DANFORTH'S *Obstetrics and Gynecology* Tenth Edition

Ronald S. Gibbs • Beth Y. Karlan • Arthur F. Haney • Ingrid Nygaard

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Danforth's Obstetrics and Gynecology

TENTH EDITION

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EDITORS

RONALD S. GIBBS, MD

Professor and Chair
Department of Obstetrics and Gynecology
E. Stewart Taylor Chair in Obstetrics and Gynecology
University of Colorado Health Sciences Center
Denver, Colorado

BETH Y. KARLAN, MD

Director
Women's Cancer Research Institute and Division of Gynecologic Oncology
Cedars-Sinai Medical Center
Professor
Department of Obstetrics and Gynecology
David Geffen School of Medicine at UCLA
Los Angeles, California

ARTHUR F. HANEY, MD

The Catherine Lindsay Dobson Professor and Chairman
Department of Obstetrics and Gynecology
Division of Biologic Sciences and the Pritzker School of Medicine
The University of Chicago
Chicago, Illinois

INGRID E. NYGAARD, MD

Professor
Department of Obstetrics and Gynecology
School of Medicine
The University of Utah
Salt Lake City, Utah


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This hallmark 10th Edition of *Danforth's Obstetrics and Gynecology* is dedicated to our mentors and our teachers who have guided us to where we are; to our residents and students who have stimulated and prodded us; to our patients who have given us great gratification and inspiration; and to our families and friends who have given us love and support and make all that we do so meaningful.

Contributors

KJERSTI AAGAARD-TILLERY, MD, PHD Assistant Professor of Obstetrics and Gynecology, Baylor College of Medicine, Waco, Texas

BAHARAK AMIR, MD Assistant Professor, Department of Obstetrics and Gynecology, Dalhousie University; Active Medical Staff and Faculty, Department of Obstetrics and Gynecology, Division of Urogynecology and Pelvic Floor Surgery, IWK Health Centre, Halifax, Nova Scotia

RICARDO AZZIZ, MD, MPH, MBA Vice Chairman, Department of Obstetrics and Gynecology, David Geffen School of Medicine; UCLA Chair, Department of Obstetrics and Gynecology, Cedar-Sinai Medical Center, Los Angeles, California

KURT T. BARNHART, MD, MSCE Associate Professor, Department of Obstetrics and Gynecology and Epidemiology, University of Pennsylvania School of Medicine; Staff, University of Pennsylvania Medical Center, Department of Obstetrics and Gynecology, Philadelphia, Pennsylvania

ROSEMARY BASSON, MD Clincial Professor, Department of Psychiatry, University of British Columbia; Director, Sexual Medicine Program, Department of Psychiatry, Vancouver Hospital, British Columbia

JASON K. BAXTER, MD Assistant Professor, Department of Obstetrics and Gynecology, Thomas Jefferson University, Philadelphia, Pennsylvania

ALFRED BENT, MD Professor, Department of Obstetrics and Gynecology, Dalhousie University; Head, Division of Gynecology, Department of Obstetrics and Gynecology, IWK Health Centre, Halifax, Nova Scotia

LORI A. BOARDMAN, MD, ScM Associate Professor, Department of Obstetrics and Gynecology, The Warren Alpert Medical School of Brown University; Director of Colposcopy and Vulvar Clinics, Department of Obstetrics and Gynecology, Women and Infants' Hospital of Rhode Island, Providence, Rhode Island

JAMES A. BOFILL, MD Professor, Director, Maternal-Fetal Medicine Fellowship, University of Mississippi Medical Center; Staff, Department of Obstetrics and Gynecology, University of Mississippi Medical Center, Jackson, Mississippi

D. WARE BRANCH, MD Professor, Department of Obstetrics and Gynecology, University of Utah; Physician, University of Utah Hospital, Salt Lake City, Utah

ROBERT E. BRISTOW, MD Associate Professor, Department of Obstetrics and Gynecology, The Johns Hopkins University School of Medicine; Director, The Kelly Gynecologic Oncology Service, Department of Obstetrics and Gynecology, The Johns Hopkins Medical Institutions, Baltimore, Maryland

J. CHRIS CAREY, MD Professor, Department of Obstetrics and Gynecology, University of Colorado School of Medicine; Director, Denver Health and Hospital Authority, Denver, Colorado

ILANA CASS, MD Director, Gynecologic Oncology Fellowship, Associate Clinical Professor Program, Department of Obstetrics and Gynecology, David Geffen School of Medicine at UCLA; Faculty Physician, Associate Clinical Professor and Director of Obstetrics and Gynecology, Department of Obstetrics and Gynecologic Oncology, Cedar-Sinai Medical Center, Los Angeles, California

MARCELLE I. CEDARS, MD Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of California at San Francisco; Director, Center for Reproductive Health, University of California at San Francisco, San Francisco, California

DAVID P. COHEN, MD Associate Professor and Chief, Section of Reproductive Endocrinology and Infertility, University of Chicago Medical Center; Chicago, Illinois

CHARLES C. CODDINGTON III, MD Director, Department of Obstetrics and Gynecology, Denver Health Medical Center; Professor, Department of Obstetrics and Gynecology, University of Colorado School of Medicine, Denver, Colorado

DWIGHT P. CRUIKSHANK, MD The Jack A. and Elaine D. Klieger Professor and Chairman, Department of Obstetrics and Gynecology, Medical College of Wisconsin; Chairman, Department of Obstetrics and Gynecology, Froedtert Memorial Lutheran Hospital, Milwaukee, Wisconsin

MARIAN D. DAMEWOOD, MD Clinical Professor of Obstetrics and Gynecology, Johns Hopkins University School of Medicine, Baltimore, Maryland; Chairman, Department of Obstetrics and Gynecology; Director, Women and Children's Services, York Hospital/WellSpan Health Systems, York, Pennsylvania

SUSAN A. DAVIDSON, MD Associate Professor, Department of Obstetrics and Gynecology, University of Colorado at Denver and Health Sciences Center; Chief, Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Colorado Hospital, Aurora, Colorado

JILL K. DAVIES, MD Associate Professor, Department of Obstetrics and Gynecology, University of Colorado Health Sciences Center, Aurora, Colorado

ANN J. DAVIS, MD Departments of Pediatrics and Obstetrics and Gynecology, Tufts-New England Medical Center, Boston, Massachusetts

JOHN O. L. DELANCEY, MD Norman F. Miller Professor of Gynecology, Director of Pelvic Floor Research, The University of Michigan, Ann Arbor, Michigan

DONALD J. DUDLEY, MD Professor, Department of Obstetrics and Gynecology, University of Texas Health Science Center at San Antonio, San Antonio, Texas

LORRAINE DUGOFF, MD Associate Professor, Department of Obstetrics and Gynecology, University of Colorado Health Sciences Center, Aurora, Colorado

DAVID A. ESCHENBACH, MD Professor and Chair, Department of Obstetrics and Gynecology, University of Washington School of Medicine, Seattle, Washington

MICHELE EVANS, MD Clinical Fellow, Division of Reproductive Endocrinology and Infertility, Departments of Obstetrics, Gynecology, and Reproductive Sciences, University of California—WHCRC, San Francisco, California

DEE E. FENNER, MD Harold A. Furlong Professor of Obstetrics and Gynecology, Director of Gynecology, Associate Chair for Surgical Services, Department of Obstetrics and Gynecology, University of Michigan, Ann Arbor, Michigan

HENRY L. GALAN, MD Associate Professor, Chief of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Colorado at Denver Health Sciences Center, Aurora, Colorado

MARY L. GEMIGNANI, MD, MPH Assistant Professor, Department of Surgery, New York Hospital—Cornell Medical Center; Assistant Attending, Department of Surgery/Breast Science, Memorial Sloan-Kettering Cancer Center, New York, New York

RONALD S. GIBBS, MD Professor and Chair, Department of Obstetrics and Gynecology, E. Stewart Taylor Chair in Obstetrics and Gynecology, University of Colorado Health Sciences Center, Denver, Colorado

MELISSA GILLIAM, MD, MPH Associate Professor, Department of Obstetrics and Gynecology, The University of Chicago; Chief, Section of Family Planning and Contraceptive Research, Department of Obstetrics and Gynecology, The University of Chicago, Chicago, Illinois

LARRY C. GILSTRAP, MD Clinical Professor, Department of Obstetrics and Gynecology, University of Texas Southwest Medical School; Chair Emeritus, Department of Obstetrics and Gynecology, University of Texas at Houston Health Science Center, Houston, Texas

ROBERT L. GIUNTOLI II, MD Assistant Professor, The Kelly Gynecologic Oncology Service, Department of Obstetrics and Gynecology, The Johns Hopkins Medical Institutions, Baltimore, Maryland

STEVEN R. GOLDSTEIN, MD Professor, Department of Obstetrics and Gynecology, New York University School of Medicine; Director of Gynecologic Ultrasound; Co-Director of Bone Densitometry, New York University Medical Center, New York, New York

NATALIE S. GOULD, MD Gynecologic Oncologist, Department of Obstetrics and Gynecology, Carilion Gyn Oncology Associates, Roanoke, Virginia

MOUNIRA HABLI, MD Department of Obstetrics and Gynecology, Maternal-Fetal Medicine Division, University of Cincinnati, Cincinnati, Ohio

SARAH HAMMIL, MD Department of Obstetrics and Gynecology, University of Washington School of Medicine, Seattle, Washington

AUTHUR F. HANEY, MD The Catherine Lindsay Dobson Professor and Chairman, Department of Obstetrics and Gynecology, Division of Biologic Sciences and the Pritzker School of Medicine, The University of Chicago, Chicago, Illinois

JOY HAWKINS, MD Professor, Department of Anesthesiology, The University of Colorado School of Medicine; Director of Obstetric Anesthesia, Department of Anesthesiology, University of Colorado Hospital, Aurora, Colorado

JOHN C. HOBBINS, MD Professor, Department of Obstetrics and Gynecology, University of Colorado School of Medicine, Aurora, Colorado

SABRINA HOLMQUIST, MD Assistant Professor, Section of Family Planning and Contraceptive Research, Department of Obstetrics and Gynecology, University of Chicago, Chicago, Illinois

CHRISTINE H. HOLSCHNEIDER, MD Assistant Professor, Department of Obstetrics and Gynecology, David Geffen School of Medicine at UCLA; Chair, Department of Obstetrics and Gynecology, Olive View–UCLA Medical Center, Sylmar, California

CAROL J. HOMKO, RN, PHD, CDE Assistant Professor, Department of Obstetrics and Gynecology and Medicine, Temple University School of Medicine; Nurse Manager, Department of GCRC, Temple University Hospital, Philadelphia, Pennsylvania

JULIA V. JOHNSON, MD Professor, Department of Obstetrics and Gynecology, University of Vermont; Vice Chair, Department of Obstetrics and Gynecology, Fletcher Allen Health Care, Burlington, Vermont

BRONWEN F. KAHN, MD Fellow/Instructor, Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Colorado Health Sciences Center, Denver, Colorado

AMY R. KANE, MD Resident, Department of Reproductive Medicine, University of California—San Diego, San Diego, California

BETH Y. KARLAN, MD Professor, Department of Obstetrics and Gynecology, David Geffen School of Medicine at UCLA; Director, Women's Cancer Research Institute; Director, Division of Gynecologic Oncology, Cedars-Sinai Medical Center, Los Angeles, California

VERN L. KATZ, MD Clinical Assistant Professor, Department of Obstetrics and Gynecology, Oregon Health Science University, Portland, Oregon; Medical Director, Perinatal Services, Sacred Heart Medical Center, Eugene, Oregon

HELEN H. KAY, MD Professor, Section Chief, Maternal-Fetal Medicine, Chief of Obstetrics, Chicago Lying-In Hospital, University of Chicago, Chicago, Illinois

COLLEEN M. KENNEDY, MD, MS Assistant Professor, Department of Obstetrics and Gynecology, University of Iowa; Director, Vulvar Vaginal Disease and Colposcopy Clinics, Department of Obstetrics and Gynecology, University of Iowa Hospital, Iowa City, Iowa

WILLIAM R. KEYE, JR., MD Director, Division of Reproductive Endocrinology and Infertility, Beaumont Medical Services, Royal Oak, Michigan

TIMOTHY E. KLATT, MD Assistant Professor, Department of Obstetrics and Gynecology, Medical College of Wisconsin; Medical Director, Obstetrical Services, Froedtert Memorial Lutheran Hospital, Milwaukee, Wisconsin

DEBORAH KRAKOW, MD Medical Genetics Institute, Cedars-Sinai Medical Center, Departments of Obstetrics and Gynecology and Human Genetics, David Geffen School of Medicine at UCLA, Los Angeles, California

RICHARD S. LEGRO, MD Professor, Department of Obstetrics and Gynecology, Pennsylvania State University, Hershey Medical Center, Hershey, Pennsylvania

ANDREW JOHN LIM, MD Assistant Professor, Department of Obstetrics and Gynecology, David Geffen School of Medicine at UCLA; Faculty Physician, Department of Obstetrics and Gynecology, Cedars-Sinai Medical Center, Los Angeles, California

KIRSTEN J. LUND, MD Associate Professor, Department of Obstetrics and Gynecology, University of Colorado School of Medicine, Denver. Colorado

JAMES N. MARTIN, JR., MD Professor, Department of Obstetrics and Gynecology, University of Mississippi Medical Center; Chief, Division of Maternal-Fetal Medicine and Obstetrics, Winfred L. Wiser Hospital for Women and Infants, Jackson, Mississippi

LISA MEMMEL, MD Fellow, Family Planning, Section of Family Planning and Contraceptive Research, Department of Obstetrics and Gynecology, University of Chicago, Chicago, Illinois

CATHERINE ANN MATTHEWS, MD Associate Professor, Department of Obstetrics and Gynecology, Virginia Commonwealth University, Richmond, Virginia

JAMES MCMANAMAN, MD Professor, Departments of Obstetrics, Gynecology, Physiology and Biophysics, University of Colorado Health Sciences Center, Denver, Colorado

LISA MEMMEL, MD Fellow, Family Planning, Section of Family Planning and Contraceptive Research, Department of Obstetrics and Gynecology, University of Chicago, Chicago, Illinois

HOWARD MINKOFF, MD Distinguished Professor, Department of Obstetrics and Gynecology, SUNY Downstate; Chairman, Department of Obstetrics and Gynecology, Maimonides Medical Center, Brooklyn, New York

DAVID G. MUTCH, MD Judith and Ira Gall Professor, Director of the Division of Gynecologic Oncology, Washington University School of Medicine, St. Louis, Missouri

CHARLES W. NAGER, MD Professor, Department of Reproductive Medicine, University of California, San Diego; Division Director, Urogynecology, Department of Reproductive Medicine, University of California, San Diego Medical Center, San Diego, California

ROGER B. NEWMAN, MD Professor, Department of Obstetrics and Gynecology, Medical University of South Carolina; Vice Chairman for Academic Affairs and Women's Health Research, Department of Obstetrics and Gynecology, Medical University Hospital, Charleston, South Carolina

PEGGY A. NORTON, MD Professor, Department of Obstetrics and Gynecology, Chief, Department of Urogynecology and Reconstructive Pelvic Surgery, University of Utah School of Medicine, Salt Lake City, Utah

INGRID E. NYGAARD, MD Professor, Department of Obstetrics and Gynecology School of Medicine, University of Utah, Salt Lake City, Utah

MICHAEL W. O'HARA, PHD Professor of Psychology and Starch Faculty Fellow, Vice President, Faculty Senate, Department of Psychology, University of Iowa, Iowa City, Iowa

SANTOSH PANDIPATI, MD Paranatologist, Northwest Perinatal Center, Portland, Oregon

JEFF PEIPERT, MD, PHD Robert J. Terry Professor, Vice Chair of Clinical Research, Department of Obstetrics and Gynecology, Washington University School of Medicine; Attending Physician, Department of Obstetrics and Gynecology, Barnes-Jewish Hospital, St. Louis, Missouri

T. FLINT PORTER, MD, MSPH Associate Professor, Department of Obstetrics and Gynecology, University of Utah Health Sciences; Medical Director, Department of Maternal-Fetal Medicine, Intermountain Medical Center, Murray, Utah

E. ALBERT REECE, MD, PHD, MBA Vice President for Medical Affairs, University of Maryland; John Z. and Akiko K. Bowers Distinguished Professor and Dean, School of Medicine, University of Maryland School of Medicine, Baltimore, Maryland

ROBERT L. REID, MD Professor, Department of Obstetrics and Gynecology, Queen's University; Chair, Division of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynecology, Kingston General Hospital, Ontario, Canada

HOLLY E. RICHTER, MD, PHD Professor, Division Director, Department of Obstetrics and Gynecology, University of Alabama at Birmingham Medical Center, Birmingham, Alabama

CHARLES RITTENBERG, MD Fellow, Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Medical University of South Carolina; Instructor, Department of Obstetrics and Gynecology, Medical University of South Carolina, Medical Center, Charleston, South Carolina

LISA M. ROBERTS, MD Gynecology and Laparoscopy Surgeons, PC, Raleigh, North Carolina

JOSEPH S. SANFILIPPO, MD Professor, University of Pittsburgh Medical School; Vice Chair and Director, Center for Reproductive Endocrinology and Infertility, Division of Obstetric Gynecology and Reproductive Sciences, McGee Women's Hospital, Pittsburgh, Pennsylvania

ROBERT S. SCHENKEN, MD Professor and Chairman, Department of Obstetrics and Gynecology, The University of Texas Health Science Center at San Antonio; Chairman, Department of Obstetrics and Gynecology, University Hospital, San Antonio, Texas

JAMES R. SCOTT, MD Professor, Department of Obstetrics and Gynecology, University of Utah Medical Center, Salt Lake City, Utah

BEATA E. SEEBER, MD, MSCE Assistant Professor, Division of Gynecologic Endocrinology and Reproductive Medicine, Medical University of Innsbruck, Innsbruck, Austria

LISA S. SEGRE, PHD Associate Research Scientist, Department of Psychology, University of Iowa, Iowa City, Iowa

HOWARD T. SHARP, MD Associate Professor and Chief, General Division of Obstetrics and Gynecology, University of Utah School of Medicine; Assistant Professor, Department of Obstetrics and Gynecology, University of Utah Medical Center, Salt Lake City, Utah

BAHA M. SIBAI, MD Professor, Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine, Cincinnati, Ohio

ROBERT M. SILVER, MD Professor, Chief, Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Utah School of Medicine, Salt Lake City, Utah

CATHERINE Y. SPONG, MD Chief, Pregnancy and Perinatology Research, NICHD, NIH, Bethesda, Maryland; Maternal Fetal Medicine Specialist, Perinatal Diagnostic Center, INOVA Alexandria, Alexandria, Virginia

KRIS STROHBEHN, MD Associate Professor, Department of Obstetrics and Gynecology, Dartmouth School of Medicine; Director, Division of Urogynecology/ Re-constructive Pelvic Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire

MIKA THOMAS, MD Fellow, Department of Reproductive Endocrinology, University of Iowa Hospitals and Clinics, Iowa City, Iowa

BRADLEY J. VAN VOORHIS, MD Professor, Department of Obstetrics and Gynecology, University of Iowa College of Medicine, Iowa City, Iowa

JOAN L. WALKER, MD The James A. Merrill Chair and Professor, Section of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma

KENNETH WARD, MD Professor and Chair, Departments of Obstetrics, Gynecology, and Women's Health, John A. Burns School of Medicine, University of Hawaii, Honolulu, Hawaii

LOUIS WEINSTEIN, MD Paul A. and Eloise B. Bowers Professor and Chairman, Department of Obstetrics and Gynecology, Thomas Jefferson University, Philadelphia, Pennsylvania

R. STAN WILLIAMS, MD Harry Prystowsky Professor of Reproductive Medicine, Iterim Chairman, Department of Obstetrics and Gynecology, Chief, Division of Reproductive Endocrinology and Fertility, University of Florida, Gainesville, Florida

KRISTEN P. WRIGHT, MD Women and Children's Hospital, Department of Obstetrics and Gynecology, Burlington, Vermont

JEROME YANKOWITZ, MD Professor, Department of Obstetrics and Gynecology, Roy J. and Lucille A. Carver College of Medicine, Director, Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Iowa Hospitals and Clinics, Iowa City, Iowa

EDWARD R. YEOMANS, MD Associate Professor, Department of Obstetrics and Gynecology, Universiity of Texas—Houston, Chief of Obstetrics, LBJ General Hospital, Houston, Texas

Preface

Welcome to the hallmark 10th Edition *of Danforth's Obstetrics and Gynecology.* In the 42 years since the first edition of this text appeared, it has been widely recognized as a standard text book for practicing physicians, residents, medical students and nurses. Previous editions have been translated into several languages and the text has enjoyed wide readership over the face of the globe. As medical practice changes continually, we also have made important changes in the 10th Edition. Important new topics have been added including stillbirth, group *B streptococci* and a whole new section on pelvic reconstructive surgery. To add to the appeal of the text, we have added many two-color figures and there is an enlarged multi-color section. In the textbook's website, accessible to those who purchase the book, we will have the full text of the book including all figures and tables. Our objective throughout has been to provide in a single textbook, current cutting edge information on the practice of the breadth of obstetrics and gynecology. Our goal has been to provide this in a highly readable, user friendly and evidence-based fashion.

We are also happy to announce that with this 10th edition, we have a new editor, Dr. Ingrid Nygaard, Professor of Obstetrics and Gynecology in the Division of Urogynecology and Reconstructive Pelvic Surgery at the University of Utah. Dr. Nygaard replaced Dr. James R. Scott who had served as editor from the 5th through the 10th Editions—a record that will be long lasting. We also are most pleased to welcome new contributing authors, all experts in their fields, and returning contributing authors who have updated their previous chapters. With all of the pressures on faculty in academic departments these days, we know that writing a chapter for this text becomes a labor of love and demonstrates great commitment on the part of the authors to education and translating knowledge to the bedside.

We also wish to extend a heartfelt thanks to our administrative staff who labored extensively in the preparation of this text—Michelle Nelson at University of Colorado and Phyllis Lopez at Cedars Sinai Medical Center. Finally this book would not have been possible without the expertise and organization our trusty editors, Sonya Seigafuse and Ryan Shaw at Lippincott Williams & Wilkins. We wish all of our readers continued success and gratification in the practice of obstetrics and gynecology.

Ronald S. Gibbs, MD
Beth Y. Karlyn, MD
Arthur F. Haney, MD
Ingrid Nygaard, MD

Preface to the 9th Edition

Now in its ninth edition, *Danforth's Obstetrics and Gynecology* has been widely recognized as a standard textbook for practicing physicians, residents, medical students, and nurses. It is gratifying that previous editions have been translated into several languages and have enjoyed worldwide acceptance. For many practitioners, this text has been the basis of learning and an essential reference in our beloved specialty.

The ninth edition has a new look. Three of the four editors of the eighth edition (Drs. DiSaia, Hammond, and Spellacy) have now turned over the reins to new editors. We are delighted that Jim Scott has continued to serve as an editor for the ninth edition to bring perspective, experience, and continuity. In planning this edition, we carefully reviewed the topic of each chapter and its contents. Consisting of 59 chapters, the ninth edition is now focused to provide a practical, clinically-useful text that covers all of obstetrics and gynecology in one volume. In previous editions, basic science chapters were free standing. In the ninth edition, the basic science concepts have been incorporated into pertinent, more clinically oriented chapters. We have strived to incorporate evidence-based medicine in each of the chapters and have strengthened each of the component chapters. We are also pleased to welcome new contributing authors who are all experts in their field and we thank, also, the contributing authors who have updated and revised their previous chapters.

For ready learning, each chapter contains summary points, conveniently placed at the end of the chapter. In addition, rather than using a heavily referenced format, each author has included a concise list of up-to-date suggested readings at the end of each chapter.

The editors are most grateful for the contributions of the administrative staff at our respective universities: Jane Cook and Barb Carpenter at the University of Colorado; Sheryl Martin at the University of Utah; and Phyllis Lopez at Cedars Sinai Medical Center. We also wish to thank Lisa McAllister, Sonya Seigafuse, and Jenny Kim at Lippincott Williams & Wilkins for their great editorial assistance, support, encouragement—and patience during the gestation of this work.

James R. Scott, MD
Beth Y. Karlan, MD
Ronald S. Gibbs, MD
Arthur F. Haney, MD

Contents

1 Prenatal Care

Vern L. Katz

The time period from the recognition of a pregnancy until delivery is one of the greatest physical and psychologic transitions that a woman undergoes in her lifetime. During these months, the obstetrician, family physician, or midwife serves a much larger role than just health care provider. The clinicians' role during this time is not only to assess the health of the mother and fetus, prescribe interventions, and try to influence behaviors but also to advise and help patients as they undergo this challenging psychologic passage. This chapter outlines the principles of prenatal care and addresses specific concerns of a woman's general health during gestation.

Prenatal care has consisted of adherence to ritual and taboo for generations. Greek authors suggested that Spartan women exercised in pregnancy to give birth to better warriors. Roman physicians argued that strong and violent movements induced rupture of membranes. In the early twentieth century, hanging clothing to dry on a clothesline was said to increase the risk of the umbilical cord wrapping around the baby's neck. In the United States, the first organized prenatal care programs began in 1901 with home nurse visits. The first prenatal clinic was established in 1911. The goal of early prenatal care was to diagnose and treat preeclampsia in order to decrease maternal mortality. It is not surprising that this focus on maternal and infant health occurred as a direct outgrowth of the woman suffrage movement.

The current emphasis on prenatal care stems from historic pronouncements and retrospective analyses concluding that women who receive prenatal care have less fetal, infant, and maternal morbidity and mortality. However, a conclusive scientific foundation is lacking for the content of prenatal care and the relationship of its components to good outcomes. As technology flourishes and resources dwindle, it has become increasingly important to obtain scientifically based evidence demonstrating which components of prenatal care are clinically appropriate, cost-effective, and deserving of preferential funding. At this time, the optimal content and delivery of prenatal care remains the subject of discussion and debate. Given the increasing number of tools of prenatal assessment, the current consensus is that the best prenatal care is individualized for the specific needs of the mother.

Prenatal care has two areas of emphasis. The first is directed at ensuring appropriate fetal growth and development. This is accomplished through counseling with regard to health behaviors of the mother as well as physical and laboratory evaluations. The second area of emphasis is more complex and involves assessment of the physical and psychologic adaptations of the mother during her pregnancy. Most aspects of pathology occur when there is either insufficient maternal adaptation or too much. Preeclampsia and diabetes are good examples of such pathologies, respectively. The two areas of attention—maternal and fetal well-being—are obviously intertwined. For the clinician facing complex problems, it sometimes helps to untangle these two themes to better address diagnosis and therapy. An example is the pregnant woman diagnosed with cancer or the mother with epilepsy. The evaluation of risk:benefit ratio of tests and treatments must be seen looking at both maternal and fetal health. This chapter will emphasize normal changes in pregnancy, and later chapters will build on this discussion to focus on pathology.

Over the three trimesters of pregnancy, a woman must develop new aspects to her identity. Her self-image develops an additional sense of femininity beyond what was developed at puberty, and a maternal self-concept must develop as well. Reba Rubin, in her works on the maternal experience, describes a new mother's psychologic tasks as the woman grows into her new role. These tasks include:

- Accepting a new body image, which is often in conflict with accepted societal views of attractiveness
- Accepting the child who is growing inside her
- Reordering her identity with her mother, her friends, and the father of the pregnancy
- Symbolically finding acceptance and safety for her child (i.e., making a new home).

For many women with good social support, these tasks are anticipated and desired roles that bring a sense of fulfillment. For other women, some or all of these tasks are unanticipated and difficult. The obstetric provider, in multiple ways, helps the mother through these transitions while at the same time ensures the physical health of both patients (mother and fetus). Many aspects of prenatal care have grown from their original role of health promotion to ritualized traditions that have acquired symbolic value in helping women and their families adapt to these psychologic transitions. For example, studies have found that for women of average weight, the practice of weighing a woman during each visit has minimal medical value. Yet, if the nurse forgets to weigh a patient, that woman usually remarks quite quickly about having her weight taken. Another example is the routine ultrasound. This is now a demand ritual. At this visit, a mother will usually bring several female family members or friends to see the sonogram. The new mother not only uses the sonogram to bond with her child but also shows the baby to the other women around her for their acceptance. Throughout the world, cultures and subcultures view prenatal care differently, but most all hold it with respect. A woman might miss her annual Pap smear, but she rarely misses a prenatal visit.

PRIMARY AND PRECONCEPTION CARE

Philosophy

Care for preconception, pregnancy, and postpartum should be integrated and accessible, focus on the majority of personal health care needs, represent a sustained partnership between patient and provider, and occur within the context of family and community. For many women, pregnancy care occurs as a part of the continuum in a long-term relationship with the health care provider. The first visit may be a preconception visit or may occur after the woman is pregnant. If a woman is seen for a preconception visit, many issues need not be readdressed when she becomes pregnant.

Content of the Preconception Visit

The preconception visit is a focused visit for the woman who is planning to become or is considering becoming pregnant in the near future. The content of this interval visit includes a complete history; when appropriate, a complete physical examination; risk assessment and intervention; selected laboratory testing based on the patient's age and the results of the foregoing evaluation; ongoing management of medical conditions; and a plan of care. A purposeful discussion of contraception, sexually transmitted disease prevention, and timing of conception is appropriate. Timely administration of routine immunizations, educational counseling, and advice complete the visit.

Risk Assessment

A goal specific to the preconception interval visit is the systematic identification of potential risks to pregnancy and the implementation of early intervention as necessary. These risks fall into several categories, described in the following sections.

Unalterable Factors

Unalterable factors are preexisting factors that cannot be altered in any medical way by clinical intervention. These include the patient's height, age, reproductive history, ethnicity, educational level, socioeconomic status, genetic composition, and to some extent her body mass index (BMI). Genetic and family histories, although unalterable, may lend themselves to screening and evaluation. A detailed family history should be obtained, including inquiry of thromboembolic disease, recurrent miscarriage, neonatal or early infant death, congenital cardiac disease, mental retardation, or other major disease affecting health in family members.

Factors Benefiting from Early Intervention

Conditions that should or could be modified before pregnancy is attempted include poor nutrition; an underweight or obese BMI; and poorly controlled medical diseases such as diabetes mellitus, asthma, epilepsy, phenylketonuria, hypertension, and thyroid disease.

Some prescription medications that are known teratogens should be discontinued and appropriate substitutions made. These include medications such as isotretinoin (Accutane), warfarin sodium (Coumadin), certain anticonvulsants, and angiotensin-converting enzyme inhibitors. However, many medications are safe, such as medications for asthma and most antihistamines. Some medications such as antidepressants need to be evaluated for the risk:benefit ratio.

Determining the status of a patient's immunity to rubella, varicella, and hepatitis is appropriate during the preconception visit. If needed, the influenza vaccine is safe. In high-risk populations or endemic geographic areas, patients should be assessed for active tuberculosis with skin testing and chest x-ray.

Social Risk Factors

Inquiry should be made regarding occupational hazards involving exposure to toxins such as lead, mercury and other heavy metals, pesticides, and organic solvents (both liquid and vapors). Hazards in the home, such as exposure to toxoplasmosis or toxic chemicals (asbestos, pesticides), are important to identify. If a woman uses well water, it should be assessed for acidity, lead, and copper.

Family violence is a particularly important household hazard. Nonjudgmental, open-ended evaluation should be applied. Judith MacFarland has recommended questions such as "Are you in a relationship in which you are being hit, kicked, slapped, or threatened?" "Do you feel threatened?"

"Have you been forced to do things against your will?" These questions should be asked again at the first prenatal visit. Some studies have suggested that a written questionnaire, in addition to oral questions, will allow for greater identification of domestic abuse. Approximately 20% of all pregnant women are battered during their pregnancy. About one half of women who are physically abused prior to pregnancy continue to be battered during pregnancy. For some women, the violence begins with pregnancy. All such patients require information regarding their immediate safety and referrals for counseling and support.

Risky Health Habits

The use of illicit drugs or abuse of alcohol represents a significant health hazard to pregnancy. Alcohol is a known teratogen. There is no consensus on the correlation between the quantity of alcohol consumed and the manifestation of adverse fetal effects. Therefore, the best advice to women who wish to become pregnant is to stop drinking. The T-A-C-E screen for alcohol abuse has been well studied. The letters stand for four questions asked in a nonjudgmental manner:

1. T—"How much do you drink to feel drunk?" (*tolerance*)
2. A—"Does your drinking *annoy* anyone?"
3. C—"Has anyone told you to *cut* down?"
4. E—"Do you drink in the morning to feel better?" (*eye-opener*).

Smoking cigarettes is associated with adverse pregnancy outcomes, including low birth weight, premature birth, and perinatal death. Smoking by both the pregnant woman and members of the household should be avoided during pregnancy and, preferably, not resumed postpartum. The relative risk of intrauterine growth restriction (IUGR) among pregnant smokers has been calculated at 2.2 to 4.2. Because of the morbidity associated with smoking, various methods to assist women to quit smoking should be encouraged prior to pregnancy. Numerous interventions are available. Use of the transdermal nicotine patch in pregnancy is thought to be preferable to smoking. One benefit of using a nicotine patch is the elimination of exposure to other toxins such as carbon monoxide inhaled in cigarette smoke. Its theoretic risk is that it creates a constant blood level of nicotine, as opposed to the vacillations that occur with smoking. Depending on the timing of the prescription, it may be a very appropriate intervention. Similarly, all illicit drugs have the potential of harming the pregnancy.

Other behaviors that should be avoided are those that promote exposure to sexually transmitted and other infectious diseases. These include unprotected sexual intercourse in a nonmonogamous relationship and the sharing of needles between addicts.

Interventions

The final phase of the preconception visit involves specific interventions derived from the information obtained during the history, physical examination, and risk assessment phases. The specific interventions may include immunization against rubella, varicella, or hepatitis; changes in prescribed medications; behavior modification; genetic screening for such conditions as Tay–Sachs disease, cystic fibrosis, thalassemia, and sickle cell anemia; and nutritional and physical activity recommendations.

During the physical examination, evaluation of the thyroid and breasts is important. Signs or symptoms of thyroid disease should prompt laboratory evaluation with TSH and free T4. If a woman is 35 years of age or older, a screening mammogram should be ordered, since as much as two and a half years may pass before she will be able to have one (mammograms have significantly decreased sensitivity during pregnancy and for up to 6 months after lactation). If a woman has a family history of premenopausal breast cancer, a mammogram may be considered at younger ages. Additionally, if there is a body habitus or history suggestive of polycystic ovary disease, this condition should be evaluated (Chapter 38). If a Pap smear has not been done within a year, this test should be repeated at this time. Abnormalities of the Pap smear are more easily addressed prior to pregnancy. Additionally, it is valuable at this visit to examine the patient's skin. The incidence of melanoma is increasing faster than any other malignancy in the United States. The obstetrician has the unique opportunity to assess and teach at this visit regarding this cancer. An inquiry about periodontal disease and, when appropriate, assessment of dental hygiene is important. Periodontal disease is associated with a significant risk of preterm birth. Periodontal disease may be treated at any time in pregnancy but is best addressed preconception.

Folic acid as a supplement can reduce the occurrence and recurrence of neural tube defects and may reduce the risk of other birth defects as well. Women who have had a previous pregnancy affected by neural tube defects should take 4 mg of folic acid per day, starting 4 weeks prior to conception through the first trimester. For all other women of reproductive age who have the potential to become pregnant, 1 mg of folic acid should be prescribed. Unfortunately, prenatal vitamins contain only 0.4 to 0.8 mg.

Some patients purposely initiate a preconception visit to determine whether or not a preexisting medical condition is an absolute contraindication to pregnancy. Pulmonary hypertension, for example, although rare, is associated with up to a 50% maternal mortality and a greater than 40% fetal mortality. It is possible to obtain epidemiologic studies that provide statistics on the morbidity and mortality for mother and fetus for most disease states. These cannot, however, provide specific data for any one patient with her own unique set of medical, demographic, and social variables. Many patients who make these inquiries will benefit by reading the relevant medical materials themselves and by obtaining more than one opinion. Consultation with other medical specialists may be necessary. For example, women with orthopedic problems often inquire about vaginal delivery. Another common concern is advanced

maternal age. Specific risks of increased rates of aneuploidy and miscarriage should be discussed. Women over age 40 have been found to have higher rates of low birth weight, fetal demise, preterm birth, and operative delivery.

It is also important to discuss how and when to discontinue contraceptive measures. Patients using medroxyprogesterone acetate (Depo-Provera) injections may experience a delay of several months in the return of regular ovulatory menstrual cycles. An intrauterine device (IUD) may be removed at any time in the cycle. It should be removed as soon as conception is considered, since removal during pregnancy (although preferable to leaving in place) is associated with a higher rate of pregnancy loss. Likewise, birth control pills and other hormone-based contraceptives should be discontinued prior to attempting conception. Many physicians believe that discontinuing the use of hormone-based contraceptives for one to two cycles allows better growth of the endometrium. Although definitive evidence is lacking, the thought is that this may be associated with better implantation of the fertilized egg. If a woman discontinues hormone-based contraception, she needs to be reminded that ovulation may occur in a variable time period after stopping the contraception. Thus, risky behaviors should be avoided at the time of discontinuation.

The patient should be advised to seek early prenatal care by making an appointment after missed menses or on confirmation of pregnancy by a home pregnancy test. Unfortunately, in the United States, only 75% of pregnant women receive prenatal care beginning in the first trimester. Ongoing barriers to prenatal care access include lack of money or insurance to pay for care, system undercapacity for appointments, and inadequate transportation.

INITIAL PRENATAL VISIT

This visit represents the first detailed assessment of the pregnant patient. The optimal timing of this visit may vary. For women who have not undergone the comprehensive preconception visit, prenatal visits should begin as soon as pregnancy is recognized. For these women, much of the content of the preconception visit will need to be addressed at this time—for example, screening for domestic abuse and alcohol use. All other women should be seen by about 8 menstrual weeks (6 weeks after conception) gestation. For all patients, the appropriate content of prenatal care and the first prenatal visit is contained in the antepartum record published by the American College of Obstetrics and Gynecology (ACOG). Identifying data, a menstrual history, and a pregnancy history are obtained. Past medical, surgical, and social history are recorded, along with symptoms of pregnancy. The patient's current medications, including over-the-counter (OTC) and herbal supplements should be evaluated. A focused genetic screen, infection history, and risk status evaluation are performed or reconfirmed.

Diagnosis of Pregnancy

The two aspects of pregnancy diagnoses include confirmation of an intrauterine pregnancy and assessment of viability. Evaluation of the signs and symptoms associated with the presumptive diagnosis of pregnancy, while a useful adjunct, has been largely superseded by the widely available urine pregnancy test and ultrasound. The detection of greater than 35 mIU of human chorionic gonadotropin (hCG) in the first morning void has a very high specificity for pregnancy. OTC pregnancy tests can confirm a pregnancy prior to the missed period. Other tests for confirming the presence of pregnancy include a positive serum β-hCG and demonstration of the fetal heart by either auscultation or ultrasound. Using a transvaginal probe, an intrauterine pregnancy may be confirmed (gestational sac–intradecidual sign) at the time a β-hCG reaches 1,500 IU. Fetal cardiac activity should be seen by postconception week 3. Ultrasound imaging is not routinely indicated to diagnose pregnancy but is often used in the evaluation of a patient who is unsure of her last period, at increased risk for ectopic pregnancy, or showing signs of miscarriage. In conjunction with early quantitative serum β-hCG assessments, these conditions can be clearly differentiated from a normal intrauterine pregnancy and timely therapy initiated (Chapter 5).

Gestational Age

The Nägele rule is commonly applied in calculating an estimated date of confinement (EDC). The clinician should remember that this is an approximate rule. Using the date of the patient's last menstrual period minus 3 months plus 1 week and 1 year, the rule is based on the assumptions that a normal gestation is 280 days and that all patients have 28-day menstrual cycles. Although several studies have found the average length of gestation for primiparous women to be 282 to 283 days, for convention, 280 days is the currently accepted average gestation. After adjustment for a patient's actual cycle length, natality statistics indicate that the majority of pregnancies deliver within 2 weeks before or after this estimated date. During prenatal care, the week of gestation can be obtained based on the calculated EDC. When the last menstrual period is unknown or the cycle is irregular, ultrasound measurements between the 14 and 20 weeks gestation provide an accurate determination of gestational age (Chapter 9). Care should be taken not to change the EDC unless the ultrasound differs by 10 or more days from the menstrual dates. Once dates are appropriately confirmed, continued alterations of EDC based on fetal size are problematic and ill advised.

Physical Examination

A targeted physical examination during the first prenatal visit includes special attention to the patient's BMI, blood pressure, thyroid, skin, breasts, and pelvis. On pelvic