

# DAVIES



## 1-2-3 Step Ultrasound Education & Test Preparation

### Step 1

Review text

### Step 2

Mock examination

### Step 3

Q&A memory skills  
flashcard drill

**DAVIES**

Registry Reviews & Study Aids

## ScoreCards for

# Vascular

## T E C H N O L O G Y

### Q & A FLASHCARD STUDY SYSTEM

Includes Image Gallery + Bonus Physics Coverage!

SDMS-Approved  
Continuing Education Activity

Approved for **7.5** hours CME Credit

A Step 3 Educational Activity

CINDY OWEN

D.E. STRANDNESS

ScoreCards for

# Vascular Technology

by Cindy Owen, RDMS, RVT, with D. E. Strandness, Jr., MD

The sophisticated ScoreCards flip- and flashcard study system yields maximum gain with minimum pain, and it's fun. Exercise your ability to think fast and recall key facts wherever you are—at lunch, on weekend outings, or between patients. Written by well-known experts, these handy ScoreCards deliver nearly 400 questions keyed to the registry's own exam outline, plus answers, explanations, and quick references. Fifty image-based cases prepare you to tackle scans on the exam. Step 3 in Davies' CME-approved 1-2-3 Step Ultrasound Education and Test Preparation program, *ScoreCards for Vascular Technology* are very effective in combination with *Vascular Technology: An Illustrated Review* (Step 1—review text), *Vascular Technology Review*, and *Vascular Physics Review* (Step 2—mock exams). Visit us online at [DaviesPublishing.com](http://DaviesPublishing.com) for the latest information about our products.



Catalog #11021 (VT)

9 780941 022484

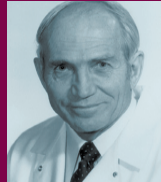
ISBN 0-941022-48-X



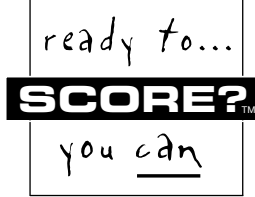
Cindy Owen is the author of *Abdominal Sonography Review*, *Ultrasound Physics Review*, and *Ultrasound Physics Mock Exam on CD-ROM*. A former ARDMS and

ICAVL board member, she is a Fellow of the Society of Diagnostic Medical Sonography and lectures widely throughout the world. Cindy lives with her family in Memphis, where she bases her ultrasound consulting practice and rides her horse Gus.

A pioneering leader well known for his central role in the development of duplex ultrasonography, the late Dr. Strandness wrote dozens of major books, published hundreds of important papers, lectured extensively throughout the world, and was professor of surgery and chair of the department of vascular surgery at the University of Washington.



[DaviesPublishing.com](http://DaviesPublishing.com)



**ScoreCards™ for**

# **Vascular Technology**

**A Q&A Flashcard Study System for  
Vascular Technology**



By Cindy Owen, RDMS, RVT, FSDMS  
D. E. Strandness, Jr., MD, Series Editor

### **Library of Congress Cataloging-in-Publication Data**

Owen, Cindy.

ScoreCards for vascular technology : a Q & A flashcard study system for vascular technology / by Cindy Owen, D. E. Strandness, Jr.

p.; cm.

ISBN 0-941022-48-X

1. Blood-vessels—Diseases—Ultrasonic imaging—Examinations, questions, etc.

[DNLM: 1. Vascular Diseases—ultrasonography—Examination Questions. WG 18.2 O97s 2000] I. Title: Vascular technology. II. Strandness, D. E. (Donald Eugene), 1928-. III. Title.

RC691.6.U47 O94 2000

616.1'307543'076—dc21

00-060161

**Copyright © 2012 by Davies Publishing, Inc.** All rights reserved. No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic or mechanical, including photocopying, scanning, and recording, without prior written permission from the publisher.

### **Davies Publishing, Inc.**

32 South Raymond Avenue

Pasadena, California 91105-1935

Website: [DaviesPublishing.com/telephone](http://DaviesPublishing.com/telephone) 626-792-3046

Cover and text design by Satori Design Group, Inc. / Prepress production by The Left Coast Group, Inc.

Printed and bound in the United States of America by Versa Press, Inc.

ISBN 0-941022-48-X



# CONTENTS

The *ScoreCards* study system covers what you need to know to pass the ARDMS exam for the Vascular Technology (VT) examination. The *ScoreCards* contents therefore cover key concepts, facts, and principles topic by topic. The numbers in parentheses indicate the approximate percentage of the exam that a particular topic is likely to represent. On the question side of each page of the *ScoreCards*, at the bottom, there is a key indicating its place within the topic outline, as well as the relative importance of the topic. So you always know where you are and how you are doing.

*ScoreCards for Vascular Technology* also contains an image gallery of challenging case-based problems and coverage of physiology and fluid dynamics—the vascular-specific physical principles that you must know to pass the Vascular Technology exam. These physical principles are key to understanding the physiologic basis of the indirect vascular tests, Doppler technology and its clinical application, and other clinically important issues and applications.

For best results, we strongly urge you to combine *ScoreCards* with *Vascular Technology: An Illustrated Review* and either *Vascular Technology Review* (the book form of the mock exam) or *Vascular Technology CD-ROM Mock Exam*.

<b>How To Use ScoreCards</b> .....	IX
<b>CME Application</b> .....	825



**1 ANATOMY, PHYSIOLOGY, AND HEMODYNAMICS (4–18%)** .....1

**Cerebrovascular (1–5%)**

Aortic arch and upper extremities, cervical carotid, vertebral, and intracranial arteries (circle of Willis)

**Venous (1–5%)**

Deep, superficial, and perforating veins—upper and lower extremities, central (vena cava, innominate/brachiocephalic), venous wall and valves

**Peripheral Arterial (1–5%)**

Aortic arch, upper and lower extremities, abdominal aorta, microscopic anatomy

**Abdomen and Visceral (1–3%)**

Arterial (celiac, mesenteric, renal, hepatic arteries) and venous (vena cava, renal, portal, mesenteric veins)

**2 CEREBROVASCULAR (25–35%)** .....111

**Mechanisms of Disease (1–5%)** .....111

Risk factors, atherosclerosis, dissection, thromboembolism, subclavian steal, carotid body tumor, fibromuscular dysplasia, neointimal dysplasia

**Signs and Symptoms (1–5%)** .....137

Transient symptoms, stroke, physical exam (neurologic signs and symptoms, bruits, bilateral brachial pressures)

**Testing and Treatment (20–25%)** .....163  
 Noninvasive testing (patient positioning, technique, interpretation, capabilities, and limitations for duplex imaging—B-mode, Doppler, and color Doppler—and transcranial Doppler), miscellaneous diagnostic tests (methods, interpretation, and limitations for arteriography, MR angiography, and CT), treatment and follow-up (medical—pharmacologic, risk reduction, and lifestyle modification; endovascular—angioplasty and stent; and surgery)

**3 VENOUS (25–35%)** .....257

**Mechanisms of Disease (2–7%)** .....257  
 Risk factors, deep and superficial acute venous thrombosis, chronic deep venous obstruction, chronic venous valvular insufficiency (primary and secondary), varicose veins, congenital disorders, pulmonary embolism

**Signs and Symptoms (1–3%)** .....283  
 Acute and chronic (skin changes, lymphedema, ulceration)

**Testing and Treatment (Upper and Lower Extremity) (20–25%)** .....307  
 Noninvasive testing (patient positioning, technique, interpretation, capabilities, and limitations for acute venous thrombosis—duplex imaging and continuous-wave Doppler—and chronic venous insufficiency and obstruction—duplex imaging and reflux plethysmography by air- and photoplethysmography), venography (methods, interpretation, capabilities, and limitations), treatment (anticoagulation, thrombolytic therapy, vena caval filter, support hose, and surgery)

<b>4 PERIPHERAL ARTERIAL (20–30%)</b> .....	379
<b>Mechanisms of Disease (1–5%)</b> .....	379
Risk factors, atherosclerosis, embolism, aneurysm, nonatherosclerotic lesions (arteritis, vasospastic disorders, dissection, entrapment syndromes)	
<b>Signs and Symptoms (1–5%)</b> .....	399
Chronic disease (claudication, rest pain, tissue loss), acute arterial occlusion (thrombosis and embolism), vasospastic disorders, physical examination (skin changes, pulse palpation, auscultation)	
<b>Testing and Treatment (Upper and Lower Extremity) (15–20%)</b> .....	419
Noninvasive testing (patient positioning, technique, interpretation, capabilities, and limitations for qualitative and quantitative evaluation of analog and spectral Doppler waveforms; pressures—ABI, segmental pressures, exercise testing, and reactive hyperemia; plethysmography—volume pulse recording and photoplethysmography with digital pressures and cold stress; and duplex imaging for stenosis, occlusion, aneurysm, and intraoperative/postoperative evaluation of bypass grafts), miscellaneous diagnostic tests (methods, interpretation, and limitations for arteriography, MR angiography, and CT), treatment (medical—pharmacologic and lifestyle modification; endovascular—angioplasty and stent; and surgery—endarterectomy and bypass)	
<b>5 ABDOMEN AND VISCERAL (5–15%)</b> .....	515
<b>Mechanisms of Disease (0–3%)</b> .....	515
Risk factors, renovascular hypertension, mesenteric ischemia, portal hypertension	



**Signs and Symptoms** (0–3%) .....531

**Testing and Treatment** (4–13%) .....535  
 Duplex imaging and angiography

**6 MISCELLANEOUS CONDITIONS AND TESTS** (5–15%) .....577  
 Preoperative vein mapping, pseudoaneurysms, arteriovenous fistulae, dialysis access, organ transplants (renal and liver), impotence, preoperative arterial mapping (radial, epigastric, and mammary), temporal arteritis, thoracic outlet syndrome, trauma

**7 QUALITY ASSURANCE** (3–5%) .....629

**Statistics** (2–4%)  
 Sensitivity, specificity, positive and negative predictive values, accuracy

**Patient Safety** (1–3%)  
 Infection control and medical emergencies

**8 PHYSIOLOGY AND FLUID DYNAMICS** (10–20%) ..... 643  
 Bonus coverage of the Vascular Physical Principles and Instrumentation exam, part 1!

VIII Contents

<b>Arterial Hemodynamics</b> (7–11%) .....	643
<b>Venous Hemodynamics</b> (4–8%) .....	685
<b>Other</b> (0–3%) .....	715
<b>9 IMAGE GALLERY</b> .....	725
Image-Based Cases and Questions	



## HOW TO USE SCORE CARDS

As part of our 1-2-3 Step Ultrasound Education and Test Preparation program, *ScoreCards for Vascular Technology* systematically prepares you to pass the Vascular Technology exam for the RVT credential. It also helps you to master the facts, problem-solving skills, and habits of mind that form the foundation of success not only on your registry exams but also in your career as an ultrasound professional. And they're fun. Here are some tips for maximizing their value:

**Take it with you.** The pocket-sized *ScoreCards* study system is designed to be portable. Use it on breaks or between patients. You can review a dozen question/answer items in five minutes.

**Study, test yourself, review.** As you study vascular technology, *ScoreCards* drills you on key facts and figures, it tests your knowledge of those facts in practical situations, and it provides clear explanations and references for further study. Each Q&A card is keyed to the ARDMS exam content outline so that you always know where you are, how you are doing, and how important the topic is to your overall success on the exam.

**Triangulate on your target.** By itself, the *ScoreCards* study system is a powerful, convenient, and fun way of learning and testing yourself. It is especially effective when used with *Vascular Technology: An Illustrated Review* [Step 1: review text] and *Vascular Technology Review* [Step 2: mock examination]. Just as each ScoreCard tells you which exam topic it covers, it also indicates exactly where in the Step 1 text you can find further information about the subject. So do the

Davies mock examinations. This integrated, systematic strategy triangulates on your target—exam and career success!

**Shuffle it!** After using the flipcard format for a while, consider removing the spiral wire binding and mixing up the cards to vary the order in which they challenge you.

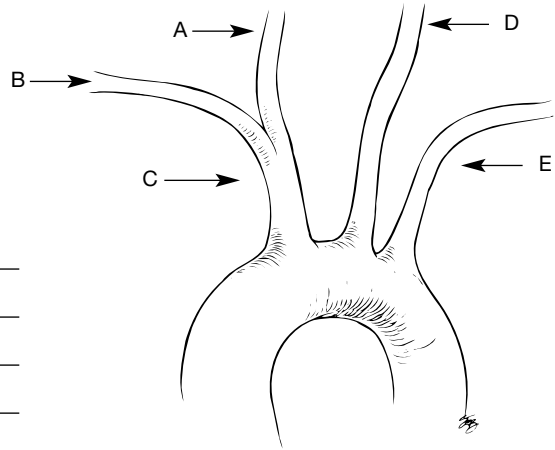
**Earn CME credit.** The *ScoreCards* study system is an SDMS-approved CME activity that can help you earn the 12 clock hours required to take an ARDMS exam or to meet the CME requirements necessary to maintain your registry status once you pass your exams. Use the application that follows the last question in this book.

**Check our website.** News about your exams, continuing medical education, diagnostic testing, catalogs of additional references and resources, and online help are just a click away. Visit us at [DaviesPublishing.com](http://DaviesPublishing.com).

1

In this illustration of the aortic arch, name the vessels labeled A–E.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_





- A. Right common carotid artery.
- B. Right subclavian artery
- C. Innominate artery.
- D. Left common carotid artery.
- E. Left subclavian artery.

This classic pattern of the aortic arch is seen in approximately 70% of individuals. The first of these branches is the innominate or brachiocephalic trunk, which usually courses 3–4 cm before dividing into the right common carotid and subclavian arteries. The second branch is the left common carotid artery. The last branch of the aortic arch is the left subclavian artery.

**2**

The most common anatomic variant of the aortic arch is:

- a. a common origin of the innominate and left common carotid arteries
- b. origin of the left vertebral from the aortic arch
- c. origin of the right subclavian from the aortic arch
- d. origin of the right common carotid from the aortic arch

# A

## 2

### A. A common origin of the innominate and left common carotid arteries.

A common origin of the innominate and left common carotid arteries is by far the most common variant anatomy of the aortic arch, occurring in approximately 22% of individuals.

- ▶ Kadir S: Regional anatomy of the thoracic aorta. In *Atlas of Normal and Variant Angiographic Anatomy*. Philadelphia, Saunders, 1991, pp 19–54.



**3**

The subclavian artery becomes known as what artery after crossing the lateral margin of the first rib?

- a. brachiocephalic artery
- b. axillary artery
- c. brachial artery
- d. vertebral artery



## B. Axillary artery.

The subclavian artery continues as the axillary artery after it passes the lateral margin of the first rib. The axillary artery in turn becomes the brachial artery.