

Compendium  
of  
Podiatric  
Medicine  
and  
Surgery  
2016

Kendrick A. Whitney, D.P.M.

*Editor-in-Chief*



Copyright © 2016 Data Trace Publishing Company  
All rights reserved, Annual First Edition  
Printed in the United States of America

**Published by**  
**Data Trace Publishing Company**  
**P.O. Box 1239**  
**Brooklandville, Maryland 21022-9978**  
**410-494-4994 Fax: 410-494-0515**

ISBN 978-1-57400-150-1

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

Compendium of podiatric medicine and surgery 2000/Stephen J. Kominsky,  
editor-in-chief.

p.; cm.

Reviews of published articles followed by a commentary by the chapter  
editor.

Includes indexes.

ISBN 1-57400-057-8

1. Foot—Diseases—Surgery—Abstracts. 2. Podiatry—Abstracts.  
3. Surgery, Operative—Abstracts.

[DNLM: 1. Foot Diseases. 2. Leg. 3. Skin Diseases. 4. Surgical  
Procedures, Operative. WE 880 C7362 2000] I. Kominsky, Stephen J.  
RD563. C6535 2000

617.5'85—dc21

00-064537

# Contents

<b>Editors</b> .....	v
<b>Contributors</b> .....	ix
<b>Journals Represented</b> .....	x
<b>Continuing Medical Education</b> .....	xiii
<b>Introduction</b> .....	xiv
<i>Kendrick A. Whitney, D.P.M.</i>	
<b>1. Vascular Disorders</b> .....	<b>1</b>
<i>edited by Ziad Labbad, M.D, D.P.M., and Ebony Love, D.P.M.</i>	
<b>2. Dermatology</b> .....	<b>11</b>
<i>edited by Tracey C. Vlahovic, D.P.M., FFPM, RCPS (Glasg)</i>	
<b>3. Medicine</b> .....	<b>19</b>
<i>edited by Erika M. Schwartz, D.P.M., Ashleigh Korves, D.P.M., and Priya Parthasarathy, D.P.M.</i>	
<b>4. Trauma</b> .....	<b>29</b>
<i>edited by Joshua L. Moore, D.P.M.</i>	
<b>5. Sports Medicine</b> .....	<b>39</b>
<i>edited by Howard J. Palamarchuk, D.P.M.</i>	
<b>6. Radiology</b> .....	<b>53</b>
<i>edited by Bruce G. Greenfield, D.P.M., Marianne Peacock, D.P.M., and Rhonda Cornell, D.P.M.</i>	
<b>7. Forefoot Surgery</b> .....	<b>69</b>
<i>edited by Whitney Ellis-McConnell, D.P.M., Jane Pontious, D.P.M., and Andrew J. Meyr, D.P.M.</i>	
<b>8. Rearfoot Surgery</b> .....	<b>85</b>
<i>edited by Lawrence A. DiDomenico, D.P.M., and Danielle Butto, D.P.M.</i>	
<b>9. Diabetes</b> .....	<b>95</b>
<i>edited by Vincent Giacalone, D.P.M.</i>	
<b>10. Biomaterials</b> .....	<b>115</b>
<i>edited by James A. Furmato, D.P.M., Ph.D.</i>	
<b>11. Biomechanics of the Lower Extremity</b> .....	<b>133</b>
<i>edited by Kendrick A Whitney, D.P.M.</i>	

---

<b>12. Anatomy</b> .....	<b>149</b>
<i>edited by Amanda Crowell, D.P.M., and Andrew J. Meyr, D.P.M.</i>	
<b>13. Pathology/Tumors</b> .....	<b>165</b>
<i>edited by Michael Rupp, D.P.M., M.D.</i>	
<b>14. Pediatrics</b> .....	<b>175</b>
<i>edited by Philip J. Bresnahan, D.P.M., and Nicholas J. Pagano, Jr., D.P.M.</i>	
<b>15. Plastic Surgery</b> .....	<b>189</b>
<i>edited by Caitlin S. Garwood, D.P.M., and Katherine M. Raspovic, D.P.M.</i>	
<b>16. Rehabilitation</b> .....	<b>201</b>
<i>edited by Richard Scott Krupkin, M.D.</i>	
<b>17. Wound Management</b> .....	<b>215</b>
<i>edited by Kathya M. Zinszer, D.P.M., M.P.H., Marcus Riedhammer, MD, CWSP, D. L. Troutman, D.P.M.</i>	
<b>18. Heel Pain</b> .....	<b>233</b>
<i>edited by Rocco A. Petrozzi, D.P.M.</i>	
<b>19. Gait/Kinematics</b> .....	<b>245</b>
<i>edited by James A. Furfato, D.P.M., Ph.D.</i>	
<b>Author Index</b> .....	
<b>Subject Index</b> .....	

## Subscription Information

This Data Trace Publishing Company publication is updated on a yearly basis. Your subscription is automatic with the purchase of this publication. Subsequent books will be sent to you automatically and billed at the then-current prices.

If you do not wish to receive any updates, you must write a letter, with all pertinent information (name, company name, address, phone number, and publication) to cancel your subscription. Cancellations may be faxed to 410-494-0515 or mailed to:

Data Trace Publishing Company  
P.O. Box 1239  
Brooklandville, MD 21022-9978

# Editors

## *Editor-in-Chief*

### **Kendrick A. Whitney, D.P.M.**

Clinical Associate Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA

## *Chapter Editors*

### **Philip J. Bresnahan, D.P.M., F.A.C.F.A.S.**

Clinical Assistant Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA

### **Danielle Butto, D.P.M., A.A.C.F.A.S.**

Fellow, Ankle & Foot Care Centers/Kent State College of Podiatric Medicine, Youngstown, Ohio

### **Rhonda Cornell, D.P.M.**

Diplomate, American Board of Foot and Ankle Surgery; Certified in Foot Surgery; Fellowship-trained Diabetic Limb Salvage, Georgetown University Hospital, Washington, D.C.; Private Practice, Havertown, PA

### **Amanda Crowell, DPM**

### **Lawrence A. DiDomenico, D.P.M., F.A.C.F.A.S.**

Director of Fellowship Training, Ankle & Foot Care Centers/Kent State College of Podiatric Medicine; Section Chief, St. Elizabeth Hospital, Youngstown, Ohio

### **James A. Furrato, D.P.M., Ph.D.**

Chief Engineer, Gait Study Center and Clinical Assistant Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA

### **Caitlin S. Garwood, D.P.M., A.A.C.F.A.S.**

Assistant Professor, Department of Plastic Surgery, MedStar Georgetown University Hospital; Division of Podiatric Surgery, MedStar Washington Hospital Center, Washington, District of Columbia

### **Vincent F. Giacalone, D.P.M., F.A.C.F.A.S.**

Diplomate, American Board of Podiatric Surgery; Board Certified in Foot and Ankle Surgery; Private Practice, Diabetic Foot Care Center, Emerson,

NJ; Attending Physician, Hackensack University Medical Center Wound Care Center, Pascack Valley.

**Bruce G. Greenfield, D.P.M.**

Diplomate, American Board of Podiatric Surgery; Board Certified in Foot and Ankle Surgery; Chief, Section of Podiatric Surgery, Department of Surgery, Delaware County Memorial Hospital, Drexel Hill, PA

**Marc A. Karpo, D.P.M.**

Clinical Assistant Professor Department of Medicine at the Temple School of Podiatric Medicine

**Ashleigh Korves, D.P.M.**

**Richard Scott Krupkin, M.D.**

Clinical Assistant Professor, Case Western Reserve University, School of Medicine, Cleveland, OH; Diplomate, American Board of Physical Medicine and Rehabilitation, Rochester, MN; Fellow, American Academy of Physical Medicine and Rehabilitation, Chicago, IL; Attending Physician, Spinal Cord Injury, Louis Strokes VA Medical Center, Cleveland, OH; Faculty, MetroHealth Medical Center, Rehabilitation Institute of Ohio, Cleveland, OH; Adjunct Professor, Kent State University College of Podiatric Medicine, Independence, OH

**Ziad Labbad, M.D., D.P.M., C.Ped., F.A.P.W.C.A.**

Clinical Associate Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA; Fellow of the American Lower Extremity Surgeons; Founding Fellow at the American Professional Wound Care Association

**Ebony Love, D.P.M.**

Clinical Assistant Professor, Department of Medicine, Temple University School of Podiatric Medicine, Philadelphia, PA

**Anna McLemore, D.P.M.**

Resident, Temple University Hospital Podiatric Surgical Residency Program, Philadelphia, PA

**Andrew J. Meyr, D.P.M., F.A.C.F.A.S.**

Clinical Associate Professor and Residency Program Director, Temple University School of Podiatric Medicine and Temple University Hospital, Philadelphia, PA

**Whitney Ellis-McConnell, D.P.M.**

Resident, Temple University Hospital Podiatric Surgical Residency Program, Philadelphia, Pennsylvania

**Joshua L. Moore, D.P.M., F.A.C.F.A.S.**

Assistant Dean of Educational Affairs and Clinical Assistant Professor, Department of Surgery, Temple University School of Podiatric Medicine, Philadelphia, PA

**Nicholas J. Pagano, Jr., D.P.M., F.A.C.F.A.S., F.A.C.F.A.P.**

Adjunct Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA

**Howard J. Palamarchuk, D.P.M.**

Clinical Associate Professor, Department of Podiatric Biomechanics, Temple University School of Podiatric Medicine, Philadelphia, PA; Fellow, American Academy of Podiatric Sports Medicine

**Priya Parthasarathy, D.P.M.**

Young Physician Liaison, American Podiatric Medical Association; Diplomate, American Board of Podiatric Medicine ; Private Practice, Foot and Ankle Specialists of the Mid-Atlantic, Silver Spring MD.

**Marianne Peacock, D.P.M.**

American Board of Podiatric Medicine, Certified

**Rocco A. Petrozzi, D.P.M.**

Assistant Professor and Head, Podiatric Medicine Division, Kent State University College of Podiatric Medicine, Independence, OH

**Jane Pontious, D.P.M.**

Clinical Associate Professor and Chairman, Department of Surgery, Temple University School of Podiatric Medicine, Philadelphia, PA

**Katherine M. Raspovic, D.P.M., A.A.C.F.A.S.**

Assistant Professor, Department of Plastic Surgery, MedStar Georgetown University Hospital; Division of Podiatric Surgery, MedStar Washington Hospital Center, Washington, District of Columbia

**Michael Rupp, D.P.M., M.D.**

Chairman, Department of Pathology, Chambersburg Hospital, Chambersburg, PA

**Erika M. Schwartz, D.P.M., F.A.C.F.A.S.**

Immediate Past President, American Association for Women Podiatrists; Diplomate, American Board of Foot and Ankle Surgery; Private Practice, Foot and Ankle Specialists of the Mid-Atlantic, Washington, DC and Chevy Chase, MD

**Tracey C. Vlahovic, D.P.M., F.F.P.M., R.C.P.S. (Glasg)**

Clinical Associate Professor, Department of Podiatric Medicine and J. Stanley and Pearl Landau Faculty Fellow, Temple University School of Podiatric Medicine, Philadelphia, PA

**Kathya M. Zinszer, D.P.M., M.P.H., F.A.P.W.C.A.**

Podiatric Physician and Lower Extremity Wound Care Specialist, Geisinger Health System, Department of Dermatology, Danville, PA; Assistant Professor, Executive Board Member of the American Professional Wound Care Association



# Contributors

## Kent State University College of Podiatric Medicine

Samir Abdelmagid	Vishal Desai	Spencer Pickett
Steven Andreasen	Nicholas DiMassa	Adam Port
Vineela Ayyagari	Lesemiw Enyew	Seth Rogers
Benjamin Askin	Amanda Figliuzzi	Michael Thomas
Vanatius Babila	Nathaniel Gastaldo	John Thompson
Morgan Baxter	Seth Holland	Ann Tran
Kristen Brett	Selina Kaminski	Christian Valle
Muhammad Burhan	James Knudson	Ian Vandergulik
Philip Carolin	Michael Liette	Joe Wolf
Rory Cocks	Chandler Ligas	Hannan Zahid
Deepali Darji	Kelsi Nutter	
Darren Day	Stephanie Petrofski	

## Temple University School of Podiatric Medicine

Asmaa Abada	Tanvi Kadakia	Rana Moses
Anam Ali	Alia Karmali	Travis Murphy
Rami Basatneh	Junayed Khan	Robert Norton
Naved Bhuiyan	Joshua Kim	Komal Patel
Amanda Borrelli	Sokieu Mach	Ashmi Shah
Abbey Boyd	Sunny Makhijani	Deep Shah
Danny Chan	Amna Malik	Vinit Shah
Saakshi Chowdhary	Vani Manchanda	Priyanka Sharma
Amro El-Nakib	John Martucci	Kevin Shim
Emily Gombosi	Sharon Mathew	Rebecca Van Dyke
Suraj Hansalia	Samantha Miner	Christine Vareed
Randi Heming	Matthew J Modugno	Matthew Voluck
Farheen Iqbal	Ally Mooty	



# **Journals Represented**

Journals represented in this Compendium are listed below:





# Continuing Medical Education

The *Compendium of Podiatric Medicine and Surgery* Continuing Medical Education (CME) program has 38 questions of Board Examination quality in a four-part (A-D) multiple-choice format. *Compendium* subscribers will receive up to a maximum of 38 contact hours (2 contact hours per chapter)\* for a correctly completed CME Answer Form submitted to Data Trace Publishing Company for scoring. All applicants for CME credit must be current subscribers and there may only be one applicant per subscription.

Data Trace Publishing Company is approved by the Council on Podiatric Medical Education as a provider of continuing education in podiatric medicine. Data Trace has approved this activity for a maximum of 38 continuing education contact hours.

## **Fees**

All applicants for continuing medical education (CME) credit must be current subscribers to the *Compendium*. A fee of \$10.00 per chapter (2 contact hours per chapter) must be paid in advance of test grading. The fee for a retake exam is \$10.00 per chapter, payable in advance. *See the enclosed form for payment options.*

## **Instructions**

You have the option to earn 2 CME contact hours per chapter. Visit [www.datatrace.com/approvalcodes/cpms](http://www.datatrace.com/approvalcodes/cpms) to verify CME eligibility for your state.

1. Select which chapters you want to use for CME.
2. Answer both questions for each chapter you select by marking the appropriate box on the enclosed form.  
At the end of each chapter (1-19) you will find two multiple-choice questions based on the material presented in that chapter. Please select the best answer and mark the appropriate box with an X on the CME Answer Form (see enclosed form). For example, the answers to the questions for Chapter 1 should be marked in the top line, marked **1-1** and **1-2**; the questions for Chapter 19 should be marked in the bottom line, marked **19-1** and **19-2**, etc.
3. Return the answer form to Data Trace Publishing Company for grading (remember to include payment).

To earn contact hours for your chapter, you must answer both questions correctly.

---

\* Note that the number of credits granted may vary from state to state.

# Introduction

In what promises to be a most interesting year ahead, with the proposed changes to the “Affordable Health Care Act,” we welcome new and established readers to this newest 2016 edition of Podiatric Medicine and Surgery. With a rapidly changing healthcare environment, it may be more important now than ever for the podiatric physician to be prepared to adapt to these changes. This year’s 2016 Compendium edition should help to provide some advantages by introducing its readers to the newest tested innovative strategies and therapies based on podiatric-relevant subject areas which may have an immediate positive impact on one’s practice and patient’s care.

Thanks to the user-friendly layout of the Compendium, podiatric physicians and students can quickly review summaries of selected articles from national and international research papers of the past year. While these summations of the study data and results are most welcome, what makes the Compendium of Podiatric Medicine and Surgery unique for podiatric practitioners and students are the commentaries offered by teaching podiatric physicians and researchers in their particular areas of expertise. These thoughtful commentaries may note whether the study goals were met and may offer study modifications for enhanced future studies.

The reviewer may also note evaluation and treatment “pearls” that may be readily adapted to podiatric practice. The compendium will also afford the practitioner an opportunity to gain knowledge in less familiar subject areas which may result in enhanced treatment for patients with less need for outside referrals. We hope that you will take advantage of the 38 possible continuing education credits which may be earned by correctly answering two questions following each of the 19 chapters. I would like to extend my gratitude to the contributing chapter commentary authors and article summaries by the many student contributors for this year’s compendium. Special thanks go to the talented staff editors at Data Trace responsible for this year’s Compendium edition.

Kendrick Alan Whitney, D.P.M., F.A.P.W.C.A.

*Editor-in-Chief*