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# Vascular Technology Review

**Vascular Technology** A Q&A Review for the ARDMS Specialty Exam

**DAVIES**

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Continuing Education Activity

Approved for **12** hours CME Credit

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# **Vascular Technology Review**

**A REVIEW FOR THE REGISTRY EXAM**

# Vascular Technology Review

A REVIEW FOR THE VASCULAR TECHNOLOGY EXAM

2019

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*For my mother,  
Jeanne F. Ridgway,  
who is largely responsible  
for my growing up to be a book junkie.*  
—DR

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# Preface to the Fourth Edition

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WELL, HERE IT IS AT LAST, an update of Barton Bean's *Vascular Technology Review*, and it has been quite a journey. For years I have been using *Vascular Technology Review* as a text in the latter portion of the vascular technology program at Grossmont College, and I was glad to help refurbish it for the millennium. But that rascal Barton sure knew what he was doing when he said I could go ahead and work on it. Now I deserve a vacation.

Like previous editions, this edition of *Vascular Technology Review* is designed as an adjunct to your regular study and as a method to help you determine your strengths and weaknesses so that you can study more effectively. *Vascular Technology Review* covers everything on the current ARDMS exam content outline and in fact follows that outline, which you will find in Part XI of this book.

The new fourth edition has been thoroughly revised, updated, and expanded. While it retains the prodigious strengths and famous spirit of the first three editions (including occasionally tricky and very registry-like questions), it has changed in many other respects:

- It has been thoroughly reorganized to cover and follow the current ARDMS exam outline.
- It now focuses exclusively on the vascular technology specialty exam to ensure thorough coverage of even the smallest subtopic on the exam. (For the Vascular Physical Principles and Instrumentation exam, see *Vascular Physics Review*.)
- It contains hundreds of new questions, many of which are image-based or otherwise illustrated.
- A *Hall of Images* has been added to give you even more practice with duplex images, pressures and waveforms, color flow images, and angiograms.
- Existing questions have been revised, updated, or reformulated.
- Explanations have been fortified and conveniently referenced for fact-checking or further study.
- Each section is keyed to the ARDMS exam outline so that you always know where you are, what you are studying, and how it applies to your preparation.
- A new bibliography appears at the end of the book, as does the exam outline and contact information for the ARDMS.

Finally, this new edition of *Vascular Technology Review* has been approved for 12 hours of continuing medical education (CME) credit by the Society of Diagnostic Medical Sonographers. The CME application appears toward the end of the book in Part X.

Effectively used, this simulated examination will help you experience the atmosphere of the exam. Current ARDMS standards call for approximately 170 multiple-choice questions to be answered during a three-hour period. That means that you will have about 1 minute per question. Timing your practice sessions according to the number of questions you need to finish will help you prepare for the experience of taking this exam. It also helps to ensure that your mock-exam score accurately reflects your strengths and weaknesses so that you study more efficiently and with greater purpose in the limited time you can devote to preparation. Because the content of this Q&A review is formatted and weighted according to the registry's outline of topics and subtopics, you can readily identify those areas on which you should concentrate.

A few of the questions depart from the usual registry format. I've left them in because they deal with useful information in a different way. And there will be some repeat questions on the same issues to reinforce key concepts and principles. These aberrations aside, the questions are designed to closely reflect what you will encounter in the registry exam. As in the exam, some questions are easier, some more difficult or obscure.

We strongly recommended that you review test-taking strategies by reading *Coping with the Exam* in this book and perhaps also by referring to one of the many books written on taking multiple-choice examinations such as the SAT, MCAT, GRE, and LSAT. The principles are the same. Such guides can increase your confidence and your performance by explaining how standardized multiple-choice exams are designed and describing practical strategies for taking and passing these tests.

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LET ME JUST TELL YOU, it absolutely is *not* easy to write good multiple-choice questions. You should keep that in mind when you take the registry exam. Those ARDMS folks put a lot of effort into sorting out questions in easier versus more difficult categories, keeping the distribution even over many topics, and generally making the test challenging but not vicious or—worse—incomprehensible.

Inevitably there will be the occasional question on the actual exam that isn't quite clear or has ambiguous answers, and you will wish you could argue with the ARDMS about it. But you can't; that's the nature of this kind of exam. It is for gatekeeping, not teacherly feedback to help you to learn. The point is to do the best you can on those troublesome questions, and nail the rest. You do not need 100% correct to pass, right? Generally, you must answer between 65% and 75% of the questions correctly in order to pass, depending on the difficulty of the particular exam. And some of the questions you will be asked—approximately 15%, in fact—are trial questions that do not count. These questions, which are not identified for you, are being evaluated for use in future tests. So you can let them have a few and not get upset.

I myself have had occasion to take the vascular registry exam twice: I originally passed it in 1985, and then I received permission to take it again six years later (not officially scored), as a personal challenge and to make certain I was teaching in the mainstream of what we need to know to be smart technologists and sonographers. Both times I felt that the exam was fair and reasonable and that I would not want someone working on me who could not pass it.

We cannot guarantee that this book gives you exactly the questions you will encounter in the registry exam, and we wouldn't want to do that if we could—the integrity of the exam is too important. *Vascular Technology Review* is not meant to be a Beat-the-SAT sort of book. It is meant to help you solidify your knowledge by giving you questions in the style of and with the content that you can expect on the registry. It gives you the opportunity to test yourself and to learn from the experience, building your confidence, identifying your strengths and weaknesses, and practicing your exam-taking skills so that you can better demonstrate your knowledge on the actual exam.

We welcome feedback, both positive and negative. If you find a questionable question—or answer—please let us know: [info@daviespublishing.com](mailto:info@daviespublishing.com) is the e-mail address. We also want to know how you do on the exam. For your convenience, an evaluation form (*You Grade Us!*) appears in Part X.

I'd like to thank some folks for their help with this project:

- Pat, my wife, for putting up with me while I slogged through all this.
- Mike Davies, the publisher and editor, who was most patient with my slow progress and who had to tie up a bunch of the loose ends. Also Janet Heard of Davies Publishing, who had to clean the Augean stable of my manuscript.
- Barton Bean, Donna Cox, Keith Mauney, John Bennett, Colleen Douville, Andrew Hayes, Margaret Johnson, Ruth Kalmer-Holmes, Robert McGrath, Cynthia Ramirez, and Lars Shaw, whose fine work created the first three editions of the book that has helped literally thousands of RVTs pass their exams.
- Cindy Owen, who graciously contributed many of her own questions, answers, and always sterling explanations from her review book and courses. No good deed going unpunished, she has been credited as Special Contributor to this book.
- Polly deCann Wilson, who contributed some of the tips in *Coping with the Exam*, a collection of practical advice that follows this preface.
- MedaSonics and Advanced Technology Laboratories for their permission to use several useful images.

- And all the people at ARDMS, ICAVL, SVU, SDMS, and many other organizations who keep working to raise and maintain a level of excellence in this field.

Finally, you have not only our best wishes for success, but also our admiration for taking this big and important step in your career.

*Don Ridgway*

Donald P. Ridgway, RVT  
El Cajon, California

# Coping with the Exam

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## BEFORE THE EXAM

- Study
- Use flashcards
- Join a study group
- Take a review course
- Wind down a week before
- Don't cram
- Relax

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**Study.** And then study some more. Start early—six months in advance is reasonable, depending on how much free time you can devote to your preparation—and set a regular study schedule. Make your schedule specific so you know exactly what you must study on a particular day. Establish realistic goals so that you don't build a mountain you can't climb. Write it on your calendar, and stick to it.

As to *what* you study, don't just read aimlessly—use and refer to the sources in this book's bibliography and references. This book happens to be part two of a 3-step study program that covers and follows the very detailed ARDMS exam outline: (1) A concise, didactic, explanatory review of everything on the exam outline (*Vascular Technology: An Illustrated Review*, by Rumwell and McPharlin), (2) a mock exam based on the exam outline (this book), and (3) a flashcard drill that helps you memorize key facts and figures, think on your feet, and review the exam outline from a different angle (*ScoreCards for Vascular Technology*, by Owen and Strandness). This program offers a very reasonable, effective, and focused approach that concentrates your time and energy on the specific topics you must know to pass the exam and be a good technologist and sonographer. It also encourages you to familiarize yourself with and read other works, including the standard references, to read journal articles, and to poke around in the literature for specific bits of information that will deepen your knowledge of the facts and principles on which you will be tested.

Whether or not you use this particular program, or certain of its components, the approach is sound: Rely on a small core group of references, referring to others as necessary to firm up your understanding of specific topics. Use the exam outline to guide your studies. And use different but complementary study methods—texts, flashcards, and mock exams—to exercise those neural pathways.

**Make and/or buy flashcards.** Both is probably better, since the ones you buy may have questions you haven't thought of and because making your own reinforces your knowledge in a distinctly different way. Cindy Owen's and Dr. Strandness's *ScoreCards for Vascular Technology* is very effective and complement this book nicely. Doing your own 3 x 5 cards will help you organize and reinforce what you know as well. Again, study exercises using several complementary methods reinforce different neural pathways.

**Study in a group.** *This is very, very important.* You have blind spots, and the group can find and fix them. In addition, it is important to be able to articulate concepts, not just to pick out answers on a multiple-choice exam. Good vascular technologists and sonographers are also educators. Practice educating each other. Have sessions dedicated to specific content areas (such as "Venous Disease and Diagnosis"), and assign each group member some of the items from the exam outline. That way people are counting on you to bring something to the party, and you have to focus on your contribution. Weekly sessions are good.

**Spend the bucks and take one of those review courses.** This is a pretty good investment for most people at the stage of taking the ARDMS exam. First, think of it as insurance. Second, it's a nice way to consolidate your overall knowledge of the field, which many techs find valuable. In addition, you meet some other people in the field, and that's good by itself. Your clinical site might be willing to help with this expense. And you may be able to write it off; check with your accountant.

**Ease down on the studying and stress the week before.** If you've done a good job studying, you can safely wind down in your final week to reduce stress, build confidence, and rest up.

**Breathe.** In for a count of five through gently-pursed lips, then out for a count of five. Five times. There, isn't that better? Do this during the exam, too.

**No studying the night before.** You had your chance. Now just go to a really dumb movie and relax. Go to bed early and sleep well.

**Organize your things the night before:** Lay out comfortable clothes (including a sweater or sweatshirt in case the testing center is cold), pencils, your ARDMS test-admission papers, car and house keys, glasses, prescriptions, directions to the test center, and any other personal items you might need. You don't want to have to think that much the next day.

## THE EXAM

Eat lightly, arrive early, avoid coffee  
Take a sweater  
Be confident!  
Read each question twice  
Answer the easy ones first  
Guess—but wisely—when you have to  
Pace yourself  
Never despair  
Take a deep breath

---

**Eat lightly.** You do not want to fall asleep during the exam.

**Arrive early.** Leave early enough to arrive at the test center early, especially if you haven't been there before. You don't need the added stress of a wrong-offramp adventure. Be sure to take directions, including the telephone number of the testing center in case you have to make contact en route.

**Lay off the coffee.** Guess how grim it gets if your bladder begins distracting you halfway through the exam. If you are a coffee or tea drinker, get up early enough to have a cup and visit the bathroom before leaving. Should you need to use the bathroom during the exam, don't worry. You can. You just have to notify the test proctor first.

**Take a sweater.** Sometimes it's bloody cold in those places, and you'll be a bit vasoconstricted anyway.

**Be confident.** Or at least affect a confident air. When you're waiting for the exam to begin, you should smile, lift both hands and wave them toward yourself, and say, "Bring it on." Welcome the challenge, because *you* are a smart tech, by golly.

**Read each question twice before answering.** Guess how easy it is to get one word wrong and misunderstand the whole question.

**Try to answer the question without looking at the choices.** Then look for your answer among the answer choices. This practice minimizes the distractibility of the incorrect answer choices, which in the test-making business are called—guess what?—*distractors*.

**Knock off the easy ones first.** Walk briskly through the exam and answer the questions you feel good about. Then go back through and answer the more difficult items. Next, one or two more passes to get the really tough ones. Finally, for those remaining

questions you just cannot answer with certainty, eliminate the obviously wrong answer choices and then guess (see below).

**Don't second-guess.** The common wisdom is that your first answer is more likely than revised answers to be correct, and that when you return to a question and change the answer, you'll probably be wrong. I don't know for sure that I agree. I know that I frequently rethink a question and realize I had something wrong to begin with. So, frankly, I include this obligatory bit of advice with a grain of salt. I guess you should change an answer only if you're quite sure you should.

**Pace yourself; watch the time.** I have known a few people to get so involved in the registry exam that they did not quite finish. Some tiresome folks fly through the exam in an hour and walk away whistling, but you should plan to take the whole time-allotment so you can work relaxed (or at least as un-tense as possible). If you feel good about finishing early, so be it.

**Start winding it up 15 minutes before the end.** Work methodically and quickly to make your best guesses at the gnarly ones, and leave no question unanswered or un-guessed-at.

**If you have to guess, then guess.** Passing the exam depends on the number of correct answers you make. Because unanswered questions are counted as *incorrect*, it makes sense to guess when all else fails. The ARDMS itself advises that "it is to the candidate's advantage to answer all possible questions."

I hesitate to mention it, but there is a potentially handy book called *How to Beat the SAT* by Michael Donner. It takes you through different strategies for dealing with multiple-choice questions, from the ones you know cold to the ones that might as well be written in a Martian dialect. This is not to recommend cheating or faking it, but only to give people with severe test-anxiety a chance to cope. Among the hints in Donner's book:

- Eliminate the dumb answers, then the less-dumb answers, then work on the possibles, guessing, if necessary, at the correct answer. By eliminating obviously incorrect answers, you increase the odds that your final answer will be correct. If you were simply to guess at one out of five possible answers, you would have only a 20% chance of success. If, on the other hand, you use your knowledge and skill to eliminate three of the five answer choices, you increase your odds of success to 50%.
- Your best guess on a question in Martian (i.e., you have absolutely no idea what to make of it) is probably a B or a D, because A, C, and E are the most common guesses, so test-makers often avoid those. Nevertheless, second-guessing the test-makers can get rather tangled. Study instead.

**Take notes on tricky or long questions.** You can often help jog your memory or reasoning by rearranging the information in the question on your scratch paper.

**Don't despair 50 minutes into the exam.** At some point in the exam you may feel that things just aren't going well. Do the breathing for a minute (count of five in, count of five out) and plunge back in. You need only about three out of four correct answers to pass, and if you've put a reasonable amount of time into getting ready, that's attainable even if you feel sweat running down your back.

Uncle Don says,

**Don't forget to breathe!**

## TAKING THE EXAM ON COMPUTER

- Just point and click
- Take notes
- Mark and return to the hard questions
- Use the on-screen clock to pace yourself
- Be methodical
- Breathe

~~~~~

Some candidates express concern about taking the registry exam on computer. Most folks find this to be pretty easy; some find it off-putting, at least in prospect. But the computerized exams are quite convenient: You can take the exam at your convenience (a far cry from the days of one exam per year), you know whether or not you passed before you leave the testing center (compare that to waiting weeks and even months, as used to be the case), and you can reschedule the exam after 90 days if you happen not to pass the first time (rather than waiting another six months to a year). Another good point: The illustrations are said to be clearer on computer than in the booklets on a Scantron-type exam.

Taking the test by computer is not complicated. The center even gives you a tutorial to be sure you know what you need to do. You sit in a carrel with a computer and answer the multiple-choice questions by pointing and clicking with a mouse. There is a clock on the display letting you know how much time is left. Use it to pace yourself. Scratch paper is available; make liberal use of it.

You can mark questions for answering later. A display shows which questions have not been answered so you can return to them. When you have finished, you click on “DONE,” and you find out immediately whether you passed.

It’s nothing to be afraid of. The principles are the same as those for any exam. Be methodical and keep breathing.

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*PART I*

# Anatomy, Physiology & Hemodynamics

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## CEREBROVASCULAR SYSTEM

Aortic arch  
Upper extremity  
Cervical carotid  
Vertebral  
Intracranial (circle of Willis)

---

1. The first major arterial branch of the aorta is the:
  - A. Right common carotid artery
  - B. The left common carotid artery
  - C. The right subclavian artery
  - D. The innominate artery
  - E. The left subclavian artery
2. Which of the following arteries does NOT arise from the subclavian artery?
  - A. Vertebral
  - B. Superior thyroid
  - C. Internal thoracic
  - D. Thyrocervical trunk (axis)
  - E. Internal mammary
3. The angular artery is the terminal part of the:
  - A. Supraorbital artery
  - B. Infraorbital artery
  - C. Superficial temporal artery
  - D. Transverse facial artery
  - E. Facial artery

4. The arterial pulsations felt in front of the ear and just above the zygomatic arch are from which artery?
  - A. Maxillary
  - B. Transverse facial
  - C. Superficial temporal
  - D. Facial
  - E. Occipital
5. The common carotid artery divides into its external and internal branches usually at the level of the upper border of the:
  - A. Hyoid
  - B. Cricoid
  - C. Thyroid cartilage
  - D. Cricothyroid membrane
  - E. Carina
6. What artery is usually the first branch of the external carotid artery?
  - A. Inferior thyroid artery
  - B. Superior thyroid artery
  - C. Supraclavicular artery
  - D. Facial artery
  - E. Posterior auricular artery
7. Which of the following is not an artery in the circle of Willis?
  - A. Anterior cerebral artery
  - B. Middle cerebral artery
  - C. Anterior communicating artery
  - D. Middle communicating artery
  - E. Posterior communicating artery
8. Which of the following arteries arise(s) from the external carotid artery?
  - A. Superior thyroid artery
  - B. Lingual artery
  - C. Facial artery
  - D. Ascending pharyngeal artery
  - E. All the above
9. The prominence of the larynx is formed by the:
  - A. Hyoid bone
  - B. Thyroid cartilage
  - C. Cricoid cartilage
  - D. Thyroid gland
  - E. Greater cornu

# Vascular Technology Review

Test yourself before the ARDMS tests you! The completely revised and updated 4th edition of *Vascular Technology Review* illuminates the facts and principles on which you will be tested, hones your test-taking skills, and reveals your strengths and weaknesses by exam topic. Based on the ARDMS exam outline, this new edition contains 575 registry-like questions together with instructive illustrations, answers, clear explanations, and quick references for further study. A Hall of Images and more than 50 image-based cases prepare you to tackle the images on the exam. *Vascular Technology Review* is especially powerful in combination with *Vascular Technology: An Illustrated Review* (Step 1—review text) and *ScoreCards for Vascular Technology* (Step 3—memory skills flashcard drill). Why are our mock exams so popular and effective? Because they contain the same kinds of thought-provoking questions you will find on the exam! Approved for 12 hours of CME credit by the Society of Diagnostic Medical Sonography. Davies catalog #11024.

## Ready to score? You can!

### About the editors . . .



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D. E. Strandness, Jr., MD, pioneered the development of duplex ultrasonography and was Professor at the University of Washington before his untimely death. He authored hundreds of original articles and books.

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