applicable lab test results, and surgical history.
8. Create a patient interaction by explaining the exam to the patient, prep the patient for the exam, and perform the exam.
9. Evaluate the findings from an ultrasound vascular exam on a technologist worksheet, identifying normal anatomy, pathology and measurements of the anatomy.
10. Apply culturally sensitive communication techniques during simulated scans.
11. Analyze case studies to identify cultural factors affecting clinical decisions.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome

1. Students will evaluate a carotid doppler ultrasound exam and describe the pathologic findings of a stenosis in the internal carotid artery.
2. Students will demonstrate and document a carotid doppler ultrasound exam using proper protocols, image acquisition, and image annotation.

3. Students will demonstrate and document a lower extremity Arterial exam using proper protocols, image acquisition, and image annotation.
4. Students will demonstrate and document a lower extremity Venous exam using proper protocols, image acquisition, and image annotation.
5. Students will demonstrate and document a non-invasive vascular exam of the lower extremity using segmental pressures, ABI calculations, and PPG device.
6. Students will evaluate a lower extremity vascular exam and create a technologist worksheet to submit to the radiologist.
7. Students will apply cultural awareness to patient care by communicating respectfully, making ethical decisions, and adjusting clinical practices to meet diverse patient needs.

Content

Course Lecture Content

1. Basics of Hemodynamic Considerations
 - a. Physiologic factors of blood flow and its characteristics
 - b. Pressure and flow changes in the arterial system
 - c. Normal pulsatile flow patterns
 - d. Effects of arterial obstruction
 - e. Venous hemodynamics
 - f. Effects of venous obstruction
2. Physics and Instrumentation in Doppler Ultrasonography
 - a. Duplex instrumentation: sample volume, angle of Doppler sample, and flow direction
 - b. Frequency vs. velocity and blood flow
 - c. Doppler spectral analysis
 - d. Aliasing in pulsed Doppler
 - e. Principles of color flow imaging, including aliasing on color displays
3. Diagnosis of Arterial Obstruction
 - a. Increased stenotic velocities
 - b. Post-stenotic flow disturbance
 - c. Proximal pulsatility changes
 - d. Distal pulsatility changes
4. Cerebrovascular/Carotid Vascular System
 - a. Anatomy and collateral pathways of the carotid system
 - b. Role of ultrasound in management of cerebrovascular disease
 - c. Normal findings of the carotid system
 - d. Assessment of carotid artery plaque and stenosis
 - e. Carotid artery occlusion and related pathology
 - f. Assessment of vertebral arteries
 - g. Carotid artery examination protocol
5. The Arterial System
 - a. Role of noninvasive procedures in management of extremity arterial disease
 - b. Extremity arterial anatomy and collateral routes
 - c. Non-imaging physiological tests
 - d. Assessment of upper extremity arterial occlusive disease
 - e. Evaluation of hemodialysis grafts before and after access
 - f. Assessment of lower extremity arteries before and after interventional procedures
 - g. Diagnosis and management of arterial emergencies
6. The Venous System
 - a. Role of ultrasound in management of extremity venous disease
 - b. Venous anatomy, terminology, and normal appearance
 - c. Techniques for venous ultrasound examinations
 - d. Diagnosis of venous thrombosis
 - e. Diagnosis of venous insufficiency
 - f. Non-vascular pathology seen in the extremities
7. Cultural Considerations in Vascular Sonography

- a. Recognition of cultural and linguistic factors affecting vascular health and access to care
- b. Culturally sensitive communication during vascular assessments and consent processes
- c. Awareness of health disparities in vascular disease prevalence and outcomes
- d. Ethical and professional responsibilities in serving diverse patient populations
- e. Integration of cultural competence into Doppler and hemodynamic evaluation protocols

Methods of Instruction

Method

Film/video Viewing and Discussion

Integration

Video lectures from sources such as AIUM, Sonoworld, and Gulf Coast Institute will be viewed during class. A discussion will follow with opportunities for students to ask questions and clarify concepts. Video lecture topics will include: hemodynamics of fluid - Bernoulli's principle, Poiseuille's law, and Venturi effect; doppler scanning techniques, exam protocols, and proper use of ultrasound equipment.

Method

In-class Exercises

Integration

Students will complete a sonographers exam worksheet in class that includes proper sonographic terms, descriptive terms of pathology, measurements and calculations, lab data, and patient history. This exercise will allow students to develop this important skill that is used in clinical practice in their future career as a Sonographer

Method

Lecture

Integration

Classroom lectures by the instructor will introduce key concepts of the vascular system. Topics include vascular anatomy, ultrasound scanning protocols, doppler evaluation, hemodynamic flow calculations, and instrumentation of the ultrasound machine. These lectures will allow students the opportunity to clarify concepts in class and collaborate with classmates. Supporting visual materials may include PowerPoint presentations, diagrams, ultrasound images, videos, and examples of completed sonographer worksheets

Method

Observation and Demonstration

Integration

Multiple vascular scanning demonstrations will be performed by the instructor on a volunteer model. These live demonstrations will be observed by students with opportunities to ask questions during the demonstration. These demonstrations incorporate multiple types of learning styles: auditory, visual, and hands-on.

Method

In-class Exercises

Integration

The instructor will use the classroom white board to show carotid vessel drawings with calculations of peak systolic velocities in normal and abnormal carotid and arterial vessels are presented with multiple examples of hemodynamic scenarios. Students will add these drawings to their sketchbook and participate in an open discussion of these calculations, this will allow students to develop a better understanding on how to use a table of carotid vessel stenosis.



Method

Lab Activities

Integration

Have students in pairs. One pretends to be the sonographer and one is the patient. The instructor will give only the "patient" the prompt for the case study of Carotid Stenosis & Cultural Competence in Patient-Centered Care: Mr. Tran, Age 68.

"Sonographer" students will begin their protocol for a carotid exam, while the "patient" student will re-enact the description for Mr. Tran.

The instructor will lead an open discussion on the case study. Each team of two students will summarize the situation.

Methods of Evaluation**Method**

Class Participation

Integration

Students will participate in a peer review of a classmates sonogram exam and offer approval and constructive criticism on technique, image quality, diagnostic quality, protocol, and worksheet write-up. Students will not be graded, but will be evaluated with feedback from their peers/classmates, and instructor.

Method

Exams/Tests

Integration

Lab practical's and quizzes will be used to measure comprehension and retained knowledge of vascular anatomy, vascular imaging, vascular pathologies, and doppler calculations.

Method

Final Performance

Integration

Scanning practical's performed by the students will be evaluated on standards for ultrasound exams. Student scanning is observed on an individual basis in the campus scanning lab. Each exam is graded on technical performance: protocol, diagnostic imaging, image labeling, equipment instrumentation; patient care, correct ergonomic position, and exam write-up on a sonographers worksheet. Three final practical's are evaluated: Carotid exam, Arterial of lower extremity, and Venous of the lower extremity.

Method

Homework

Integration

Students are evaluated on the completion of weekly sketchbook entries- either hand written or digital formats are accepted. Students earn points for each entry. The entries should be at least one concept and serve as a future study resource for students as they take ARDMS credentialing exams for RVT.

Method

Role-playing/Simulation



Integration

Each group of two students will be evaluated on their actions and interpretation of the case study Carotid Stenosis & Cultural Competence in Patient-Centered Care of Mr Tran.

1. Clinical Reasoning (Questions 1–3)=Demonstrates accurate understanding of carotid duplex indications, findings, and technical considerations.
2. Cultural Awareness (Questions 4–7)= Shows thoughtful insight into cultural beliefs, communication strategies, and respectful care.
3. Application to Practice = Connects cultural competence to real-world clinical practice; can give an example or make up an example.
4. Professional Communication = Uses appropriate terminology and professional tone; Language should be clear and aligned with sonography standards; Informal or inconsistent phrasing may reduce clarity.

Points apply for participation; if students do not show understanding of cultural competence through acceptable tone and clear responses or unable to give an example, then the instructor can review the concept with the individual student.

Assignments

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Complete a carotid duplex examination using proper protocols, annotation, instrumentation, and proper technologist worksheet write-up.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Complete an arterial lower extremity examination with ABIs at the ankles, using proper protocols, annotation, instrumentation, and proper technologist worksheet write-up.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Complete a venous lower extremity examination using proper protocols, annotation, instrumentation, and proper technologist worksheet write-up.



Assignment Type

Writing

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Weekly Sketchbook from lecture topics- Students will be expected to take some written notes or drawings in their sketchbook during or after each lecture. These notes or sketches are intended to enhance learning by writing you're your "Ah-Ha" moments or the "Lightbulb" moments. , or digital graphics. (You should have 16 sketches by the end of the semester + 16 for Patho)

Example in week 2: Include a sketch of the aorta with its anterior and lateral branches.

These "lightbulbs" will be discussed in groups of 2-4 students at the beginning of the next weeks class. *You will only be sharing what you feel comfortable sharing, so do not be hesitant to write notes to yourself or worry about your artistic ability.

**Please watch the video below on sketch noting, before the second class meeting: Sketch noting: <https://www.youtube.com/watch?v=pZgMpjjgCRA&feature=youtu.be>

Supplies: Required textbooks, lap-top or tablet if possible, paper and pen/pencil, colored pencils or markers, one poster board cut into 2 half or quarter, one 8 X 6" artist's sketch pad or similar, or digital graphics- iPad or digital notebook.

Assignment Type

Writing

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Carotid artery chapter quiz will consist of 50 questions: these incorporate key terms, fill-in answer for diagrams or concepts, and multiple choice questions for Carotid sonography exams.

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Read from the lab text "Introduction to Vascular Scanning by Donald Ridgeway, RVT; 4th Edition or current. Review chapter 4 (Instrumentation); Read Chapter 5 -pages 74-89 (The Carotid study); Read Chapter 6 (positioning & ergonomics)



Assignment Type

Reading

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Carotid Stenosis & Cultural Competence in Patient-Centered Care

Read the Case Study Overview:

Patient Name: Mr. Tran

Age: 68

Background: Vietnamese immigrant, limited English proficiency

Clinical Presentation: Slurred speech, right arm weakness (suspected TIA)

Referral: Carotid duplex ultrasound to assess for carotid artery stenosis

Cultural Note: Patient expresses concern about “radiation” and “machine touching the neck,” referencing traditional beliefs about energy flow and throat vulnerability. His daughter interprets during the visit.

Section 1: Clinical Reasoning

Instructions: Complete the following based on the case.

1. What are the key clinical indications for ordering a carotid duplex scan in this case?

Student Response: _____

2. What sonographic findings would suggest significant carotid stenosis?

Student Response: _____

3. List two technical considerations when scanning a patient with limited neck mobility or high anxiety.

Student Response: _____

Section 2: Cultural Competence Reflection

Instructions: Reflect on how cultural, racial, or ethnic factors may influence patient care.

4. What cultural beliefs might influence Mr. Tran’s perception of the ultrasound procedure?

Student Response: _____

5. How can the sonographer adapt communication to ensure Mr. Tran feels respected and informed?

Student Response: _____

6. Why is it important to use a certified medical interpreter rather than relying solely on family members?

Student Response: _____

7. Describe one strategy to incorporate cultural sensitivity into the ultrasound exam setup or explanation.

Student Response: _____

Course Materials

Textbooks

Hagen-Ansert, Sandra (2022). Textbook of Diagnostic Sonography. 9th Edition. Elsevier. eBook ISBN: 9780323826495. Hardcover ISBN: 9780323826464

Ridgway, D. (2014). Introduction to Vascular Scanning 4th Davies. ISBN: 9780941022835

Pellerito, J.; Polak, J. (2012). Introduction to Vascular Ultrasound 6th ed. Elsevier Saunders. ISBN: 978-1437714173

Class Size Information

Class Size

30

Class Size Category

F - Individualized, skills#based instruction/field practice 30

Diversity and Inclusion

Course Design and Materials: Course will incorporate diverse perspectives, authors, and examples that reflect a variety of cultures, identities, and lived experiences. Instructional materials will be reviewed regularly to ensure representation, inclusivity, and alignment with equity-minded practices across disciplines.

Inclusive Learning Environment: Instructors will establish classroom norms and policies that promote respect, civil discourse, and belonging in both online and face-to-face classes. Clear expectations for communication and engagement will support a learning space where all students feel valued and heard.

Accessible Instruction: Course content will be delivered using accessible design. Materials will follow accessibility guidelines within the CMS, including captioned media, readable document formats, and multiple means of engagement to support diverse learning.

Equitable Teaching Practices: Instructors will use transparent and grading criteria, varied assessment methods, and timely feedback to promote fairness and student success. Opportunities for revision, reflection, and multiple demonstrations of learning may be incorporated when appropriate to the discipline.

Culturally Responsive Pedagogies: Instructional strategies will encourage critical thinking about diverse perspectives and systems of power relevant to the course content. Faculty will foster opportunities for students to connect course material to real-world contexts.

Ongoing Reflection and Improvement: Faculty will engage in continuous professional development related to IDEAA principles and reflect on course practices using metacognition to identify opportunities for increased equity, inclusion, and accessibility.

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

Students put patient care didactic knowledge into practice in this course by performing a patient interview before starting the vascular exam, recognizing cultural differences from their own, practicing appropriate communication, and practicing patient positioning and draping. Course objectives and learning outcomes are supported through the concurrent observation course and practice within the hospital environment. Prior foundational knowledge of patient care scenarios and case studies are also put into practice that seeks to foster knowledge, empathy, and patient advocacy in developing future healthcare professionals. Sonography students and, as future graduates, will encounter scanning patients from diverse populations.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The course resources are offered in multiple forms to offer diverse learning methods to students. Audio learners can utilize voice-over lectures; Visual learners can utilize power-point diagrams, textbook, lab demonstrations, and videos; Hands-on learners can utilize lab simulation and practice concepts or protocols in the campus lab.

Interactions**Explain how the course will incorporate student-to-student interaction.**

Students will be scanning each other in the campus lab; carotid arteries of the neck and both arterial and venous of the legs. Students have simulated technologist-patient interaction that supports tutoring and encouragement for each other in their scanning ability. Students are required to enter a drawing or digital entry in a sketchbook each week. The students interact by sharing the entry in their sketchbook with one other student at the end of each class. Students will only be sharing what they feel comfortable sharing. They are instructed to not be hesitant to write notes to themselves or worry about their artistic ability. This interactive assignment is also used in DMS-122 and DMS-132.

Explain how the course will incorporate instructor-to-student interaction.

In this face-to-face course, instructor-to-student interaction will be integrated through live scanning demonstrations, guided image interpretation, and structured feedback on student performance. Students will engage in hands-on practice with duplex imaging of carotid and extremity vessels, while instructors provide real-time coaching and clarification of hemodynamic principles. Correlation with angiogram, MRA, and CT findings will be reinforced through case-based discussions, and formative assessments will include image analysis and pathology identification with rubric-based feedback to support clinical reasoning and skill development.

Explain how the course will incorporate student-to-content interaction.

Student-to-content interaction in this face-to-face vascular sonography course will be facilitated through hands-on scanning labs, structured image analysis activities, and guided interpretation of hemodynamic data. Students will engage directly with duplex imaging equipment to explore normal and pathological vascular presentations, including stenosis and venous disease. Interactive

case studies will require students to correlate sonographic findings with angiogram, MRA, and CT images, reinforcing multimodal diagnostic reasoning. Supplementary worksheets, anatomical diagrams, and waveform interpretation exercises will deepen content engagement and support mastery of vascular principles.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Student-to-self (metacognitive) interaction in this face-to-face vascular sonography course will be fostered through structured reflection activities, self-assessment tools, and guided clinical reasoning exercises. Students will routinely evaluate their scanning technique, interpretation accuracy, and diagnostic decision-making using reflective journals and post-lab checklists. Instructors will prompt learners to identify areas of strength and improvement, encouraging goal-setting and critical thinking about their learning process. Case-based discussions will include “think-aloud” moments where students articulate their rationale, enhancing awareness of how they approach vascular pathology and multimodal image correlation.

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