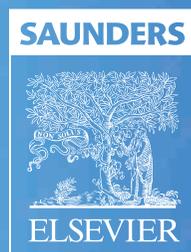


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The Practice of Clinical Echocardiography

THIRD EDITION



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1600 John F. Kennedy Blvd.
Ste 1800
Philadelphia, PA 19103-2899

THE PRACTICE OF CLINICAL ECHOCARDIOGRAPHY, THIRD EDITION ISBN: 978-1-4160-3640-1
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The Publisher

Library of Congress Cataloging-in-Publication Data

The practice of clinical echocardiography / [edited by] Catherine M. Otto ; Starr Kaplan, illustrator. -- 3rd ed.
p. ; cm.

Includes bibliographical references.

ISBN 978-1-4160-3640-1

1. Echocardiography. I. Otto, Catherine M. II. Title: Clinical echocardiography.

[DNLM: 1. Echocardiography. 2. Cardiovascular Diseases--diagnosis. WG 141.5.E2 P8942 2007]

RC683.5.U5C57 2002

616.1'207543--dc22

2007026986

Executive Publisher: Natasha Andjelkovic
Developmental Editor: Pamela Hetherington
Project Manager: Mary Stermel
Design Direction: Ellen Zanole
Marketing Manager: Paul Leese

Printed in China

Last digit is the print number: 9 8 7 6 5 4 3 2 1

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Preface

This book has two underlying goals: to serve as an advanced reference text on the clinical applications of echocardiography and to provide an introduction to newer echocardiographic modalities and research methods. As an advanced reference text, this book reflects our role as clinicians caring for patients with cardiovascular disease. The clinical information in this book will be of value to all cardiovascular specialists, not just those focused on cardiovascular imaging. This book also will be of interest to cardiology fellows, cardiovascular anesthesiologists, and other health care providers using echocardiographic approaches in the clinical setting, including radiologists, interventional cardiologists, electrophysiologists, emergency medicine physicians, and internists with an active interest in cardiovascular disease. Cardiac sonographers, cardiovascular technologists, physician assistants, nurse practitioners, and nursing professionals who wish to go beyond the basics in echocardiographic imaging will also find this book useful. For the researcher using echocardiography, there are 12 chapters focused on instrument, methodology, validation, and future prospects for newer advanced echocardiographic modalities.

Echocardiography is a vital component in the evaluation of patients with suspected or known cardiovascular disease. As this technique has evolved and matured, the role of the echocardiographer has shifted from simply providing a description of the images to providing an integrated assessment of the echocardiographic data in conjunction with the other clinical data in each patient. Often, echocardiography provides all the data needed for clinical decision making. When additional information is needed, the echocardiographic findings help define which other imaging modalities might be helpful. In effect, echocardiography has become a specialized type of cardiology consultation.

The information now requested by the referring physician includes not only the qualitative and quantitative interpretation of the echocardiographic images and Doppler flow data, but also a discussion of how this informa-

tion might affect clinical decision making. Specific examples include decisions regarding interventional procedures (e.g., detection of coronary ischemia), medical or surgical therapy (e.g., treatment of endocarditis, surgery for aortic dissection), optimal timing of intervention in patients with chronic cardiac diseases (e.g., valvular regurgitation, mitral stenosis), prognostic implications (e.g., heart disease in pregnancy, patients with heart failure), and the possible need for and frequency of periodic diagnostic evaluation (e.g., congenital heart disease, the postoperative patient). In addition, echocardiography is critical in choosing the optimal therapy for each patient (e.g., selection of patients with heart failure for biventricular pacing) and in monitoring the effects of medical, percutaneous, or surgical intervention.

The clinical practice of echocardiography no longer is restricted to the full diagnostic examination performed in an imaging laboratory. Instead echocardiography has become so integrated into cardiovascular care that specialized instruments are now used in the intensive care unit, in the emergency department, in the interventional laboratory, during electrophysiology procedures, and in the operating room. As instruments become easier to use, smaller, and less expensive, it is likely that the clinical applications of this imaging modality will continue to expand.

Each chapter provides an advanced level of discussion, written by an expert in the field, building upon the basic material in the *Textbook of Clinical Echocardiography*, third edition, by Catherine M. Otto. The primary focus of each chapter is the role of echocardiography in clinical decision making and the impact on clinical outcomes. Emphasis is also placed on the principles of optimal data acquisition, quantitative approaches to data analysis, potential technical limitations, and areas of active research. In addition, the strengths and limitations of alternative diagnostic approaches are reviewed to put the role of echocardiography into the context of clinical practice. Detailed tables, color illustrations, echocardiographic images and Doppler tracings, and figures with important data from

published outcome studies are used to provide clarity and depth.

In this edition, all the chapters have been updated to reflect recent advances, including revision of the text, references, figures, and tables. Key points that provide a quick overview or review of the most important concepts have been added to each chapter. There are over 40, full-color artist-drawn anatomic illustrations oriented to match echocardiographic image planes that demonstrate cardiac anatomy in different disease states. A new feature is the inclusion of a DVD that complements the material presented in the text. For each chapter, there are clinical cases (80 total), with echocardiographic images and cine loops, that demonstrate the clinical applications of the material discussed in the chapter. Multiple choice questions (over 210 total) provide an opportunity for readers to test their knowledge or quickly review the core material. The detailed explanation of the correct answer that is included with each question also provides an opportunity for additional learning.

The first two parts of the book are dedicated to advances in echocardiographic imaging. The chapters in these parts provide a detailed description of advanced imaging modalities, which includes basic principles, instrumentation, technical aspects of data acquisition, measurement of data, any limitations of the approach, and interpretation of results. Chapters are included on transesophageal echocardiography, intraoperative echocardiography, contrast echocardiography, three-dimensional echocardiography, and intravascular ultrasound. In addition, three new chapters have been added on intracardiac echocardiography, tissue-Doppler echocardiography, and handheld echocardiography to reflect the increasing use of these approaches in clinical practice. The next section focuses on methods to evaluate the left ventricle, with chapters spanning the spectrum from critical appraisals of quantitative techniques for evaluation of ventricular size, shape, and global and regional systolic function to chapters on edge detection and assessment of diastolic function.

The greater portion of the book is organized into parts based on major diagnostic categories. These chapters expand from a concise summary of data acquisition to focus on the clinical application of basic and advanced echocardiographic techniques in each disease state. The part on ischemic heart disease includes chapters on the role of echocardiography in the emergency department and coronary care unit, stress echocardiography (exercise and nonexercise), and a new chapter on echocardiographic imaging of coronary blood flow. The central role of echocardiography in management of patients with valvular heart disease is evident with chapters on quantitation of regurgitant severity, the optimal timing of surgery in patients with chronic valvular regurgitation, management of patients

undergoing balloon mitral commissurotomy, clinical decision making in patients with endocarditis, evaluation of disease severity and progression in valvular aortic stenosis, and evaluation of prosthetic valves.

The following parts discuss the role of echocardiography in patients with cardiomyopathies (the patient with heart failure, hypertrophic cardiomyopathy, and restrictive cardiomyopathy and the posttransplant patient) and pericardial disease. Cardiac resynchronization therapy is addressed in the chapter on heart failure. There is a separate chapter on heart disease in pregnant women. In a part on other vascular and systemic diseases that lead to cardiac dysfunction (hypertension, aortic dissection, pulmonary disease, systemic immune-mediated diseases, renal disease, aging, systemic embolic events, and cardiac arrhythmias), a new chapter on connective tissue disorders now is included.

The part on congenital heart disease will be of value to clinicians caring for the increasing number of patients being seen with this diagnosis, as more children with corrective or palliative surgical procedures now survive to adulthood. The first chapter is entirely new and focuses on the general echocardiographic approach to the patient with congenital heart disease. The next chapter discusses congenital heart disease in adults without prior surgical procedures, and the third chapter discusses the often complex echocardiographic findings in adults with prior intervention for congenital heart disease. Finally, a new chapter on cardiac tumors has been added.

It is hoped that this book will provide the needed background to support and supplement clinical experience and expertise. Of course, competency in the acquisition and interpretation of echocardiographic and Doppler data depends on appropriate clinical education and training as detailed in accreditation requirements for both physicians and technologists and as recommended by professional societies, including the American Society of Echocardiography, the American College of Cardiology, and the American Heart Association. I strongly support these educational requirements and training recommendations; readers of this book are urged to review the relevant documents.

In addition, there continue to be advances both in the technical aspects of image and flow data acquisition and in our understanding of the clinical implications of specific echocardiographic findings. This book represents our knowledge base at one point in time; readers will wish to consult the current literature for the most up-to-date information. Although an extensive list of carefully selected references is provided with each chapter, the echocardiographic literature is so robust that it is impractical to include all relevant references; the reader can use an online medical literature search if an all-inclusive listing is desired.

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