



Toward Improving the Outcome of Pregnancy III



Enhancing Perinatal Health Through Quality,
Safety and Performance Initiatives

TIOP III Steering Committee

The mission of the March of Dimes is to improve the health of babies by preventing birth defects, premature birth and infant mortality.

William Oh, MD, FAAP, Chair

Professor, Department of Pediatrics,
Warren Alpert Medical School
of Brown University
Women and Infants' Hospital
Providence, RI

Scott D. Berns, MD, MPH, FAAP

Senior Vice President, Chapter Programs,
March of Dimes Foundation,
National Office
White Plains, NY
Clinical Professor, Department of Pediatrics
Warren Alpert Medical School
of Brown University
Providence, RI

Ann Scott Blouin, RN, PhD

Executive Vice President,
Accreditation and Certification Operations
The Joint Commission
Oakbrook Terrace, IL

Deborah E. Campbell, MD, FAAP

Director, Division of Neonatology
Children's Hospital at Montefiore
Professor of Clinical Pediatrics
Associate Professor of
Obstetrics & Gynecology
and Women's Health
Albert Einstein College of Medicine
New York, NY

Alan R. Fleischman, MD

Senior Vice President and Medical Director,
March of Dimes Foundation,
National Office
White Plains, NY
Clinical Professor of Pediatrics and
Clinical Professor of
Epidemiology & Population Health
Albert Einstein College of Medicine
New York, NY

Paul A. Gluck, MD

Associate Clinical Professor, Obstetrics
and Gynecology
University of Miami
Department of Obstetrics and Gynecology
Miller School of Medicine
Miami, FL

Margaret E. O'Kane

President
National Committee
for Quality Assurance
Washington, DC

Anne Santa-Donato, RNC, MSN

Director, Childbearing
and Newborn Programs
Association of Women's Health,
Obstetric, and Neonatal Nurses (AWHONN)
Washington, DC

Kathleen Rice Simpson, PhD, RNC, FAAN

Perinatal Clinical Nurse Specialist,
St. John's Mercy Medical Center
St. Louis, MO

Ann R. Stark, MD

Professor of Pediatrics
Baylor College of Medicine
Houston, TX

John S. Wachtel, MD, FACOG

Obstetrician Gynecologist
Menlo Medical Clinic,
Menlo Park, CA
Adjunct Clinical Professor
Department of Obstetrics and Gynecology
Stanford University School of Medicine
Stanford, CA

TIOP III Staff

Scott D. Berns, MD, MPH, FAAP, Editor

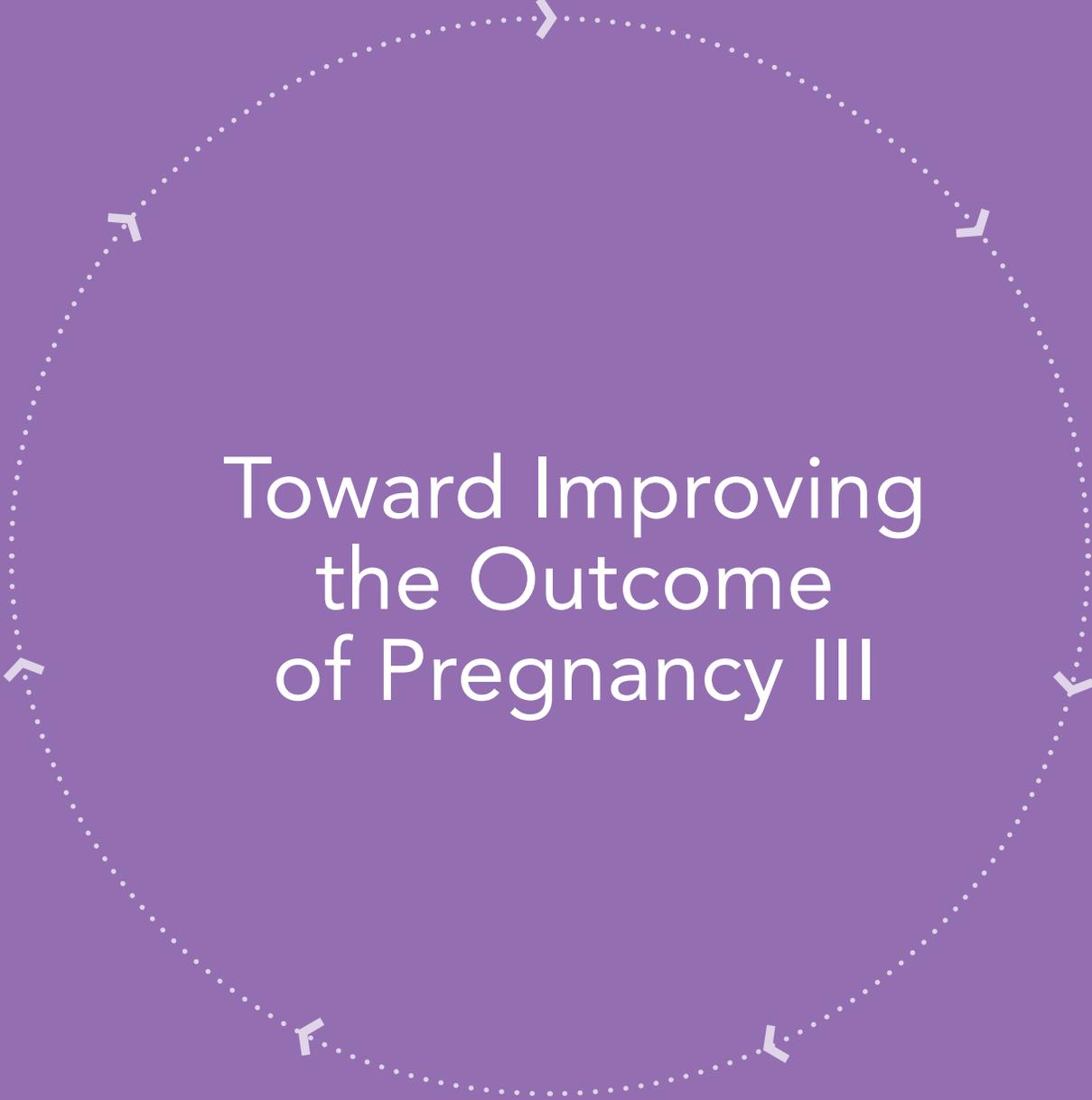
Andrea Kott, MPH, Consulting Editor

Nicole DeGroat

Kimberly Paap

Kelli Signorile

Ann Umemoto



Toward Improving the Outcome of Pregnancy III

Financial support provided in part by

American Academy
of Pediatrics



DEDICATED TO THE HEALTH OF ALL CHILDREN™



The American College of
Obstetricians and Gynecologists
Women's Health Care Physicians



Contents

- Preface: View from the Chair ii
- Acknowledgements..... iii
- TIOPIII Advisory Group..... iv
- Authors..... v
- Executive Summary..... ix
- Foreword xi
- Chapter 1: History of the Quality Improvement Movement 1
- Chapter 2: Evolution of Quality Improvement in Perinatal Care..... 9
- Chapter 3: Epidemiologic Trends in Perinatal Data 19
- Chapter 4: The Role of Patients and Families in Improving Perinatal Care 33
- Chapter 5: Quality Improvement Opportunities in Preconception and Interconception Care 45
- Chapter 6: Quality Improvement Opportunities in Prenatal Care..... 55
- Chapter 7: Quality Improvement Opportunities in Intrapartum Care 65
- Chapter 8: Applying Quality Improvement Principles in Caring for the High-Risk Infant..... 75
- Chapter 9: Quality Improvement Opportunities in Postpartum Care 87
- Chapter 10: Quality Improvement Opportunities to Promote Equity in Perinatal Health Outcomes 101
- Chapter 11: Systems Change Across the Continuum of Perinatal Care 111
- Chapter 12: Policy Dimensions of Systems Change in Perinatal Care..... 123
- Chapter 13: Opportunities for Action and Summary of Recommendations 135

Preface: View from the Chair

After witnessing the emergence and dramatic progress in perinatal medicine and improvement in pregnancy outcomes during the past half century, it is a distinct honor and pleasure to introduce this document. In the early 1970's, a report from Canada showed that neonatal mortality was significantly lower in obstetric facilities with neonatal intensive care units (NICUs) compared to those without. This finding emphasized the importance of an integrated system that would promote delivery of care to mothers and infants based on the level of acuity. The concept prompted the March of Dimes, in 1976, to publish *Toward Improving the Outcome of Pregnancy* (TIOP I).

Leaders in perinatal health collaborated on this effort and introduced a model system for regionalized perinatal care, including definitions of levels of hospital care, which led to the template for perinatal regionalization and improved perinatal outcomes. Endorsement of this document by key professional organizations ensured the implementation of the concepts advanced by TIOP I. Regionalization of care, along with evidenced-based therapeutic interventions (assisted ventilation, antenatal corticosteroids, etc.), contributed to the marked improvement in neonatal survival rates during the ensuing two decades.

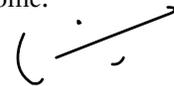
Despite these accomplishments, the March of Dimes saw the need for further improvement and, in 1993, it published TIOP II, which emphasized the importance of the perinatal continuum of care, from preconception through infancy. TIOP II appeared just when the importance of quality improvement in U.S. health care was gaining attention.

This third volume, *Toward Improving the Outcome of Pregnancy: Enhancing Perinatal Health Through Quality, Safety and Performance Initiatives* (TIOP III), picks up where the first two volumes left off.

It is not meant to be a comprehensive textbook on perinatal health, but rather an action-oriented monograph that highlights proven principles and methodologies, as well as selected safety initiatives and quality improvement programs, that you can imple-

ment now that may significantly improve perinatal outcomes in your practice setting. Many individuals and organizations came together to produce TIOP III. A Steering Committee was responsible for the overall direction of TIOP III and was comprised of experts from the American Academy of Pediatrics, The American College of Obstetricians and Gynecologists, the Association of Women's Health, Obstetric and Neonatal Nurses, The Joint Commission, the National Committee for Quality Assurance, and the March of Dimes. Also, an Advisory Group, made up of additional organizations, committed to assisting with dissemination of the findings of TIOP III.

It has been deeply satisfying and an honor to witness and participate in the tremendous advances in perinatal care during the past 50 years. The March of Dimes, through its efforts in publishing the three TIOP documents and its initiatives dedicated to improving the health of babies, preventing prematurity and integrating family-centered care into NICUs, has made a profound contribution to improving pregnancy outcomes. I am certain that TIOP III will enhance pregnancy outcomes through collaborative, perinatal quality improvement in the years to come.



William Oh, MD,
Chair, TIOP III Steering Committee

Acknowledgements

I am indebted to the many colleagues who contributed to this monograph. Thanks to William Oh, Chair of the TIOP III Steering Committee, for his inspiration and leadership. Thanks to the Steering Committee, who met numerous times over the course of 17 months in person, over the phone, and via e-mail: Ann Scott Blouin; Deborah Campbell; Alan Fleischman; Paul Gluck; Margaret O’Kane; Anne Santa-Donato; Kathleen Rice Simpson; Ann Stark; and John Wachtel. In addition, thanks to Hal Lawrence, ACOG Vice President, Practice Activities, for his support and input throughout the development of this monograph.

.....

In particular, I thank Andrea Kott, Consulting Editor, for her steadfast commitment that ensured this document would come to fruition. I also thank the TIOP III staff who were vital to all aspects of the preparation of this document, including the coordination of e-mails, mailings, conference calls and meetings: Nicole DeGroat; Kimberly Paap; Kelli Signorile; and Ann Umemoto. I especially thank all of the authors for their expertise and contributions to the monograph. In addition, thanks to the members of the TIOP III Advisory Group who provided essential feedback and are helping to disseminate the recommendations provided within TIOP III.

Thanks to the following March of Dimes staff for their varied and significant contributions:

Diane Ashton; Lisa Bellsey; Vani Bettegowda and the March of Dimes Perinatal Data Center; Janis Biermann; Gerard Carrino; Anne Chehebar; Todd Dezen; Sean Fallon; Ray Fernandez; Angela Gold; Judi Gooding; Sabine Jean-Walker; Amanda Jezek; Barbara Jones; Michele Kling; Alison Knowings; Elizabeth Lynch; Michelle Miller; Carolyn Mullen; John Otero; Judith Palais; David Rose; Beth St. James; Doug Staples; Marina Weiss; and Emil Wigode. Finally, I thank Jennifer Howse, President of the March of Dimes, whose vision and support made this third volume of TIOP a reality.



Scott D. Berns, MD, MPH, FAAP
Editor, TIOP III

TIOP III Advisory Group

Agency for Healthcare Research and Quality

Beth Collins Sharp
Senior Advisor for Women's Health
and Gender Research

American Academy of Family Physicians

Carl R. Olden, MD, FAAP
Vice Chair of Advisory Board of AAFP,
Advanced Life Support in Obstetrics Program
(ALSO)

American College of Nurse Midwives

Tina Johnson, CNM, MS
Director of Professional Practice
and Health Policy

American Hospital Association

Beth Feldpush, PhD
Senior Associate Director, Policy
Bonnie Connors Jellon, MHSA
Director, AHA Section for
Maternal Child Health

American Public Health Association

Georges C. Benjamin, MD, FACP, FACEP
Executive Director

America's Health Insurance Plans

Karen Ignagni
President and Chief Executive Officer

Association of Maternal and Child Health Programs

Michael Fraser, PhD
Chief Executive Officer

Centers for Disease Control and Prevention

CAPT Wanda D. Barfield, MD, MPH
Director, Division of Reproductive Health,
National Center for Chronic Disease
Prevention and Health Promotion

Centers for Medicare and Medicaid Services (CMS)

Lekisha Daniel-Robinson, MPH
Center for Medicaid, CHIP and Survey &
Certifications (CMCS), Division of Quality,
Evaluation, and Health Outcomes

Health Resources and Services Administration

Christopher DeGraw, MD
Deputy Director, Division of Research,
Training and Education

Institute for Healthcare Improvement

Sue Leavitt Gullo, RN, MS, BSN
Managing Director
Director, Labor and Delivery, Maternity,
Lactation Services, Childbirth and Family
Education, Infant Loss Program,
Elliott Hospital and Director

National Association of Children's Hospitals and Related Institutions

Sandy McElligott, MBA, RN, CNA, BC
Senior Vice President/Chief Nursing Officer,
Texas Children's Hospital

National Association of Neonatal Nurses

Lori Armstrong, MS, RN
President

National Business Group on Health

Cynthia Tuttle, PhD, MPH
Vice President,
Center for Prevention and Health Services

National Hispanic Medical Association

Diana E. Ramos, MD, MPH, FACOG
Leadership Fellow
Associate Professor in OB/GYN
University of Southern California
Keck School of Medicine

National Initiative for Children's Healthcare Quality

Karthika Streb
Senior Project Manager and
Director of Program Management
and Staffing

National Institute of Child and Human Development

Lisa Kaeser
Program Analyst

National Medical Association

Ivonne Fuller Bertrand, MPA
Associate Executive Director

National Partnership for Women and Families

Lee Partridge
Health Policy Advisor

National Perinatal Association

Mary Anne Laffin, Midwife
President-Elect

National Perinatal Information Center

Janet H. Muri, MBA
President

The contents of this monograph and the recommendations and opinions expressed are those of the authors and do not necessarily represent the official views of the organizations or institutions with which the authors are affiliated or the members of the Advisory Group.

National Quality Forum

Janet M. Corrigan, PhD
President and Chief Executive Officer

Pediatric/Obstetric Medical Group

Alan Spitzer, MD
Senior Vice President and Director,
Center for Research and Education

Society for Maternal-Fetal Medicine

Daniel O'Keefe, MD
Executive Vice President

Vermont Oxford Network

Jeffrey D. Horbar, MD
Chief Executive & Scientific Officer

Authors

Marie R. Abraham, MA

Senior Policy and Program Specialist
Institute for Patient- and
Family-Centered Care
Bethesda, MD

Diane M. Ashton, MD, MPH, FACOG

Deputy Medical Director
March of Dimes Foundation, National Office
White Plains, NY
Assistant Clinical Professor, Department
of Obstetrics & Gynecology
SUNY Downstate Medical Center
New York, NY

Maribeth Badura, RN, MSN*

Former Director of Health Resources and
Services Administration (HRSA)
Maternal Child Health Bureau's
Division of Healthy Start and
Perinatal Services
Bethesda, MD

Wanda D. Barfield, MD, MPH, FAAP

Director, Division of Reproductive Health
Centers for Disease Control and Prevention
Atlanta, GA

Cheryl Tatano Beck, DNSc, CNM, FAAN

Distinguished Professor
University of Connecticut
Storrs, CT

Vincenzo Berghella, MD

Director, Maternal-Fetal Medicine
Thomas Jefferson University
Philadelphia, PA
Professor, Department of Obstetrics &
Gynecology
Thomas Jefferson University
Philadelphia, PA

Scott D. Berns, MD, MPH, FAAP

Senior Vice President, Chapter Programs
March of Dimes Foundation, National Office
White Plains, NY
Clinical Professor, Department of Pediatrics
Warren Alpert Medical School of Brown
University
Providence, RI

Vani R. Bettegowda, MHS

Acting Director, Perinatal Data Center
March of Dimes Foundation, National Office
White Plains, NY

Eric Bieber, MD

System Chief Medical Officer
University Hospitals
Cleveland, OH

Ann Scott Blouin, RN, PhD

Executive Vice President
Accreditation and Certification Operations
The Joint Commission
Oakbrook Terrace, IL

Deborah E. Campbell, MD, FAAP

Director, Division of Neonatology
Children's Hospital at Montefiore
New York, NY
Professor of Clinical Pediatrics
Associate Professor of Obstetrics
& Gynecology and Women's Health
Albert Einstein College of Medicine
New York, NY

Joanna F. Celenza, MA, MBA

March of Dimes/CHaD ICN
Family Resource Specialist
Children's Hospital at
Dartmouth-Hitchcock Medical Center
Lebanon, NH

*deceased

Authors

Mark R. Chassin, MD, FACP, MPP, MPH
President
The Joint Commission
Oakbrook Terrace, IL

Steven L. Clark, MD, FACOG
Medical Director, Women's and Children's
Clinical Services
Hospital Corporation of America
Nashville, TN

James W. Collins, Jr., MD, MPH
Medical Director
Neonatal Intensive Care Unit
Children's Memorial Hospital
Chicago, IL
Professor, Department of Pediatrics
Northwestern University
Feinberg School of Medicine
Chicago, IL

Raymond Cox, MD, MBA
Chairman, Department of
Obstetrics and Gynecology
Saint Agnes Hospital
Baltimore, MD

Karla Damus, PhD, MSPH, MN, RN, FAAN
Clinical Professor, School of Nursing
Bouvé College of Health Sciences
Northeastern University
Boston, MA

Diana L. Dell, MD
Assistant Professor Emeritus
Department of Psychiatry
Duke University Medical Center
Durham, NC

Siobhan M. Dolan, MD, MPH
Associate Professor
Department of Obstetrics
& Gynecology and Women's Health
Albert Einstein College of Medicine/
Montefiore Medical Center
New York, NY

Edward F. Donovan, MD
Co-Lead, Ohio Perinatal
Quality Collaborative
James M. Anderson Center for Health
Systems Excellence
Cincinnati Children's Hospital
Medical Center
Cincinnati, OH
Professor of Clinical Pediatrics
University of Cincinnati College of Medicine
Cincinnati, OH

Susan M. Dowling-Quarles, BSN, MA
Principal
Premier Consulting Solutions
Charlotte, NC

Alan R. Fleischman, MD
Senior Vice President and Medical Director
March of Dimes Foundation, National Office
White Plains, NY
Clinical Professor of Pediatrics and
Clinical Professor of
Epidemiology & Population Health
Albert Einstein College of Medicine
New York, NY

**Margaret Comerford Freda,
EdD, RN, CHES, FAAN**
Editor, MCN The American Journal of
Maternal Child Nursing
Professor of Clinical Obstetrics &
Gynecology and Women's Health
New York, NY

Paul A. Gluck, MD
Associate Clinical Professor, Obstetrics
and Gynecology
University of Miami
Department of Obstetrics and Gynecology
Miller School of Medicine
Miami, FL

Jeffrey B. Gould, MD, MPH
Director, Perinatal Epidemiology
and Health Outcomes Research Unit
Stanford University Medical Center
Stanford, CA
Robert L. Hess Professor of Pediatrics
Division of Neonatal
and Developmental Medicine
Stanford University School of Medicine
Stanford, CA

Gary D.V. Hankins, MD
Professor and Chairman
Department of Obstetrics & Gynecology
University of Texas Medical Branch
Galveston, TX

Jeffrey D. Horbar, MD
Chief Executive and Scientific Officer
Vermont Oxford Network
Burlington, VT
Jerold F. Lucey Professor of
Neonatal Medicine
University of Vermont College of Medicine
Burlington, VT

Jay D. Iams, MD

Frederick P. Zuppan Professor
& Endowed Chair
Division of Maternal Fetal Medicine
Department of Obstetrics & Gynecology
The Ohio State University College of
Medicine
Columbus, OH

Beverly H. Johnson

President and Chief Executive Officer
Institute for Patient-
and Family-Centered Care
Bethesda, MD

Carole A. Kenner, PhD, RNC-NIC, FAAN

President
Council of International Neonatal Nurses, Inc.
Dean/Professor School of Nursing
Associate Dean
Bouvé College of Health Sciences
Northeastern University
Boston, MA

Sarah J. Kilpatrick, MD, PhD

Department Head, Obstetrics and Gynecology
Vice Dean
University of Illinois College of Medicine
Chicago, IL

Eric Knox, MD, FACOG

Chief of OB Risk & Safety Officer
PeriGen, Inc.
Princeton, NJ

Andrea Kott, MPH

Consulting Editor
March of Dimes Foundation, National Office
White Plains, NY

Eve Lackritz, MD

Chief, Maternal & Infant Health Branch
Division of Reproductive Health
National Center for Chronic Disease
Prevention and Health Promotion
Centers for Disease Control & Prevention
Atlanta, GA

George A. Little, MD

Neonatal/Perinatal Medicine
Dartmouth-Hitchcock Medical Center
Professor of Pediatrics and of Ob/Gynecology
Dartmouth Medical School
Hanover, NH

Michael C. Lu, MD, MPH

Associate Professor,
Obstetrics and Gynecology
Associate Director, Child and Family Health
Training Program
University of California at Los Angeles
Los Angeles, CA

Barbara S. Medoff-Cooper, RN, PhD, FAAN

Professor
University of Pennsylvania, School of Nursing
Philadelphia, PA

Merry-K. Moos, RN, FNP, MPH, FAAN

Research Professor (retired)
Department of Obstetrics and Gynecology
University of North Carolina at Chapel Hill
Raleigh, NC

Janet H. Muri, MBA

President
National Perinatal Information Center
Providence, RI

William Oh, MD, FAAP

Professor, Department of Pediatrics
Warren Alpert Medical School of Brown
University
Women and Infants' Hospital
Providence, RI

Margaret E. O'Kane

President
National Committee for Quality Assurance
Washington, DC

Bryan T. Oshiro, MD

Vice Chairman and Associate Professor
Department of Obstetrics and Gynecology
Loma Linda University School of Medicine
Loma Linda, CA

Joann R. Petrini, PhD, MPH

Assistant Director of Research
Danbury Hospital
Danbury, CT
Associate Clinical Professor, Obstetrics &
Gynecology and Women's Health
Albert Einstein College of Medicine
New York, NY

Samuel F. Posner, PhD

Editor in Chief, Preventing Chronic Disease
Deputy Associate Director for Science
National Center for Chronic Disease
Prevention and Health Promotion
Centers for Disease Control and Prevention
Atlanta, GA

Authors

Stephen D. Ratcliffe, MD, MSPH

Program Director
Lancaster General Hospital Family Medicine
Residency
Lancaster, PA
Clinical Associate Professor
Temple University School of Medicine
Philadelphia, PA
Clinical Associate Professor
Penn State College of Medicine
Hershey, PA

Nancy Jo Reedy, RN, CNM, MPH, FACNM

Director of Nurse-Midwifery Services
Texas Health Care, PLLC
Fort Worth, TX

Anne Santa-Donato, RNC, MSN

Director, Childbearing and Newborn Programs
Association of Women's Health,
Obstetric and Neonatal Nurses
Washington, DC

Kathleen Rice Simpson, PhD, RNC, FAAN

Perinatal Clinical Nurse Specialist
St. John's Mercy Medical Center
St. Louis, MO

Lora Sparkman, RN, MHA

Director, Clinical Excellence
Ascension Health
St. Louis, MO

Ann R. Stark, MD

Professor of Pediatrics
Baylor College of Medicine
Houston, TX

Bruce C. Vladeck, PhD

Senior Advisor
Nexera Inc.
New York, NY

John S. Wachtel, MD, FACOG

Obstetrician Gynecologist
Menlo Medical Clinic,
Menlo Park, CA
Adjunct Clinical Professor
Department of Obstetrics and Gynecology
Stanford University School of Medicine
Stanford, CA

Executive Summary

Andrea Kott and Scott D. Berns

Toward Improving the Outcome of Pregnancy: Enhancing Perinatal Health

Through Quality, Safety and Performance Initiatives (TIOP III) is a call to action.

It is a tool for anyone committed to the enhancement of perinatal health: clinicians on the frontline, as well as public health professionals, researchers, payers, policy-makers, patients and families. TIOP III is filled with examples of promising and successful initiatives at hospitals and health care systems across the country, designed to improve the quality of perinatal care.

Each chapter explores the elements that are essential to improving quality, safety and performance across the continuum of perinatal care: consistent data collection and measurement; evidence-based initiatives; adherence to clinical practice guidelines; a life-course perspective; care that is patient- and family-centered, culturally sensitive and linguistically appropriate; policies that support high-quality perinatal care; and systems change.

As TIOP III demonstrates, improving the quality of perinatal care depends on applying evidence-based practice and clinical guidelines throughout the course of a woman's life. This means screening and monitoring for conditions that could compromise a healthy pregnancy long before a woman ever considers becoming pregnant; it means taking a comprehensive, culturally sensitive, linguistically and developmentally appropriate approach to a woman's preconception, prenatal, interconception and postpartum care, considering biological, emotional, as well as socioeconomic factors that could influence her health and her access to health care services.

Many of these evidence-based practices — CenteringPregnancy®, Kangaroo Care and exclusive breastmilk feeding — have been shown to improve perinatal health outcomes by empowering patients: positioning them, their newborns and their families at

the center of their care and making them an integral part of their health care decision-making team.

Each chapter of TIOP III illustrates specific strategies and interventions that incorporate robust process and systems change, including the power of statewide quality improvement collaboratives that are improving perinatal outcomes. And it concludes with cross-cutting themes and action items that stakeholders across the continuum of perinatal care will recognize as opportunities to improve pregnancy outcomes.

Summary of TIOP III Cross-Cutting Themes

- Assuring the uptake of robust perinatal quality improvement and safety initiatives
- Creating equity and decreasing disparities in perinatal care and outcomes
- Empowering women and families with information to enable the development of full partnerships between health care providers and patients and shared decision-making in perinatal care
- Standardizing the regionalization of perinatal services
- Strengthening the national vital statistics system

continued

Executive Summary

Ultimately, reaching a more efficient, more accountable system of perinatal care will require a level of collaboration, services integration and communication that lead to successful perinatal quality improvement initiatives, many of which are described throughout this book. In addition to the consistent collection of data and measurement and the application of evidence-based interventions, successful collaborations, like

all perinatal quality improvement, depend on the engagement, support and commitment of everyone reading this book: health care professionals and hospital leadership, public health professionals and community-based service providers, research scientists, policy-makers and payers, as well as patients and families. TIOP III is the call to action and the tool that can inspire and guide their efforts toward improving the outcome of pregnancy.

Foreword

Toward Improving the Outcome of Pregnancy III has an illustrious past. It began in 1972, when the March of Dimes, newly dedicated to the burgeoning field of perinatology, created the Committee on Perinatal Health and asked it to identify critical issues and develop guidelines and recommendations for the care of pregnant women and newborns with a special focus on infant mortality. Just four years later, in 1976, the committee released *Toward Improving The Outcome of Pregnancy* (TIOP I), a book that synthesized the efforts of four organizations (The American College of Obstetricians and Gynecologists, the American Medical Association, the American Academy of Pediatrics, and the American Academy of Family Physicians) and revolutionized the system of perinatal hospital care by recommending systematized, cohesive regional networks of hospitals, each assigned to one of three levels of inpatient care based on patient risks and needs.

.....

TIOP I also galvanized the March of Dimes leadership to intensify its support for neonatal research, regional neonatal intensive care unit (NICU) centers, neonatal nursing education, intensive care nurseries, nurse-midwife education, community health teams and genetic counseling.

Subsequently, through research breakthroughs such as surfactant therapy, continued development of lifesaving NICU technology and improved systems accomplished through regionalization, infant mortality has continued a steady decline to the present day.

Nevertheless, maternal health issues such as lack of health insurance, poverty, substance abuse, unintended pregnancy and other behavioral and social barriers continued to hamper the Foundation's efforts to improve birth outcomes. As a result, the Foundation turned its attention to improving care during pregnancy and birth through proven risk-reduction strategies and the establishment of perinatal boards, to better ensure accountability within regionalized systems of care. This became the framework for TIOP II, *Toward Improving the Outcome of Pregnancy: The 90s and Beyond*,

which a second Committee on Perinatal Health issued in 1993.

The March of Dimes put TIOP II to work at the grassroots level through the Campaign for Healthier Babies, a 1990 initiative that addressed improved access to prenatal care and, *Think Ahead!*, in 1995, a nationwide campaign that emphasized preconception care, healthy lifestyles and the importance of folic acid.

Both the 1972 and 1990 Committees on Perinatal Health aimed to reduce rates of maternal and infant mortality and morbidity in the United States. But one negative birth outcome began to receive increased scrutiny within the Foundation, and that was the relentless increase in the nation's rate of premature birth since TIOP I. The March of Dimes responded to this alarming trend by launching a comprehensive national Prematurity Campaign in 2003.

The Foundation has since attacked the issue of premature birth by raising political and public visibility for this problem, supporting cutting-edge research and exploring clinical, educational and public health interventions designed to achieve the widest impact. These include the March of

Foreword

Dimes NICU Family Support® program and “Healthy Babies Are Worth the Wait®”, a prematurity-prevention partnership in Kentucky. Preliminary data from the National Center for Health Statistics show that for the first time in 30 years, rates of premature birth have declined in 2007 as well as 2008, most recently from 12.7 percent (2007)¹ to 12.3 percent (2008).² But we must continue to seek solutions if these small gains are to be preserved and accelerated. And solutions may be at hand.

Most recently, two Institute of Medicine (IOM) reports — *To Err Is Human: Building a Safer Health Care System* (1999) and *Crossing the Quality Chasm: A New Health System for the 21st Century* (2001) — revealed the high rate of preventable errors in hospitals and the extreme complexity of systems that underlie most of those errors. As a result, there has been growing interest in the perinatal community in applying

quality improvement strategies to prevent errors and to reduce the rate of prematurity.

Based on a subsequent IOM report, *Preterm Birth: Causes, Consequences, and Prevention*, we now know that preterm birth costs our nation \$26 billion annually in health and medical costs.³ Preventing preterm birth, through quality improvement approaches, offers an unprecedented opportunity to both bend the cost curve and to improve the outcome of pregnancy.

The March of Dimes is hopeful that this third volume, *TIOP III: Toward Improving the Outcome of Pregnancy: Enhancing Perinatal Health Through Quality, Safety and Performance Initiatives*, will drive the implementation of model programs and quality improvement initiatives and will increase transparency and accountability for consumers — all of which can support improved pregnancy outcomes.



Dr. Jennifer L. Howse
President
March of Dimes

References

1. Martin JA, Hamilton BE, Sutton PD, et al. Births: Final Data for 2007. Natl Health Stat Report 2010;58.
2. Hamilton BE, Martin JA, Ventura SJ. Division of Vital Statistics. Births: Preliminary Data for 2008. Natl Health Stat Report 2010;58.
3. Behrman R, Stith Butler A. eds. *Preterm Birth: Causes, Consequences, and Prevention*. Washington, DC: The National Academies Press, 2007.



History of the Quality Improvement Movement

Mark R. Chassin and Margaret E. O'Kane

Chapter 1: History of the Quality Improvement Movement

Mark R. Chassin and Margaret E. O’Kane

Early Effects to Improve Clinical Care and Medical Education

The evolution of quality improvement has been a steady response to the need to correct errors. Consider Florence Nightingale, a public health pioneer who addressed the link between paltry hospital sanitation and the high — 60 percent — fatality rate among wounded soldiers during the Crimean War of 1854. Germ theory was gaining traction in Europe and pointing to the link between high morbidity and mortality rates and the lack of basic sanitation and hygiene standards. Nightingale, while serving as a nurse at the Barrack Hospital in Istanbul, developed practices — hand washing, sanitizing surgical tools, regularly changing bed linens and making sure all wards were clean — that are standard in hospitals today. She also promoted good nutrition and fresh air. By the time this forerunner of evidence-based medicine left Barrack Hospital, mortality had plummeted to 1 percent.^{1,2}

A continent away, concern about the state of American medicine mounted. In 1847, the American Medical Association (AMA) emerged, in response to the need for a tougher, standardized medical education system. Medical education and the practice of medicine in colonial America were haphazard at best. According to Paul Starr, in *The Social Transformation of American Medicine*, “All manner of people took up medicine in the colonies and appropriated the title of doctor...,” including “a Mrs. Hughes, who advertised in 1773 that besides practicing midwifery, she cured ‘ringworms, scald heads, piles, worms’ and also made ladies’ dresses and bonnets in the newest fashion.” During the American Revolution, 400 of the nation’s estimated 3,500 to 4,000 physicians had formal medical training, and only half held medical degrees, which weren’t worth much, since they required, at most, only 6 to 8 months

of medical school and 3 years of apprenticeship. And yet, medical school diplomas often were accepted as licenses to practice medicine.³

In its drive to reform medical education, the AMA in 1904 created the Council on Medical Education, which asked the Carnegie Foundation for the Advancement of Teaching to conduct a study of medical schools. The Foundation assigned the study to education expert Abraham Flexner, who wrote in his 1910 report, *Medical Education in the United States and Canada*, “Touted laboratories were nowhere to be found, or consisted of a few vagrant test tubes squirreled away in a cigar box; corpses reeked because of the failure to use disinfectant in the dissecting rooms. Libraries had no books; alleged faculty members were busily occupied in private practice. Purported requirements for admission were waived for anyone who would pay the fees.”³

Medical education underwent dramatic transformation after the publication of Flexner's report. Many schools closed, some consolidated, and all tightened their entrance requirements. Length of study and training increased and incorporated biomedical studies in biology, chemistry and physics with strict, supervised clinical training.⁴ While just 50 percent of medical school graduates moved on to hospital training in 1904, an estimated 75 to 80 percent were taking internships by 1912.³

As Flexner's report revolutionized the medical education system, Ernest Codman, a surgeon from Harvard Medical School and Massachusetts General Hospital, applied his "End Result System of Hospitalization Standardization Program," a three-step approach to quality assurance, to improving hospital care. Codman's system used quality measures to determine if problems stemmed from patients, the health care system or clinicians; quantified the lack of quality; and, remedied problems to prevent them from happening again.⁵ In 1917, the American College of Surgeons (ACS) adopted his "End Result System" for its Hospitalization Standardization Program, which set minimum standards for hospital care. These standards required that, among other things: all hospital physicians are well-trained, competent and licensed; staff meetings and clinical reviews occur regularly; and, that medical histories, physical exams and laboratory tests are recorded.⁶

In 1918, the ACS began using its newly established minimum standards to inspect hospitals. Of 692 hospitals, only 89 met the minimum standards. However, by 1950, the Hospitalization Standardization Program approved more than 3,200 hospitals.⁷

Improvements to Maternal Child Health Trigger Other Efforts

While much concern about health care quality in the early 20th century revolved around hospitals, America's high maternal and infant mortality rates, longtime indicators of quality, were also claiming attention.

In 1921, Congress passed the Sheppard-Towner Act, which granted states funds to improve access to maternal and child health services. In 1935, Congress passed Title V of the Social Security Act, to equip and finance pediatric and primary care services for hospitals in underserved areas. The Emergency Maternity and Infant Care program followed, financing care for 1.5 million women and infants of United States soldiers during World War II. And, in 1946 came the Hill-Burton Act, which awarded grants to states to build hospitals.⁸

Efforts to provide women, children and the underserved with more and better care led to the creation of numerous programs, including Medicare and Medicaid.

By the mid-1900s, improving the quality of health and hospital care was an idea with a century of effort behind it. It was after World War II, however, when the concepts of modern quality improvement emerged, initially focusing not on health outcomes but on systems change in business and industry.

The Revolution of Quality Improvement in Business and Industry

Beginning in the mid 1920s, Walter A. Shewhart and W. Edwards Deming, both physicists, and Joseph M. Juran, an engineer, laid the groundwork for modern quality improvement. In their efforts to increase the efficiency of American industry, they concentrated on streamlining production processes, while minimizing the opportunity for human error, forging important quality improvement concepts like standardizing work processes, data-driven decision making, and commitment from workers and managers to improving work practices.⁶ These elements of systems change, first applied to business and industry, ultimately trickled down to the American health care system as awareness of its need for improvement grew.⁹⁻¹²

Florence Nightingale, while serving as a nurse at the Barrack Hospital in Istanbul, developed practices — hand washing, sanitizing surgical tools, regularly changing bed linens and making sure all wards were clean — that are standard in hospitals today.

Systems Change Reaches American Medicine

In 1951, the American College of Surgeons, the American College of Physicians, the American Hospital Association, the American Medical Association, and the Canadian Medical Association formed The Joint Commission on Accreditation of Hospitals as a not-for-profit organization to provide voluntary accreditation to hospitals. Early on, The Joint Commission used the minimum standards of ACS's Hospital Standardization Program to evaluate hospitals. In time, however, The Joint Commission, which became The Joint Commission on Accreditation of Healthcare Organizations in 1987, adopted more rigorous standards, which reflected the structure-process-outcomes model that Avedis Donabedian presented in his 1966 article, *Evaluating the Quality of Medical Care*. Who provides care and where (structure); how care is provided (process); and the consequences of care (outcomes) are all needed to measure quality, Donabedian argued.¹³ By the mid-1990s, The Joint Commission introduced into the accreditation process the elements of system change derived from the work of Deming, Shewhart and Juran: the role of organizational leadership, data-driven decision making, measurement, statistical process control, a focus on process, and a commitment to continuous improvement.

Process was especially important to quality management expert Philip Crosby, former vice president of corporate quality for International Telephone and Telegraph, who espoused the value of preventing errors altogether by doing things right the first time. Crosby's "zero defects" approach to quality improvement set the stage for two other models that focused on eliminating waste: Toyota's "lean" operations and Six Sigma.¹⁴

Toyota's lean operations, introduced in the 1980s, standardized work processes to avoid wasting resources, time and money. Six Sigma, which Motorola developed in the

late 1980s, also strives to improve quality during the process stage. It refers to a statistical measure of variation, but instead of using percentages, Six Sigma assesses "defects per million opportunities" and aims for fewer than 3.4 defective parts per million opportunities.¹⁵

The Role of NCQA in Improving Quality of Health Care

In the late 1980s, corporate purchasers had fixed on a strategy of the accountable health plan to contain their health care costs. Led by many of the Fortune 500 companies that had adopted the principles of total quality management (e.g., Xerox, Ford, General Motors, Bank of America) or continuous quality improvement, they were seeking to enroll their employees in health plans that would measure their quality and continuously improve it. In 1988, the National Committee for Quality Assurance (NCQA) changed its governance to put health plans in the minority on the board, and developed a multistakeholder board, including these corporate purchasers, consumers and quality experts. NCQA worked with these corporate leaders and with health plan quality leaders to develop standards for what a true Health Maintenance Organization would be. NCQA's accreditation standards were developed around many of Deming's and Juran's ideas, and the program was launched in 1991.

At the same time, NCQA took on a project that had been developed by a number of health plans and purchasers to standardize quality measurement. In 1993, NCQA published its first Health Plan Report Card, using the Healthcare Effectiveness Data and Information Set (HEDIS). For the first time, it was possible to compare health plans on the effectiveness of care that their members received. HEDIS and NCQA accreditation were parallel projects for a number of years. In 1999, NCQA made HEDIS (including standardized patient experience results) an official part of its accreditation program,

and plans' performance relative to each other now drive about 40 percent of the accreditation score.

Institute of Medicine Puts New Emphasis on Quality Improvement

Although the world of health care was slowly assuming Donabedian's structure-process-outcomes approach to quality improvement, doubts about the effectiveness of various improvement initiatives moved Congress in the late 1980s to commission a study on quality assurance for Medicare.¹⁶ The Institute of Medicine (IOM) conducted the study, which found that many health services were inadequate. In response to the IOM findings, the Health Care Finance Administration launched several quality improvement initiatives during the early 1990s.

However, it was the publication of two IOM reports in 1999 and 2001 that finally fixed national attention on the critical need for quality improvement in health care. The first report, *To Err is Human: Building a Safer Health System*, magnified the safety gaps in United States health care, noting that as many as 98,000 people die yearly in hospitals due to preventable medical errors.¹⁷ The second report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, (2001), further indicted the country's entire health care delivery system for failing to provide "consistent, high-quality medical care to all people."¹⁸ Echoing the philosophies of Deming, Juran and Crosby, the reports blamed the health care system, instead of individuals, for widespread errors. "Mistakes can best be prevented by designing the health system at all levels to make it safer — to make it harder for people to do something wrong and easier for them to do it right."¹⁹

The IOM defined quality by *what* and *how well* something is done and attached it to doing the right thing (delivering the health care services that are needed), at the right time (when a patient needs them), and in the right way (using appropriate tests or procedures).¹⁹

In *Crossing the Quality Chasm*, the IOM charged the health care system with frequently lacking "...the environment, the processes, and the capabilities needed to ensure that services are safe, effective, patient-centered, timely, efficient, and equitable," qualities it calls "six aims for improvement." In addition to achieving these aims, the IOM recommended: improving patient safety and reducing medical error by establishing a national focus on leadership, research, tools and protocols about safety; expecting mandatory and voluntary reporting of errors; raising safety standards by involving oversight organizations, purchasers and professional societies; and creating safety systems inside health care organizations.¹⁸

Hospital Quality Measurement Leads to Major Improvement

The development and implementation of standardized quality measurement for hospitals in the first decade of the 21st century led to substantial improvements in performance across a wide variety of evidence-based measures. The Joint Commission convened experts who reviewed and summarized evidence, and produced the first nationally standardized quality measures for hospitals for patients with acute myocardial infarction, heart failure, pneumonia and pregnancy. The Joint Commission required all accredited hospitals to collect and report performance data on at least two of these groups of measures in 2002 and began publicly reporting the data two years later. The Centers for Medicare and Medicare Services (CMS) initiated a program to penalize hospitals financially if they did not report to CMS the same data they were reporting to The Joint Commission and began a public reporting program the next year. Both The Joint Commission and CMS programs expanded their reporting requirements over the second half of that decade.

Hospitals resisted the collection and reporting of these data at the beginning. The American Hospital Association, the Federation of American Hospitals and the

Association of American Medical Colleges vigorously supported the effort to collect and publish data on nationally standardized measures of hospital quality of care.²⁰ As public reporting increased, hospitals increasingly directed resources to improve the clinical processes of care in order to enhance performance on the public measures. The results have been impressive. Throughout the 1990's, it was not uncommon for hospitals to exhibit rates of performance on these quality measures of 40 to 60 percent, with substantial variability among hospitals.²¹⁻²³

By 2009, hospitals had achieved very high levels of performance on many of these measures, and variation among hospitals was markedly reduced.²⁴ For example, the national average of performance by hospitals on discharging eligible acute myocardial infarction patients on a beta blocker was 98.3 percent, up from 87.3 percent in 2002. Also in 2009, on that same measure, fully 96.8 percent of hospitals exhibited rates of performance over 90 percent, compared to 75.2 percent in 2006.

In addition, the need for improvement in hospital quality measurement became clear by 2010. While many measures worked well to promote improvement activities that led clearly to improved outcomes for patients, others did not. In 2010, The Joint Commission adopted new criteria that define a higher standard for quality measures that are used in accountability programs such as accreditation, public reporting and pay for performance.²⁵ These criteria are designed

to maximize the likelihood that improved health outcomes will result when hospitals work to improve their performance, while minimizing unintended consequences and the unproductive work that often results when the design of measures makes it easier to create “paper compliance” than to truly improve clinical care. The Joint Commission perinatal care measures, which meet the new criteria for accountability measures, were adopted for voluntary use by hospitals in 2009 and are discussed in Chapter 11 of this monograph. If widely used by hospitals, they offer the opportunity to greatly improve perinatal care in America's hospitals by employing this model of measurement-driven improvement, which has already delivered consistent excellence across many valid measures of hospital quality of care.

Since the publication of the IOM reports, health care organizations and providers have been exploring ways to improve their practices. Many, like those featured in this monograph, are implementing plans designed to reduce errors and improve patient safety and health care quality. There will always be concerns about individual blame and the threat of litigation. But, as *Toward Improving the Outcome of Pregnancy III* illustrates, clinicians are committed to improving health care delivery. The following chapters will show that improving our system of perinatal care is not just possible; it is happening.

References

1. Kalisch PA, Kalisch BJ. The advance of American nursing (4th ed.). Philadelphia: Lippencott, Williams & Wilkins, 2004.
2. Henry B, Woods S, Nagelkerk J. Nightingale's perspective of nursing administration. *Sogo Kango* 1992;27:16-26.
3. Starr P. The Social Transformation of American Medicine. Basic Books, Inc., 1982:39-124.
4. Buchbinder SB, Shanks NH. Introduction to Health Care Management. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2007.
5. Cooper M. Quality assurance and improvement. In: LF Wolper (ed.), Health care administration, Planning, implementing, and managing organized delivery systems. Gaithersburg, MD: Aspen Publishers, Inc., 1999.
6. Luce JM, Bindman AB, Lee PR. A brief history of health care quality assessment and improvement in the United States. *West J Med* 1994;160:263-8.
7. The Joint Commission. A journey through the history of The Joint Commission. 2006;2010.
8. Johnson KA, Little GA. State health agencies and quality improvement in perinatal care. *Pediatrics* 1999;103:233-47.
9. Kolsar P. The relevance of research of statistical process control to the total quality movement. *Journal of Engineering and Technology Management* 1993;10:317-338.
10. Shewhart W. Economic control of quality of manufactured product. New York, NY: Van Nostrand, 1931.
11. Shewhart W. Statistical method from the viewpoint of quality control. Washington, DC: The Graduate School of the Department of Agriculture, 1939.
12. Juran J. The quality trilogy: A universal approach to managing for quality. Presented at: ASQC 40th Annual Quality Congress in Anaheim, California, May 20, 1986.
13. Donabedian A. Evaluating the quality of medical care. 2005;83:691-729.
14. Hood L. Leddy and Pepper's Conceptual Bases of Professional Nursing: Seventh Edition. Lippencott, Williams & Wilkins.
15. Chassin MR. Is health care ready for Six Sigma quality? *Milbank Q* 1998;76:565,91, 510.
16. Lohr KN. Medicare: A Strategy for Quality Assurance. Washington, DC: National Academy Press, 1990.
17. Institute of Medicine. To Err is Human: Building a Safer Health System. Washington, DC: National Academy Press, 2000.
18. Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: National Academy Press, 2001.
19. Institute of Medicine. Shaping the Future for Health. To Err is Human: Building a Safer Health System. 1999.
20. Hospital Quality Information Fact Sheet. (Accessed September 29, 2010, at www.aamc.org/quality/jointinitiative/1202hqiifactsheet.pdf.)
21. Jencks SF, Cuerdon T, Burwen DR, et al. Quality of medical care delivered to Medicare beneficiaries: A profile at state and national levels. *Jama* 2000;284:1670-6.
22. Krumholz HM, Radford MJ, Wang Y, et al. National use and effectiveness of beta-blockers for the treatment of elderly patients after acute myocardial infarction: National Cooperative Cardiovascular Project. *Jama* 1998;280:623-9.

History of the Quality Improvement Movement

23. Soumerai SB, McLaughlin TJ, Spiegelman D, Hertzmark E, Thibault G, Goldman L. Adverse outcomes of underuse of beta-blockers in elderly survivors of acute myocardial infarction. *Jama* 1997;277:115-21.
24. Improving America's Hospitals. (Accessed September 29, 2010, at www.jointcommission.org/NR/rdonlyres/D60136A2-6A59-4009-A6F3-04E2FF230991/0/2010_Annual_Report.pdf.)
25. Chassin MR, Loeb JM, Schmaltz SP, Wachter RM. Accountability measures — using measurement to promote quality improvement. *N Engl J Med* 2010;363:683-8.



Evolution
of Quality
Improvement in
Perinatal Care

George A. Little, Jeffrey D. Horbar, John S. Wachtel,
Paul A. Gluck, Janet H. Muri

Chapter 2: Evolution of Quality Improvement in Perinatal Care

George A. Little, Jeffrey D. Horbar, John S. Wachtel,
Paul A. Gluck, Janet H. Muri

Childbearing and birth have been, and are, sentinel events for society, women and families. Even before many clinical treatments were available, health professionals recorded fertility rates, pregnancy complications and birth outcomes. As the ability to alter natural biologic processes through individual and population-based interventions increased, the range of outcomes being monitored expanded. • This chapter traces the history of perinatal quality improvement, focusing on advances in perinatal quality improvement (QI) from 1950 through to the present, primarily in the United States, recognizing this restriction is largely artificial, as perinatal science and health policy are global. At this point, one could posit that the domain of perinatal QI starts with preconception and proceeds through to maturity.

TIOP I AND TIOP II

In the 1950s and 60s, medical science led to advances in clinical care of mothers and babies and in public health. Hospital care progressed rapidly, with increasing specialization and intensive care units. The first newborn care units evolved from early centers for premature babies. Rationale for these units included improved outcomes, as interventions, such as treatment of infections, were documented to be effective. Early perinatal clinical trials took place. With recognition that hospital perinatal units improved survival came the study of population-based and regional outcomes. Studies documenting regional variations in outcomes led to the awareness that further improvements may be possible by better matching needs with the allocation of resources and the regionalization of subspecialty care.

Toward Improving the Outcome of Pregnancy, Recommendations for the Regional

Development of Maternal and Perinatal Health Services (1976), better known as TIOP I, was released by an ad hoc Committee on Perinatal Health convened by the March of Dimes, with participation of the American Academy of Family Physicians, American Academy of Pediatrics (AAP), American College (now Congress) of Obstetricians and Gynecologists (ACOG) and the American Medical Association. The central concept of this landmark publication was a system of regionalized care based on designated levels of care at each facility, supported by an educational organization and a network of inter-hospital transport. The document had an immediate and broad impact on perinatal health care delivery by clearly defining the components of subspecialty care at each hospital level and the “ideal” way each of those levels should interact to provide risk-appropriate care across the continuum of perinatal care.¹

Toward Improving the Outcome of Pregnancy, the 90s and Beyond (TIOP II), the 1993 publication produced by a reconstituted ad hoc Committee on Perinatal Health, also convened by the March of Dimes, broadly expanded the operational definition of perinatal care to include preconception through the post-neonatal period. Implicit in TIOP II was the realization that perinatal care has a direct impact on an individual's health long after birth.²

As Table 1 shows, a major difference between TIOP I and II was a strong emphasis in the latter on data, documentation and evaluation. TIOP II, with its broader operational definition of the perinatal period, gave more attention to ambulatory care, while continuing to underscore the need for improvement of hospital care. TIOP II also emphasized concepts, such as accountability and availability. Quality improvement was a major message and recommendation in TIOP II, and, as seen in the discussion to follow, it has evolved to be increasingly dynamic in the perinatal care system environment.

Table 1: Summary of TIOP I and TIOP II Publications

	TIOP I	TIOP II
Year Published	1976	1993
Focus	A regional perinatal care system	Care before and during pregnancy Care during birth and beyond Data documentation and evaluation Financing
Primary Recommendations	Levels of care Level I — Uncomplicated maternity and newborn Level II — Uncomplicated and majority of complicated Level III — Uncomplicated and all serious complications Preparatory and continuing education in regional system Coordination and communication in regional system Major task ahead — financing, education, initiating action	Health promotion and education Reproductive awareness Structure and accountability Preconception and interconception care Ambulatory prenatal care Inpatient patient care Infant care Improving the availability of perinatal providers Data, documentation and evaluation Financing perinatal care

Quality Improvement and the Impetus for TIOP III

Evolution of the perinatal health care system from the 1970s to the present is well documented. Diverse scientific, system, policy and reimbursement changes increasingly came into play during the 1970s, 1980s and 1990s, while the United States implemented a system based upon matching the perinatal patient with the most risk-appropriate care and resulting in major improvements in outcomes, such as neonatal survival rates.

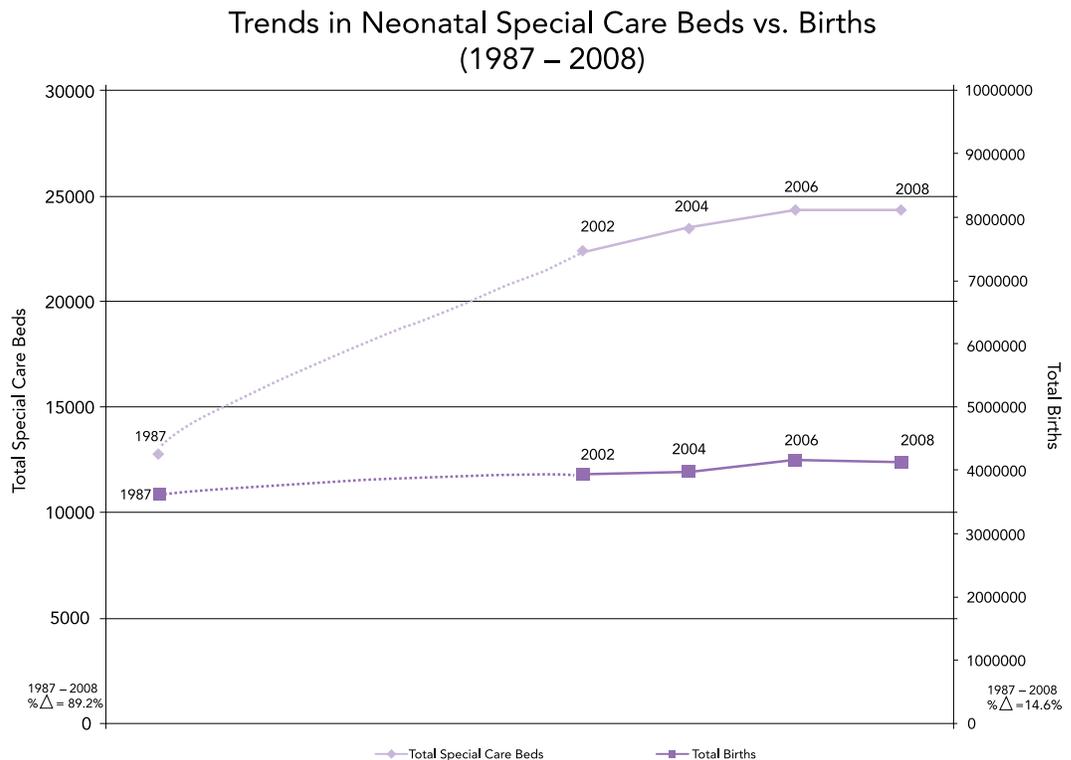
As the expansion of beds, manpower and resources continued beyond academic centers and into community hospitals, concerns about the “de-regionalization” of care and the possible impact on quality began to emerge and, in part, drove the publication of TIOP II. Figure 1 displays the modest growth in United States births (14.6 percent) between 1987 and 2008, compared to the significant growth in neonatal special care beds. Improvements in access and

quality may not have mirrored this growth.³ Critical to any current discussion is a determination of what is the right volume and allocation of subspecialty resources, especially in a climate where outside scrutiny of outcomes and cost of care is likely to increase.

Role of Professional Organizations

Many tools, especially health information technology, have strengthened the ability of care providers and facilities to actively participate in quality improvement. Professional organizations representing the many disciplines in perinatal care, including obstetrics, pediatrics, family medicine, certified nurse midwifery and nursing, have been involved in QI through members and public education to affect change in provider behavior. While each organization has a separate governing structure, many have worked collaboratively to improve quality of care by continuing to publish evidence-based research studies and set the

Figure 1: Trends in Neonatal Special Care Beds and United States Births⁴



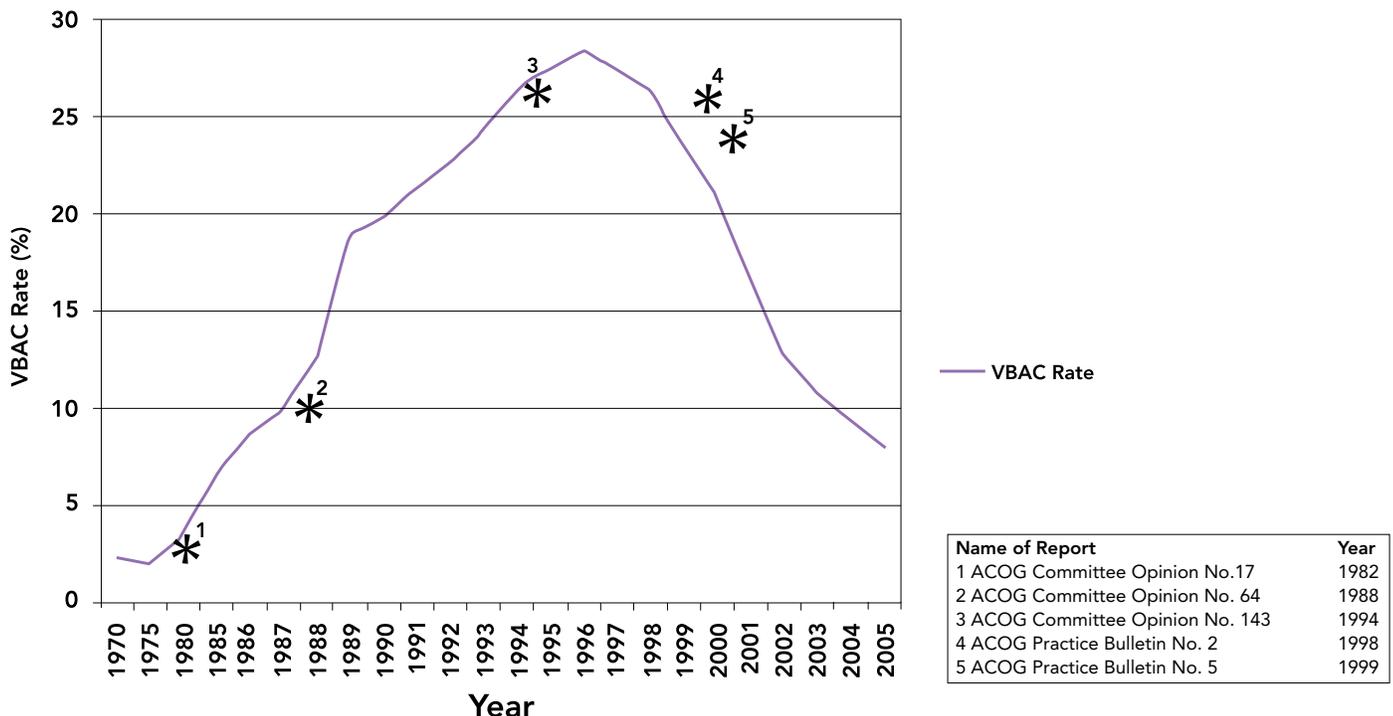
AHA Annual Survey of Hospitals

standard of care through publications, such as the TIOP documents and *Guidelines for Perinatal Care*, jointly published by AAP and ACOG every 5 years since 1983. In addition, and in response to numerous hospital requests for peer-review services of their obstetrics and gynecology departments, ACOG established the Voluntary Review of Quality of Care Program (VRQC) in 1986. The VRQC program provides confidential peer-review consultation to OB/GYN departments on request and is completely voluntary. These comprehensive department reviews are intended to assess quality of care and patient safety and lead to extensive recommendations for improvement in patient care. By 2010, the VRQC program had completed more than 275 hospital reviews, representing nearly 10 percent of hospitals in the United States providing obstetrical services. A four-day site visit is scheduled with a five-person team consisting of three board-certified OB/GYNs in active practice who have experience and training in qual-

ity assessment and improvement, a nurse reviewer and a team administrator who is a professional writer. Following a comprehensive department review, including one full day of interviews and one full day of selected chart reviews, a very detailed, confidential final report is produced with findings and recommendations based upon ACOG published guidelines. This report is protected under appropriate state peer-review statutes. While almost every hospital surveyed has implemented many of the suggested process improvements, the VRQC program has been unable to capture data from the various hospitals documenting improved outcomes as a result of the changes.⁵

Figure 2 shows how the impact of a professional organization's recommendations, in this case ACOG, can directly change provider behavior and improve quality. The graph depicts the vaginal birth after cesarean section (VBAC) rate (defined as the rate/100 women with a successful vaginal delivery after previous cesarean

Figure 2: VBAC Rate by Year⁶⁻¹⁰



delivery) from 1970 through 2005. The asterisks indicate when significant ACOG publications on the subject were released. The initial 1982 publication was the first to recommend the practice.⁶ By 1988, ACOG guidelines “encouraged” providers to allow labor for appropriate candidates.⁷ The 1994 publication reiterated that properly selected women be counseled and encouraged and that an obstetrician be “readily” available.⁸ By 1998, in response to evidence about potential complications, ACOG recommended that women “should be counseled and offered (not encouraged) a trial of labor.”⁹ In 1999, guidelines suggested that physicians be “immediately” available. By 2005, the VBAC rate again approximated the 1985 level.¹⁰ In 2010, ACOG published a further update to its prior recommendations about VBAC that relaxed some of the previous restrictions.¹¹ It will be interesting to follow any subsequent changes to the national VBAC rates based on this update.

Role of Government and Regulators in Perinatal Quality of Care

Federal and state governments, especially after the release of TIOP I, were instrumental in guiding the evolution of the perinatal system and QI efforts. Many states readily adopted TIOP I’s level of care definitions in the context of regulations and guidelines, especially with regard to Certificate of Need (CON) applications, thereby driving the expansion of regional systems. Governmental stimulation and support has also included research and program efforts, with collaborative and population-based statewide quality improvement efforts.

As a major purchaser of health care services, the government also has significant influence over providers. Medicare took the lead in tying improvements in utilization of inpatient care to payments by introducing Diagnosis Related Group (DRG) reimbursement in 1983. While perinatal patients clearly fall outside the realm of Medicare reimbursement changes, many payers adopted the DRG reimbursement model for

perinatal care, driving some of the same utilization changes. As Medicare has evolved, tying reimbursement to the reporting of adult quality metrics, it is only a matter of time (and already occurring in some states) before the public reporting and pay-for-performance of perinatal quality measures reaches the state Medicaid system. The hope is that TIOP III can help drive the perinatal community to be active participants in that process.

The Joint Commission, as the primary accrediting body for most health care facilities in the United States, plays a significant role in choosing quality measures that will be reported by hospitals. The Joint Commission’s focus has been largely on adult measures in concert with Medicare; however, it recently updated its Perinatal Care (PC) Core Measure Set. Among the 17 perinatal measures endorsed by the National Quality Forum (NQF), The Joint Commission selected five: elective delivery, cesarean section, antenatal steroids, health care-associated bloodstream infections in newborns and exclusive breastmilk feeding.

Role of Foundations, Collaboratives and other Nonprofit Organizations

Perinatally related goals have been a long-term primary focus of foundations and nonprofit organizations and a vital force in quality improvement.

The March of Dimes has played a leadership role in this arena since before the publication of TIOP I in 1976.¹ While the March of Dimes is the primary convener of TIOP I, II, and 3, it is but one of many organizations involved in perinatal improvement.

The Institute for Healthcare Improvement (IHI), a nonprofit organization that works to increase the quality of patient care by introducing improvements throughout the health care system, developed the “Idealized Design of Perinatal Care Model” and took a lead role in defining the continuum of high-quality care, from an informed woman and family to providing risk-appropriate care in a setting adequately resourced to meet all needs.¹²

Perinatal medicine has been involved in the increasingly common multi-institutional collaborative methodology to improve the quality and safety of care. Two early models that have informed this approach are IHI's Breakthrough Series¹³ and the Northern New England Perinatal Quality Improvement Network.¹⁴ Most collaboratives consist of multidisciplinary teams that work together with expert faculty to apply quality improvement methods adopted from other industries to test and implement change ideas designed to improve care.¹⁵ A number of examples, illustrating the breadth of active collaborative perinatal initiatives follow.

The Vermont Oxford Network (VON) conducted the first formal improvement collaborative in neonatology in 1995. Analysis demonstrated measurable improvements in both chronic lung disease and nosocomial infections at participating neonatal intensive care units (NICUs), when compared to a control group of non-participating NICUs.¹⁶ In addition to the clinical improvements, costs of care of participating NICUs were reduced, demonstrating that quality improvement can result in cost reduction.¹⁷ Subsequently, VON and other groups have conducted neonatology collaboratives addressing a variety of improvements in quality and safety.

Three examples of cluster randomized trials of collaborative quality improvement in neonatology are shown in Table 2.

The Maryland Perinatal Collaborative is a statewide initiative to test, adopt and implement evidence-based improvement strategies in obstetric units at hospitals in Maryland and the District of Columbia. More than 250 perinatal professionals in hospital multidisciplinary teams conducted a self-assessment and chose the improvement activity that best met its needs. Process, outcome and satisfaction measures, along with development of case studies and “improvement stories,” were employed. Notable improvements in Level I, II and III units were documented, such as a decrease in uterine rupture rate and decrease in returns to the operating room/labor and delivery. Level III units had a 23 percent decrease in admissions to the NICU for babies > 2500g with a greater-than-24-hour stay.²¹

State collaboratives, such as the Maryland example, are a dynamic, growing, productive and influential force in perinatal quality improvement. Their lineage can be traced in many states to state/regional programs initiated immediately after the release of TIOP I. While the original state education programs put in place to improve care have tended to atrophy, they still exist in a few geographic areas and live on in collaboratives that focus on identifying evidence and data for statewide system change or improvement.

Table 2: Cluster Randomized Trials¹⁸⁻²⁰

Collaborative	Participants	QI Focus	Findings
VON	114 member NICUs	Promote surfactant treatment in preterm infants 23 to 29 weeks	Infants in intervention hospitals more likely to receive surfactant in the delivery room
NICHD Neonatal Research Network	17 NICUs	Reduce risk of CLD in VLBW infants	Clinical practice can be changed with Quality Improvement
Canadian Neonatal Network	—	Reduction in CLD or nosocomial infections	Improvement in both CLD and infection rates

(VLBW: very low birth weight; CLD: chronic lung disease ; NICHD: National Institute of Child Health & Human Development)

The Ohio Perinatal Quality Collaborative (OPQC) is another example of a successful state initiative with diverse strategies for quality improvement. OPQC was founded in 2007 as a collaboration of providers, payers and state agencies that uses quality improvement methods to improve perinatal health statewide.²² OPQC publishes a monthly graph on its website, communicating across the spectrum of providers as well as consumers, clearly hoping to engage a new audience in the reporting of quality perinatal outcomes.²³

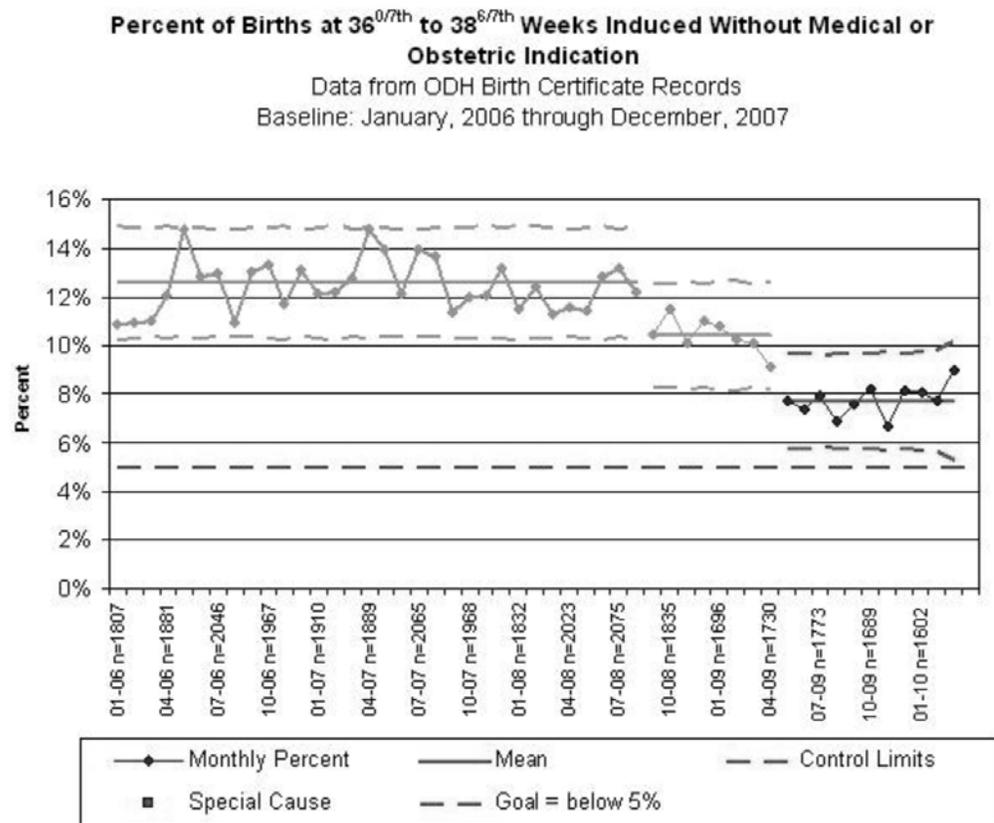
The material in Figure 3, including the caption, is an actual Ohio Perinatal Quality

Collaborative aggregate outcome chart that is available to the public electronically. They are released periodically.

Aims for Improvement

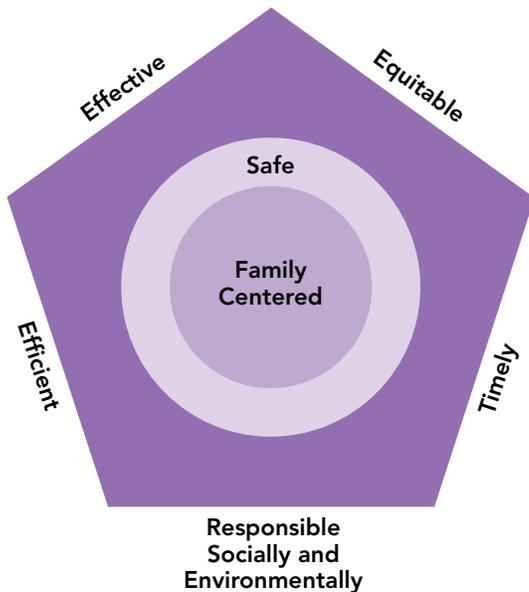
The Institute of Medicine's landmark publication, *Crossing the Quality Chasm: A New Health System for the 21st Century*, references the six aims for improvement in care: care that is family centered, safe, effective, equitable, timely and efficient.²⁴ Figure 4 adds a seventh key domain, social and environmental responsibility, with patients and families at the center of improvement efforts.²⁵

Figure 3: Ohio Perinatal Quality Collaborative²³



This is the Ohio Perinatal Quality Collaborative's (OPQC, www.OPQC.net) aggregate control chart for inductions of labor at 36 to 38 weeks gestational age without apparent medical or obstetric indication for 20 Ohio maternity hospitals accounting for 47 percent of Ohio births (Am J Ob Gyn 243.e1-8). The data for this analysis is derived from Ohio birth certificates, which do not permit exclusion of all indicated inductions. For example, abruption as an indication is not reported on birth certificates. The intervention began September 2008. The centerline (mean) was recalculated, as shown, on two occasions because of statistically significant change.

Figure 4: Seven Key Themes for Quality Improvement²⁵



Seven key themes for quality improvement used by the Vermont Oxford Network NICQ Collaboratives. (adapted from reference 25, reprinted with permission from the Vermont Oxford Network)

Conclusion and Recommendations

This chapter has provided a history of perinatal quality improvement. There has been great progress, as well as many developments that provide encouragement for the future. The continuing expansion of multi-hospital collaboratives will greatly improve

the rapid dissemination of evidence-based protocols and processes. There are, of course, challenges to be addressed, as well as the following recommendations:

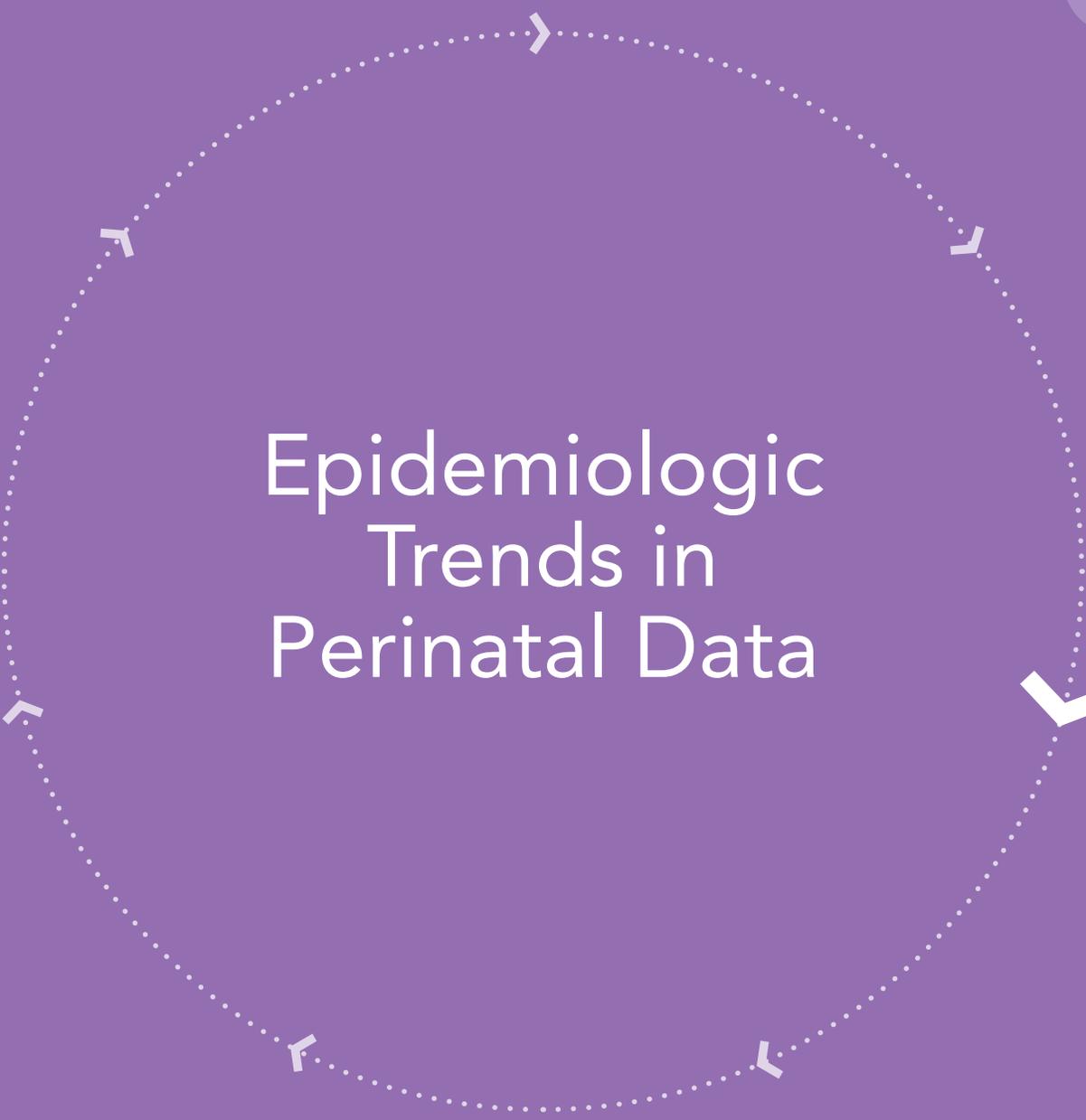
1. State regulatory agencies should try to adopt a standard definition of levels of perinatal care, to enhance quality improvement by allowing comparisons of outcomes across units within and across states and to enable providers to assess and be held accountable for population-based perinatal outcomes (total cohort accountability).²⁶
2. Use of The Joint Commission Perinatal Care Core Measure Set should be encouraged and incentivized. Use and measurements of other National Quality Forum-endorsed perinatal measures also should be encouraged.
3. Patients and families should be offered the opportunity to participate in all quality improvement initiatives.

The legacy of improving perinatal outcomes stated so clearly in TIOP I is a dynamic process that has matured in sophistication and productivity. Evolution of commitment and methodology will continue across all current collaborators, and the growing inclusion of patients and their families in the process shows great promise.

References

1. Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy: Recommendations for the Regional Development of Maternal and Perinatal Health Services. White Plains, NY: March of Dimes National Foundation, 1976.
2. Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy: The 90s and Beyond. White Plains, NY: March of Dimes National Foundation, 1993.
3. Goodman DC, Fisher ES, Little GA, Stukel TA, Chang CH, Schoendorf KS. The relation between the availability of neonatal intensive care and neonatal mortality. *N Engl J Med* 2002;346:1538-44.
4. AHA. Reports and Studies. American Hospital Association, 2010.
5. Lichtmacher A. Quality assessment tools: ACOG Voluntary Review of Quality of Care Program, Peer Review Reporting System. *Obstet Gynecol Clin North Am* 2008;35:147,62.

6. ACOG Committee Opinion No. 17, January 1982. Guidelines for Vaginal Delivery After a Cesarean Childbirth. *Obstet Gynecol* 1982.
7. ACOG Committee Opinion No. 64, October 1988. Guidelines for Vaginal Delivery After a Cesarean Childbirth. *Obstet Gynecol* 1988.
8. ACOG Committee Opinion, Number 143: Guidelines for Vaginal Delivery After Cesarean Childbirth. 1994.
9. ACOG practice bulletin. Vaginal birth after previous cesarean delivery. Number 2, October 1998. Clinical management guidelines for obstetrician-gynecologists. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 1999;64:201-8.
10. ACOG practice bulletin. Vaginal birth after previous cesarean delivery. Number 5, July 1999 (replaces practice bulletin number 2, October 1998). Clinical management guidelines for obstetrician-gynecologists. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 1999;66:197-204.
11. ACOG Practice bulletin no. 115: Vaginal birth after previous cesarean delivery. *Obstet Gynecol* 2010; 116:450-63.
12. About Us. Institute for Healthcare Improvement, 2010.
13. The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement. In: IHI Innovation Series white paper. Boston, MA. Institute for Healthcare Improvement, 2003.
14. Northern New England Perinatal Quality Improvement Network. NNEPQIN Mission. 2010.
15. Hughes R. Patient and Safety Quality: An Evidence-Based Handbook for Nurses. In: Tools and Strategies for Quality Improvement and Patient Safety. Rockville, MD: Agency for Healthcare Research and Quality (US), April 2008.
16. Horbar JD, Rogowski J, Plsek PE, et al. Collaborative quality improvement for neonatal intensive care. NIC/Q Project Investigators of the Vermont Oxford Network. *Pediatrics* 2001;107:14-22.
17. Rogowski JA, Horbar JD, Plsek PE, et al. Economic implications of neonatal intensive care unit collaborative quality improvement. *Pediatrics* 2001;107:23-9.
18. Horbar JD, Carpenter JH, Buzas J, et al. Collaborative quality improvement to promote evidence based surfactant for preterm infants: a cluster randomised trial. *Bmj* 2004;329:1004.
19. Walsh M, Lupton A, Kazzi SN, et al. A cluster-randomized trial of benchmarking and multimodal quality improvement to improve rates of survival free of bronchopulmonary dysplasia for infants with birth weights of less than 1250 grams. *Pediatrics* 2007;119:876-90.
20. Lee SK, Aziz K, Singhal N, et al. Improving the quality of care for infants: a cluster randomized controlled trial. *Cmaj* 2009;181:469-76.
21. The Maryland Hospital Association and Delmarva Foundation for Medical Care. Creating a foundation of excellence: Five years of innovation in patient safety. Maryland Patient Safety Center. 2008 Annual Report. 2008.
22. Donovan EF, Lannon C, Bailit J, Rose B, Iams JD, Byczkowski T. A statewide initiative to reduce inappropriate scheduled births at 36(07)-38(6/7) weeks' gestation. *Am J Obstet Gynecol* 2010;202(3):243 e1-8.
23. Ohio Perinatal Quality Collaborative Monthly Graphs. Available at www.opqc.net/monthly-graph.
24. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press, 2001.
25. Horbar JD, Soll RF, Edwards WH. The Vermont Oxford Network: a community of practice. *Clin Perinatol* 37:29-47.
26. Little GA. Variation, perinatal regionalization and total cohort accountability. *J Perinatol* 2009;29:777-8.



Epidemiologic Trends in Perinatal Data

Vani R. Bettegowda, Eve Lackritz, Joann R. Petrini

Chapter 3: Epidemiologic Trends in Perinatal Data

Vani R. Bettegowda, Eve Lackritz, Joann R. Petrini

The epidemiology of perinatal health in the United States has changed dramatically during the past several decades. This chapter provides the current status of key perinatal health indicators, including rates of and contributors to preterm birth. Opportunities for intervention and change in our major data collection and reporting systems are also reviewed.

A robust national vital statistics system is imperative to assess trends in perinatal health and identify emerging issues that require further investigation and response.

Perinatal Trends

A robust national vital statistics system is imperative to assess trends in perinatal health and identify emerging issues that require further investigation and response. Perinatal data as reported from birth and death certificates are fundamental to monitoring the well-being of mothers and infants in the United States. The majority of perinatal data presented in this chapter are from the National Vital Statistics System, National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). Infant mortality rates presented are from the birth/infant death data set, which contains information from the birth certificate linked to the infant's death certificate, allowing for more in-depth analyses of trends. In 2003, the United States Standard Certificate of Live Birth was revised to include additional detailed information on pregnancy health, risk factors and birth outcomes. By 2009, only 30 states, District of Columbia and New York City had implemented the 2003 revised United States Standard Certificate of Live Birth, hindering the ability to compare temporal and regional prenatal care and delivery method data, as well as new data items, such as trial of labor and admission to neonatal intensive care units (NICUs).

Infant Deaths

Infant mortality is a commonly accepted indicator of the overall well-being and health of a nation. In the United States, approximately two-thirds of infant deaths occur in the neonatal period (the first month of life).¹ Despite a marked decrease in the last century, infant mortality rates remained relatively stable and declined only 3 percent between 2000 and 2006 (6.9 and 6.7 per 1,000 live births, respectively).¹ Although neonatal mortality rates declined dramatically in the 1970s to the 1990s primarily due to advances in neonatal critical care, neonatal mortality rates remained essentially unchanged in recent years (4.6 and 4.5 per 1,000 live births in 2000 and 2006, respectively) (Figure 1).^{1,2} Rates of postneonatal mortality (deaths of infants between 28 and 364 days of life) also remained relatively stable between 2000 and 2006 (2.3 and 2.2 per 1,000 live births, respectively).^{1,2}

For more than two decades, birth defects have been categorized as the leading cause of infant mortality, followed by “prematurity/low birthweight not elsewhere classified.” Prematurity/low birthweight is the leading cause of infant death among black infants and the most common cause of neonatal mortality overall. Infant deaths due to

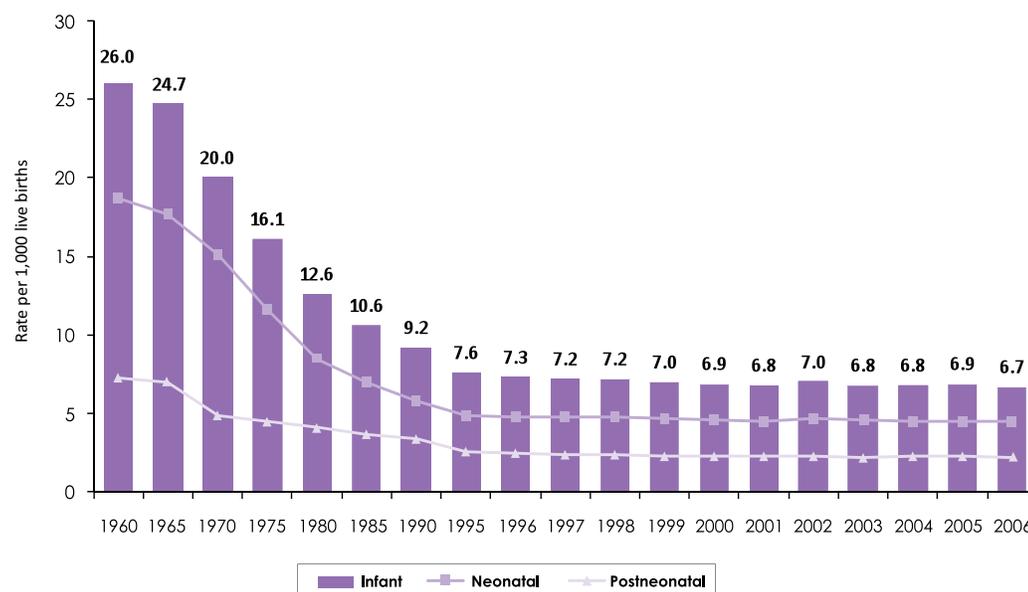
prematurity/low birthweight increased approximately 5 percent between 2000 and 2006 (108.4 to 113.5 per 100,000 live births), while deaths due to birth defects decreased more than 3 percent during this same period (141.8 to 137.1 per 100,000 live births).^{1,2} Preterm-related causes, a recently developed grouping of causes of death intended to more fully capture the impact of preterm birth as the underlying cause of infant deaths, accounted for more than one-third (36.1 percent) of infant deaths.¹ At least one-third of postneonatal deaths are due to potentially preventable causes of death, including sudden infant death syndrome (SIDS), injuries and infections.³ However, identifying effective strategies to prevent preterm birth, the most frequent cause of death during the neonatal period, will require continued research.

Fetal Deaths and Perinatal Mortality

Fetal deaths, spontaneous intrauterine death regardless of the duration of pregnancy, are a significant reproductive concern, with an estimated 1 million fetal deaths reported annually in the United States.⁴ Fetal deaths at 20 weeks of gestation or more, often termed “stillbirth,” affect approximately 1 in 160 deliveries.⁵ Yet, fetal deaths have not been studied as closely as infant deaths and, consequently, are poorly understood.

There are varying definitions of perinatal mortality, and NCHS reports trends for two different definitions. Perinatal mortality definition I, defined as infant deaths at less than seven days of age and fetal deaths at 28 or more weeks gestation, is used for international and state comparisons to account for variations of completeness in reporting fetal deaths at 20 to 27 weeks gestation. Perinatal mortality definition II

Figure 1: Infant, Neonatal, Postneonatal Mortality, United States, 1960-2006

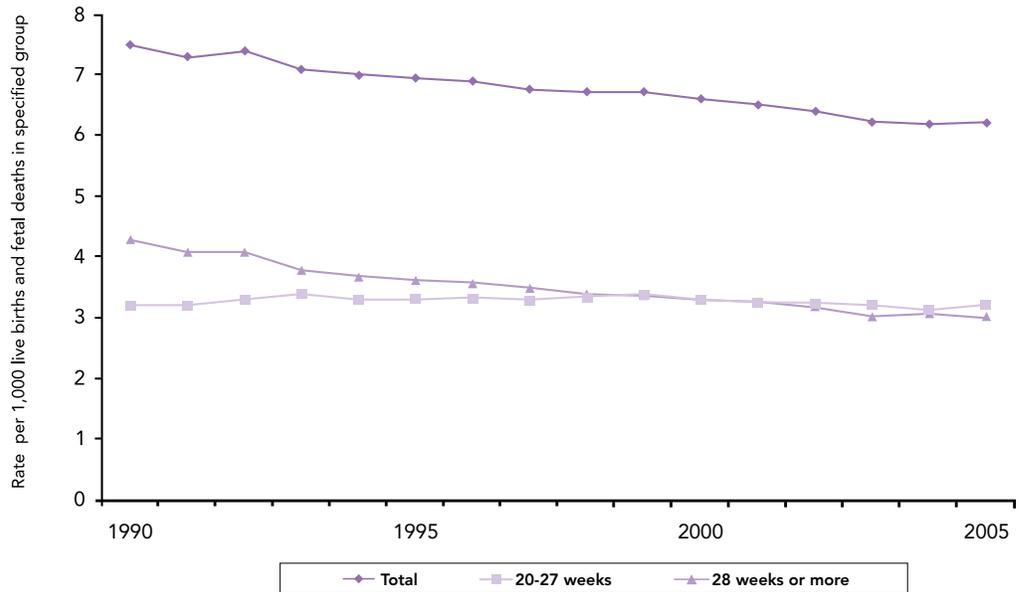


A neonatal death occurs in the first 28 days of life. A postneonatal death occurs between 28 days and one year of life. Source: National Center for Health Statistics, 1960-1990 final mortality data, 1995-2006 period linked birth/infant death data.

Prepared by the March of Dimes Perinatal Data Center, 2010.

Improved and consistent reporting of fetal deaths is needed to understand the underlying risks associated with perinatal death and strategies for prevention.

Figure 2: Fetal Mortality Rates by Gestational Age United States, 1990-2005



Source: National Center for Health Statistics, fetal death data.

is more inclusive and includes infant deaths at less than 28 days of age and fetal deaths at 20 or more weeks gestation. Definition II is helpful in monitoring perinatal mortality rates throughout the gestational period, since most fetal deaths occur before 28 weeks gestation.⁴

Fetal mortality rates (fetal deaths of 20 weeks of gestation or more) decreased 17 percent between 1990 and 2003, from 7.5 to 6.2 per 1,000 live births and fetal deaths, primarily due to a decrease in the number of reported late fetal deaths (28 weeks of gestation or more). Fetal mortality rates did not decline significantly between 2003 and 2005 (Figure 2).⁴ In 2005, there were 25,894 fetal deaths (20 weeks of gestation or more), almost equal to the number of infant deaths (28,384 infant deaths in 2005)^{2,4}

Neonatal deaths and stillbirths may have similar root causes, and perinatal mortality rates are calculated to monitor both of these obstetric events around the time of delivery. For both definitions, there was a decrease in perinatal mortality rates between 1990 and 2003, and rates remained relatively

unchanged between 2003 and 2005. There was a steeper decrease in the perinatal mortality rate for definition I, since almost all of the decrease in fetal deaths occurred among late fetal deaths.⁴ For definition I, the perinatal mortality rate decreased 25 percent between 1990 and 2003 (from 9.0 to 6.7 per 1,000 live births and fetal deaths) and remained stable at 6.6 in 2005; while, for definition II, the perinatal mortality rate decreased 17 percent between 1990 and 2003 (from 13.1 to 10.8 per 1,000 live births and fetal deaths) and also remained relatively unchanged at 10.7 in 2005.⁴

More than half (58 percent) of all perinatal deaths in the United States are fetal deaths occurring at 20 weeks of gestation or more, but less is known about their incidence and etiology.⁴ Challenges to the reliability and quality of fetal death data include differences in state reporting requirements and the completeness of fetal death certificate reporting.^{4,6} Improved and consistent reporting of fetal deaths is needed to understand the underlying risks associated with perinatal death and strategies for prevention.

Gestational Age

Preterm birth (less than 37 completed weeks gestation) is a serious clinical and public health problem, affecting more than half a million births in the United States each year, or 1 in every 8 births. Rates of preterm birth have increased 35 percent since 1981 (9.4 percent to 12.7 percent in 2007).⁷ Infants born prematurely are at increased risk for newborn death and morbidity, including respiratory problems and developmental delays. Estimates of societal economic costs associated with preterm birth total more than \$26 billion annually.⁸

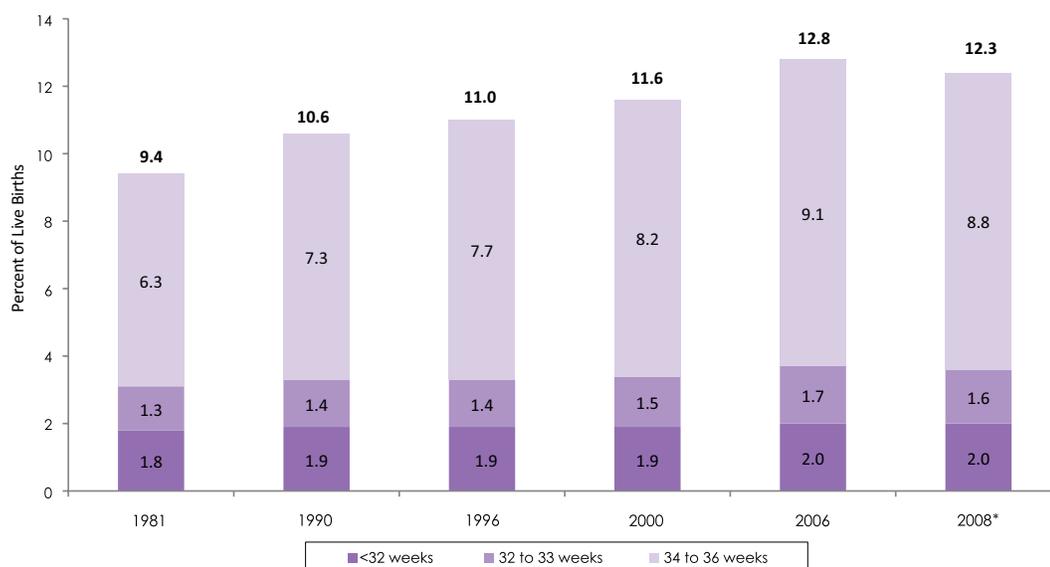
Infants born very preterm (less than 32 weeks completed gestation) are at greatest risk of death and long-term disability and accounted for 2.0 percent of live births in 2007.⁷ During the last two decades, rates of very preterm birth have remained steady, while late preterm births (between 34 and 36 weeks gestation) increased 43 percent (6.3 percent in 1981 to 9.0 percent in 2007).^{7,9} However, 2008 preliminary data

suggest a decline in rates of late preterm and preterm births (8.8 percent and 12.3 percent in 2008, respectively) (Figure 3).¹⁰ Late preterm births comprise more than 70 percent of all preterm births and are the fastest growing subgroup of preterm births.¹¹ Compared to term infants, these infants have a higher incidence of morbidity, including respiratory distress syndrome, temperature instability and jaundice and have three times the infant mortality rate.^{12,13} Late preterm births require more resources than term births, such as longer hospital stays and higher hospital costs associated with NICU admissions.¹⁴

The gestational age distribution of term births (37 to 41 completed weeks gestation) has changed since the 1990s. Between 1990 and 2007, births at 37 and 38 weeks gestation increased 45 percent (from 19.7 percent to 28.6 percent of all live births), while births at 40 and 41 weeks gestation decreased by 26 percent, (from 36.7 percent to 27.2 percent of all live births).¹⁵ Recent

Further investigation of short-term and long-term outcomes of infants stratified by gestational age is needed to guide optimal obstetric and neonatal management.

Figure 3: Preterm Births by Gestational Age, United States, 1981-2008*



*Preliminary. 2008 gestational age categories do not sum to total due to rounding. Very preterm is less than 32 completed weeks gestation. Late preterm is between 34 and 36 weeks gestation. Preterm is less than 37 completed weeks gestation. Sources: Raju TN. Epidemiology of late preterm (near-term) births. Clin Perinatol 2006;33(4):751-63. National Center for Health Statistics, final natality data and 2008 preliminary natality data. Prepared by the March of Dimes Perinatal Data Center, 2010.

evidence shows disparate birth outcomes for infants born at 37 and 38 weeks gestation, compared to infants born at 39 and 40 weeks gestation. A study by Zhang and Kramer¹⁶ revealed that despite a low absolute risk of infant death at term, singleton infants born at 37 weeks had increased neonatal mortality rates, compared to infants born at 40 weeks (0.66 and 0.34 per 1,000 live births, respectively). Recent studies of elective deliveries found increased rates of respiratory problems and admission to NICUs for infants born at 37 and 38 weeks, compared to those born at 39 weeks.^{17,18} Further investigation of short-term and long-term outcomes of infants stratified by gestational age is needed to guide optimal obstetric and neonatal management.

Birthweight

Low birthweight (<2500 grams or 5½ pounds) and preterm birth are inter-related. Infants are born low birthweight because they are born preterm, experience intrauterine growth restriction, or both. More than 43 percent of preterm births also are born low birthweight, and nearly 67 percent of low birthweight infants are born preterm.¹⁵ In 2007, 8.2 percent of live births, or 1 in 12 infants, were born low birthweight and 1.5 percent of infants were born very low birthweight (<1500 grams or 3⅓ pounds) in the United States.⁷ In the past two decades, rates of low birthweight have increased 21 percent (from 6.8 percent in 1981 to 8.2 percent in 2007), and rates of very low birthweight have increased 25 percent (1.2 percent in 1981 to 1.5 percent in 2007).⁷ According to 2008 preliminary birth data, rates of low birthweight and very low birthweight remained unchanged (8.2 percent and 1.5 percent, respectively).¹⁰

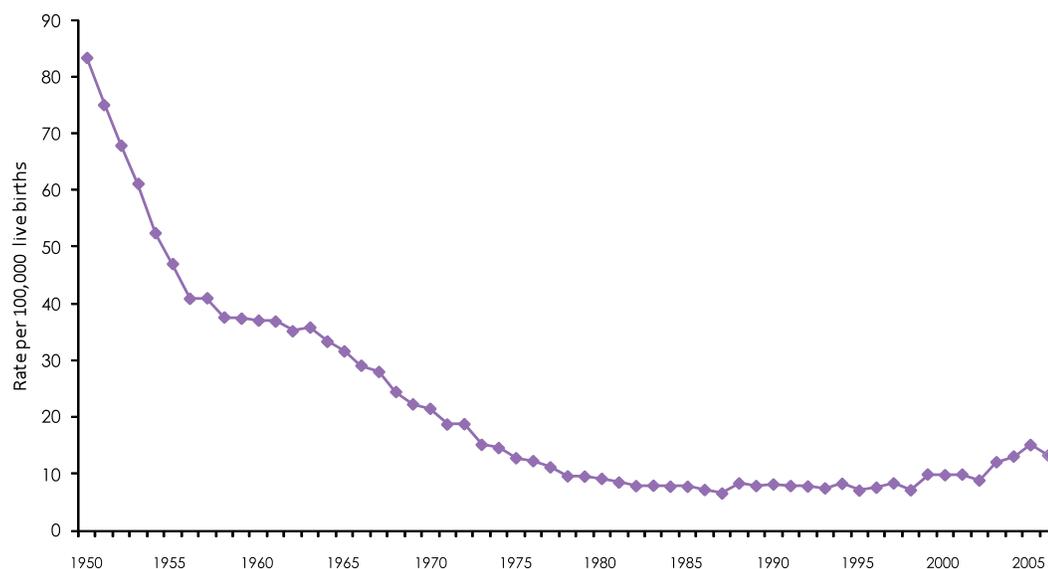
Low-birthweight infants are at increased risk for neonatal morbidities, long-term disability and death.¹⁹ Very low-birthweight infants are more than 100 times as likely and low-birthweight babies are more than 25 times as likely to die in the first year of life compared with infants not born

low birthweight.³ Although improvements in neonatal care¹⁹ have increased infant survival, research is needed to address the underlying causes of low birthweight and its relationship to preterm birth, in order to reverse increasing low-birthweight trends.

Maternal Mortality

When reporting maternal death, the National Center for Health Statistics relies on the World Health Organization definition: “The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.”²⁰ After a period of steep decline following the 1950s, when the maternal mortality rate was approximately 83 deaths per 100,000 live births, maternal deaths in the United States began to increase between 2002 and 2006 (8.9 to 13.3 per 100,000 live births) (Figure 4).²¹ In 2002, a new question was added to the Standard Certificate of Death to utilize additional codes identified in the International Classification of Diseases, tenth revision (ICD-10) for deaths related to pregnancy, and facilitated the identification of late maternal deaths, deaths caused by pregnancy that occurred from 43 days to 1 year postpartum.²² The addition of a separate pregnancy status question on the death certificate in 2002 resulted in an increase in the reported maternal mortality rate.²²

Maternal mortality rates will likely increase, as more states adopt the revised death certificate. In addition, a recent study in Maryland found that enhanced surveillance efforts, which include linking maternal death certificates with infant birth and fetal death records, along with review of medical examiner records and death certificates, led to higher reported maternal mortality rates than information from death records alone.²³ Nationally, enhanced ascertainment through CDC’s Pregnancy

Figure 4. Maternal Mortality Rates, United States, 1950-2006

A neonatal death occurs in the first 28 days of life. A postneonatal death occurs between 28 days and one year of life.
Source: National Center for Health Statistics, 1960-1990 final mortality data, 1995-2006 period linked birth/infant death data.

Prepared by the March of Dimes Perinatal Data Center, 2010.

Related Mortality Surveillance System (PMSS) captures and evaluates reported deaths causally related to pregnancy from all available information, including death certificates, maternal mortality review committee reports, autopsy reports and matched birth and fetal death certificates.²⁴ Although maternal deaths are relatively rare events, research and improved surveillance are needed to evaluate whether the recent increase in maternal mortality in the United States is real or due to increased reporting associated with the addition of a pregnancy status question on the death certificate.

Neonatal Morbidity and Developmental Outcomes

While infant mortality rates have declined over the past several decades, the resulting improved survival may mean increases in morbidity, particularly for those infants at younger gestational ages. About 10 percent of all newborns in the United States are

admitted to a NICU due to birth defects, prematurity or problems associated with delivery.²⁵ Advances in neonatal care, such as surfactant therapy and antenatal corticosteroids, are now widely available and have increased the survival of infants admitted to the NICU.²⁶ A recent study of low-risk spontaneous, singleton, late preterm deliveries demonstrated a strong relationship between gestational age and neonatal morbidities (e.g., NICU admission, respiratory and infectious morbidities). Neonatal morbidities decreased gradually as gestational age increased from 34 weeks and reached a nadir at 39 weeks²⁷ underscoring the importance of monitoring neonatal morbidities in addition to mortality. However, tracking systems are generally not available to evaluate these outcomes, which are often identified after the infant is discharged from the hospital. Clinical data systems that link patient encounters across the continuum of health care are critical to monitoring the morbidities that may result from improved infant survival.

Clinical data systems that link patient encounters across the continuum of health care are critical to monitoring the morbidities that may result from improved infant survival.

Research on long-term neurodevelopmental and school-related outcomes have focused almost exclusively on the highest risk infants who are very preterm and very low birthweight. Studies of these vulnerable infants have demonstrated moderate-to-severe deficits in academic achievement and behavior problems, which correlate strongly with immaturity at birth.²⁸ Much less is known about the growing number of infants born late preterm, but emerging evidence suggests that these infants are more likely to develop cerebral palsy and are slightly more likely than babies born term to have developmental delays.^{29,30} One recent study found late preterm infants had lower reading and math scores in first grade and were more likely to participate in special education compared with those born at term.³¹ These findings highlight the need to assess long-term outcomes of late preterm infants to adequately weigh risks and benefits of late preterm deliveries. More studies beyond

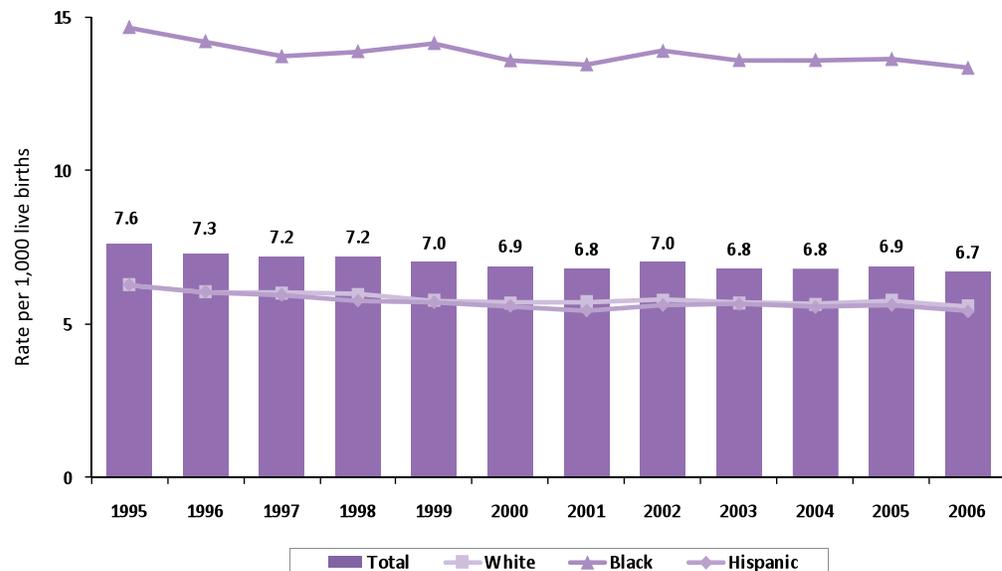
the neonatal period are needed to examine factors associated with developmental and intellectual disabilities manifested in childhood and later in life.

Disparities in Perinatal Outcomes

Considerable disparities in perinatal outcomes by race/ethnicity, maternal age and geography persist, despite efforts to narrow these gaps. For example, adverse birth outcomes among infants of black mothers are disproportionately higher than those of their counterparts in other racial/ethnic groups, across all economic and education strata.

While infant mortality has reached historic lows, infants born to non-Hispanic black mothers are more than twice as likely as infants born to non-Hispanic white mothers to die in the first year of life (13.4 and 5.6 per 1,000 live births in 2006) (Figure 5).¹ While the gap in mortality rates for black and white infants has narrowed slightly, the rate for black infants consistently remained

Figure 5: Infant Mortality by Race/Ethnicity, United States, 1995-2006



Source: National Center for Health Statistics, 1995-present period linked birth/infant death data.
Note: All race categories exclude Hispanic births.
Prepared by the March of Dimes Perinatal Data Center, 2010.

more than twice the rate for white infants throughout the past decade.

Furthermore, in 2007, more than 18 percent of infants born to black mothers (18.3 percent) were preterm, compared with approximately 12 percent of infants born to white and Hispanic mothers (11.5 percent and 12.3 percent, respectively).⁷ During the 1990s, disparities in preterm birth between black and white infants narrowed, but beginning in 2000 preterm birth rates began to increase for black infants (17.4 percent in 2000 to 18.3 percent in 2007).⁷ Infants born to non-Hispanic Native American mothers have similar disparities, with higher rates of preterm birth (14.1 percent in 2007) compared to infants born to non-Hispanic white mothers.² While race has been used as a proxy for socioeconomic factors, studies show that differences in preterm birth rates between black and white women remain after adjusting for socioeconomic differences.⁸

Disparities in outcomes also are recognized among maternal age groups. Rates of preterm birth, low birthweight, and infant death follow a U-shaped distribution, with the highest rates at the extremes of maternal age. For example, in 2007, preterm birth rates for teens younger than 18 and women older than 40 were 16.2 percent and 17.2 percent, respectively, while the rate for women ages 25 to 29 was 11.6 percent.² This has been particularly relevant during the past 25 years, as the rate of births has increased among women older than 35. While an increasing number of women of advanced maternal age are giving birth, the rate of births to teens decreased 34 percent between 1991 and 2005 (61.8 to 40.5 per 1,000 women ages 15 to 19).⁷ This downward trend stopped between 2005 and 2007, when the teen birth rate increased 5 percent to 42.5 per 1,000 women ages 15 to 19.⁷ Disparities by race/ethnicity contribute to adverse reproductive outcomes among teens. Contributing to these troubling outcomes are the economic, social and educational disadvantages that teen mothers face.

At the other extreme, women of advanced maternal age have an increased potential for obstetric and medical complications and spontaneous multiple births. They also are more likely than younger women to receive infertility treatment, thus increasing the risk of multiples and adverse outcomes.

Regional variation in perinatal outcomes is apparent, with Southern states disproportionately affected. Preterm birth rates have been consistently higher in the south: Mississippi, Alabama and Louisiana exhibited some of the highest preterm birth rates in 2007 (18.3 percent, 16.6 percent and 16.6 percent, respectively).⁷ Even when state preterm birth rates are adjusted for race/ethnicity, these states still have some of the highest preterm birth rates in the nation. In addition, Mississippi and Louisiana's infant mortality rates were also among the nation's highest in 2006 (10.5 and 10.0 per 1,000 live births, respectively).¹

Factors that influence disparities in perinatal health are complex and not fully understood. Improving maternal and infant health requires addressing disparities through continued research and multidisciplinary approaches to understand contributing factors, including differential risk exposures associated with social, biological and clinical factors before and during pregnancy, labor and delivery.

Changes in Obstetrical Practice

The increasing rates of cesarean delivery and labor induction (initiation of uterine contractions prior to spontaneous onset of labor) reflect changing obstetric practice patterns in the United States. In the past decade, the cesarean delivery rate increased more than 50 percent, from a low of 20.7 percent in 1996 to a high of 31.8 percent of live births in 2007.⁷ This trend reflects a marked increase in the primary cesarean delivery rates and a sharp decline in the rate of vaginal birth after cesarean (VBAC).⁷ To advance understanding of the issues associated with VBAC, including concern of uterine rupture associated with a trial of labor, in 2010 the National Institutes of

While infant mortality has reached historic lows, infants born to non-Hispanic black mothers are more than twice as likely as infants born to non-Hispanic white mothers to die in the first year of life (13.4 and 5.6 per 1,000 live births in 2006).

Linked data systems have the potential to examine differential risks before, during and after pregnancy and provide a better understanding of the factors that lead to disparities in perinatal health.

Health convened a Consensus Development Conference on VBAC and recognized a trial of labor as a reasonable option for many pregnant women with one prior cesarean delivery with a low-transverse incision.³² Total cesarean delivery rates are likely to continue rising, given that the majority of women with a previous cesarean delivery will subsequently deliver by cesarean. Similarly, induction rates have substantially increased since 1990, more than doubling, from 9.5 percent of live births to 22.8 percent in 2007.⁷ While many obstetric interventions are undertaken for maternal and fetal indications, these trends are troubling in light of the shift in the gestational age distribution towards earlier delivery.³³ One study revealed that the increase in singleton preterm births between 1996 and 2004 occurred primarily (92 percent) among cesarean deliveries.¹¹ Another recent study found labor induction and cesarean delivery were related to the increase in the singleton preterm birth rate between 1991 and 2006. Finally new birth certificate data from 19 states revealed that 42 percent of singleton preterm infants were delivered by obstetrical intervention without spontaneous onset of labor in 2006.³⁴ Further research is needed to understand the underlying reasons for the increase in labor induction and cesarean delivery and the risks and benefits of obstetrical interventions for mothers and infants.

Between 1996 and 2006, Assisted Reproductive Technology (ART) procedures doubled and now account for approximately 1 percent of live births.³⁵ Recent findings suggest an association between ART and birth defects.³⁶ Women who conceive through ART are more likely than those who conceive naturally to deliver multiple-birth infants. Multiple births are at increased risk for preterm birth, low birthweight and infant mortality. In addition to the risks associated with multiple births, singleton ART infants are more likely to be born preterm and low birthweight. Approximately 9 percent of singleton ART infants were low birthweight in 2006, compared

to 6 percent of singleton births nationally.³⁵ Furthermore, a recent study found that 4.6 percent of live births in 2005 were conceived with ovulation stimulation therapy and accounted for four times as many live births as ART alone.³⁷ Approximately 23 percent of infants born as multiples were conceived with ovulation stimulation therapy.³⁷ For more than a decade, the CDC has maintained the National ART Surveillance System, a population-based registry of ART treatments performed in the United States. Similarly, it is important to consider feasible methods of conducting sentinel surveillance on non-ART ovulation medications and any associated health risks.^{35,37}

Improved Data Systems

Population-based perinatal data systems, such as vital statistics, disease registries and hospital discharge data are fundamental to identifying and monitoring perinatal outcomes. State-based surveys of women who have given birth and women of childbearing age, which include the Pregnancy Risk Assessment Monitoring System (PRAMS) and Behavioral Risk Factor Surveillance System (BRFSS), provide valuable information from women about their risk and health behaviors.³⁸

Still, these extant data sources are limited in scope. Recent national attention on steadily increasing rates of cesarean delivery and labor induction point to changing obstetric practice, but key information regarding clinical decision making and the necessity of intervention is lacking. It is well documented that vital records data on maternal pre-existing medical conditions and complications of pregnancy are underreported.³⁹ Researchers and clinicians will need to look to enhanced data systems to understand the etiology of multi-factorial perinatal outcomes, such as preterm birth.

Linked Data Systems

The limitations of current population-based data systems underscore the need for linked

perinatal databases that connect preconception information, maternal medical conditions and pediatric outcomes, so we can fully understand the influence of maternal conditions on adverse birth outcomes.³⁸ Linked data systems have the potential to examine differential risks before, during and after pregnancy and provide a better understanding of the factors that lead to disparities in perinatal health. Much has been written about the significance of preconception health to neonatal outcomes,⁴⁰ and using linked perinatal data files for epidemiologic analyses of genetic and environmental factors and their interactions before and during pregnancy would provide a valuable contribution to understanding related conditions and long-term sequelae related to adverse pregnancy outcomes.

An innovative, linked reproductive data system is the Massachusetts Pregnancy Early Life Longitudinal (PELL) data system, which utilizes a broad range of existing public health databases. The PELL data system incorporates data on successive deliveries with linkages to birth and fetal death certificates, hospital delivery records and care use data and public health program participation data, such as early intervention programs. Using the PELL perinatal data system, researchers can investigate maternal and infant health questions that have previously been subject to methodological barriers. For instance, study investigators have been able to estimate newborn morbidity risk associated with gestational age and selected maternal conditions.⁴¹ Opportunities exist at the state level for additional linkages between vital records and hospital discharge data, such as administrative data (e.g., Medicaid), health care services (e.g., substance use treatment) and educational programs (e.g., special education). Expanded, linked perinatal data systems serve as valuable data sets for epidemiologic research, program planning, evaluation and policy development.

Model successive pregnancy data systems, like those established in Denmark, Sweden and Norway, represent the ideal linked perinatal data systems.³⁸ Compulsory birth registration data can be linked with other registries in these Scandinavian countries to provide long-term medical and social outcomes subsequent to adverse birth outcomes. These unique data systems provide valuable information on siblings and intergenerational studies that are vital to researchers as they study genetic, medical and environmental predictors of preterm birth and fetal loss. These registries and linked data systems may not be feasible in the United States but may inform our efforts to develop state-based linked perinatal data systems.³⁸

Clinical Databases

Primary data sources, such as electronic medical records (EMR), provide an opportunity to collect patient-specific data that are gathered from multiple points, including medical records from prenatal care, labor and delivery. Although the cost of implementation and privacy concerns are potential barriers, EMR offers a rich data repository that evaluates clinical practices by monitoring risk factors, interventions and outcomes. In an integrated health care system in Utah, EMRs were queried to establish baseline incidence of patient admissions for elective induction of labor or planned elective cesarean delivery. Data from these records informed a quality improvement program, which regularly reported the prevalence of early term elective deliveries, monitored clinical outcomes and tracked the progress of the intervention.⁴²

Targeted clinical information collected from select populations helps providers focus on specific quality-of-care issues. For example, the Vermont Oxford Network (VON), a voluntary collaborative group of neonatal intensive care units (NICUs), maintains a robust very low-birthweight (VLBW) database of infants 401 to 1500 grams born at participating hospitals or admitted to them within 28 days of birth. The VLBW Database allows for detailed evaluation

Although the cost of implementation and privacy concerns are potential barriers, EMR offers a rich data repository that evaluates clinical practices by monitoring risk factors, interventions and outcomes.

Improved epidemiologic data systems are needed to advance research and policy to improve birth outcomes.

and provides comprehensive, confidential reports to participating hospitals that support quality improvement projects and peer review.⁴³ A study from VON examined the timing of initial surfactant treatment for high-risk preterm infants and found variability among participating hospitals with many infants receiving delayed treatment. Evidence from randomized clinical trials supports prophylactic or early surfactant treatment, and data from VON indicated opportunities for practice change and improvement.⁴⁴

The recent release of a perinatal performance measure set by The Joint Commission provides unique opportunities to use data for quality improvement. In 2009, The Joint Commission, in consultation with a technical advisory panel, identified a set of evidence-based perinatal measures to replace and expand upon the previously used Pregnancy and Related Conditions. Endorsed by the National Quality Forum, this measure set, termed Perinatal Care, addresses elective delivery, cesarean section, antenatal steroids, health care-associated bloodstream infections in newborns and exclusive breast milk feeding⁴⁵ and provides hospitals with standardized measures to evaluate the quality of perinatal care.

Conclusion and Recommendations

Despite major reductions in United States infant mortality to rates well below 10 per 1,000 live births since 1989, the decline has stalled in recent years. While dramatic improvements in neonatal care have increased survival, preterm birth and low birthweight rates have increased. These trends may lead to decreased fetal losses and increased infant and childhood short- and long-term morbidities, but current data systems do not allow for monitoring these potential benefits and risks. Moreover, no single data system exists to track outcomes across the continuum of preconception, prenatal and postpartum care.

Improved epidemiologic data systems are needed to advance research and policy to improve birth outcomes, including:

1. A robust, timely national vital statistics system, which includes data quality assessments, to ensure that reliable and accurate information is collected and that all states implement the 2003 revised birth certificate to eliminate disparities in information gathering by state
2. A focused transdisciplinary research agenda on the causes of and contributors to adverse birth outcomes that involves basic science, as well as epidemiological, clinical, and behavioral and social science disciplines
3. Use of lessons from investments in existing linked databases, such as PELL in Massachusetts, to establish contemporary data sets that allow for linkages with clinical systems to create a comprehensive system that captures data on infant outcomes and maternal health before, during and after pregnancy, and
4. Assurance that validated perinatal care performance measures, such as the new set of Joint Commission perinatal measures, are adequately supported and monitored throughout the country to provide uniform, comparable data.

The complex, multifactorial contributors to overall rates of adverse outcomes, as well as disparities within population subgroups, require more sophisticated, clinically relevant databases to conduct research so that we can address and, ultimately, improve perinatal health.

References

1. Mathews T, MacDorman M. Infant mortality statistics from the 2006 period linked birth/infant death data set. Hyattsville, MD; 2010 April 30, 2010.
2. National Center for Health Statistics, final natality data. 2010. (Accessed September 28, 2010, at www.marchofdimes.com/peristats).
3. National Center for Health Statistics. 2006 period linked birth/infant death data. Hyattsville, MD; 2010.
4. MacDorman MF, Kirmeyer S. Fetal and perinatal mortality, United States, 2005. *Natl Vital Stat Rep* 2009;57:1-19.
5. ACOG Practice Bulletin No. 102: management of stillbirth. *Obstet Gynecol* 2009;113:748-61.
6. Lydon-Rochelle MT, Cardenas V, Nelson JL, Tomashek KM, Mueller BA, Easterling TR. Validity of maternal and perinatal risk factors reported on fetal death certificates. *Am J Public Health* 2005;95:1948-51.
7. Martin J, Hamilton B, Sutton P, Ventura S, Mathews T, Kirmeyer S. Births: final data for 2007. *Natl Vital Stat Rep* 2010;58:1-125.
8. Behrman R, Stith Butler A, eds. Section IV: Consequences of Preterm Birth. In: *Preterm Birth: Causes, Consequences, and Prevention*. Washington, DC: The National Academies Press; 2007.
9. Raju TN. Epidemiology of late preterm (near-term) births. *Clin Perinatol* 2006;33:751-63; abstract vii.
10. Hamilton B, Martin J, Ventura S. Births: Preliminary Data for 2008. Hyattsville, MD; 2010 April 30, 2010.
11. Bettgowda VR, Dias T, Davidoff MJ, Damus K, Callaghan WM, Petrini JR. The relationship between cesarean delivery and gestational age among US singleton births. *Clin Perinatol* 2008;35:309-23.
12. McIntire DD, Leveno KJ. Neonatal mortality and morbidity rates in late preterm births compared with births at term. *Obstet Gynecol* 2008;111:35-41.
13. Tomashek KM, Shapiro-Mendoza CK, Davidoff MJ, Petrini JR. Differences in mortality between late-preterm and term singleton infants in the United States, 1995-2002. *J Pediatr* 2007;151:450-6, 6 e1.
14. NICHD Workshop: Optimizing Care and Long-term Outcome of Near-term Pregnancy and Near-term Newborn Infant. July 18-19. Bethesda, MD, 2005.
15. National Center for Health Statistics (US). Final Natality Data. Hyattsville, MD: National Center for Health Statistics; 2010.
16. Zhang X, Kramer MS. Variations in mortality and morbidity by gestational age among infants born at term. *J Pediatr* 2009;154:358-62, 62 e1.
17. Clark SL, Belfort MA, Byrum SL, Meyers JA, Perlin JB. Improved outcomes, fewer cesarean deliveries, and reduced litigation: results of a new paradigm in patient safety. *Am J Obstet Gynecol* 2008;199:105 e1-7.
18. Tita AT, Landon MB, Spong CY, et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes. *N Engl J Med* 2009;360:111-20.
19. Goldenberg RL, Culhane JF. Low birth weight in the United States. *Am J Clin Nutr* 2007;85:584S-90S.
20. World Health Organization (WHO). *International Statistical Classification of Diseases and Related Health Problems (rev. 10, vols 1 and 2, ICD-10)*. Geneva: WHO; 1992.
21. National Center for Health Statistics. 2009: With Special Feature on Medical Technology. Rockville, Maryland: The National Center for Health Statistics; 2010.
22. Hoyert DL. Maternal mortality and related concepts. *Vital Health Stat* 3 2007:1-13.
23. Horon IL. Underreporting of maternal deaths on death certificates and the magnitude of the problem of maternal mortality. *Am J Public Health* 2005;95:478-82.

24. Chang J, Elam-Evans LD, Berg CJ, et al. Pregnancy-related mortality surveillance — United States, 1991-1999. *MMWR Surveill Summ* 2003;52:1-8.
25. Schwartz RM, Kellogg R, Muri JH. Specialty newborn care: trends and issues. *J Perinatol* 2000;20:520-9.
26. Meadow W, Lee G, Lin K, Lantos J. Changes in mortality for extremely low birth weight infants in the 1990s: implications for treatment decisions and resource use. *Pediatrics* 2004;113:1223-9.
27. Melamed N, Klinger G, Tenenbaum-Gavish K, et al. Short-term neonatal outcome in low-risk, spontaneous, singleton, late preterm deliveries. *Obstet Gynecol* 2009;114:253-60.
28. Aarnoudse-Moens CS, Weisglas-Kuperus N, van Goudoever JB, Oosterlaan J. Meta-analysis of neurobehavioral outcomes in very preterm and/or very low birth weight children. *Pediatrics* 2009;124:717-28.
29. Moster D, Lie RT, Markestad T. Long-term medical and social consequences of preterm birth. *N Engl J Med* 2008;359:262-73.
30. Petrini JR, Dias T, McCormick MC, Massolo ML, Green NS, Escobar GJ. Increased risk of adverse neurological development for late preterm infants. *J Pediatr* 2009;154:169-76.
31. Chyi LJ, Lee HC, Hintz SR, Gould JB, Sutcliffe TL. School outcomes of late preterm infants: special needs and challenges for infants born at 32 to 36 weeks gestation. *J Pediatr* 2008;153:25-31.
32. National Institutes of Health Consensus Development conference statement: vaginal birth after cesarean: new insights March 8-10, 2010. *Obstet Gynecol* 2010;115:1279-95.
33. Davidoff MJ, Dias T, Damus K, et al. Changes in the gestational age distribution among U.S. singleton births: impact on rates of late preterm birth, 1992 to 2002. *Semin Perinatol* 2006;30:8-15.
34. Macdorman MF, Declercq ER, Zhang J. Obstetrical Intervention and the Singleton Preterm Birth Rate in the United States from 1991-2006. *Am J Public Health* 2010; 100(11):2241-7.
35. Sunderam S, Chang J, Flowers L, et al. Assisted reproductive technology surveillance — United States, 2006. *MMWR Surveill Summ* 2009;58:1-25.
36. Reefhuis J, Honein MA, Schieve LA, Correa A, Hobbs CA, Rasmussen SA. Assisted reproductive technology and major structural birth defects in the United States. *Hum Reprod* 2009;24:360-6.
37. Schieve LA, Devine O, Boyle CA, Petrini JR, Warner L. Estimation of the contribution of non-assisted reproductive technology ovulation stimulation fertility treatments to US singleton and multiple births. *Am J Epidemiol* 2009;170:1396-407.
38. Petrini JR. Promoting the linkage and analysis of successive pregnancy outcome files in the United States. *Paediatr Perinat Epidemiol* 2007;21 Suppl 1:63-5.
39. Lydon-Rochelle MT, Holt VL, Nelson JC, et al. Accuracy of reporting maternal in-hospital diagnoses and intrapartum procedures in Washington State linked birth records. *Paediatr Perinat Epidemiol* 2005;19:460-71.
40. Johnson K, Posner SF, Biermann J, et al. Recommendations to improve preconception health and health care — United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep* 2006;55:1-23.
41. Shapiro-Mendoza CK, Tomashek KM, Kotelchuck M, et al. Effect of late-preterm birth and maternal medical conditions on newborn morbidity risk. *Pediatrics* 2008;121:e223-32.
42. Oshiro BT, Henry E, Wilson J, Branch DW, Varner MW. Decreasing elective deliveries before 39 weeks of gestation in an integrated health care system. *Obstet Gynecol* 2009;113:804-11.
43. Horbar JD. The Vermont Oxford Network: evidence-based quality improvement for neonatology. *Pediatrics* 1999;103:350-9.
44. Horbar JD, Carpenter JH, Buzas J, et al. Timing of initial surfactant treatment for infants 23 to 29 weeks' gestation: is routine practice evidence based? *Pediatrics* 2004;113:1593-602.
45. Joint Commission Perinatal Care Measurement Set. (Accessed January 26, 2010 at www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/Perinatal+Care+Core+Measure+Set.htm.)

The Role of Patients and Families in Improving Perinatal Care



Scott D. Berns, Siobhan M. Dolan, Carole Kenner,
Marie R. Abraham, Joanna Celenza, and Beverley H. Johnson

Chapter 4: The Role of Patients and Families in Improving Perinatal Care

Scott D. Berns, Siobhan M. Dolan, Carole Kenner,
Marie R. Abraham, Joanna Celenza, and Beverley H. Johnson

Involving the consumer, whether patient or family, in improving the quality of perinatal care starts by understanding and embracing health care practice that is patient- and family-centered. As defined by the Institute for Patient- and Family-Centered Care, “patient- and family-centered care is an innovative approach to the planning, delivery and evaluation of health care that is grounded in mutually beneficial partnerships among health care providers, patients and families.”¹ • This chapter introduces the concepts and principles of patient- and family-centered care and describes ways in which women and families can improve and enhance their own care and health outcomes, as well as ways in which they can become involved in health system organizational change. It should be noted that the term “patient” will most often refer to the pregnant or postpartum woman, and “family” will most often refer to the parents of the neonate. The chapter concludes with recommendations for increasing the involvement of women and families in their own care and in quality improvement initiatives and, for continuing efforts to advance the practice of patient- and family-centered care in perinatal settings.

Evolution of Patient- and Family-Centered Perinatal Care

Early in the 20th century, labor and delivery began moving from the home environment to the hospital setting, where infection control and medical interventions increasingly led to improved health outcomes, including decreased infant mortality.² In the hospital, for the purposes of infection control and ease of care, mother was separated first from her husband and family and then, after childbirth, from her baby.³

By the late 1940s, some recognition of the need to focus on patient (mother and baby) and family in the hospital setting began to emerge, followed by a clear impetus for patient- and family-centered care that fol-

lowed in the 1970s and continues today. This impetus came directly from the consumer⁴: an informed, involved, empowered, participatory consumer. The societal movement of informed and empowered consumers also brought parents back into the care of their newborn and began a period of more fully including parents in the care of their child.⁵

Patient- and Family-Centered Care Today — Definitions and Principles

Patient-centered care and *family-centered care* are often considered two distinct approaches; however, in perinatal care, the woman (patient) and the family become one and the same, as the pregnancy progresses

along the perinatal continuum. All along the spectrum, the woman defines the family. At the preconception and pregnancy stages, the woman is the *patient*, and she defines her “family” (husband, partner, mother, doula, others), and how she wishes them to be involved in her health care. After the birth of her baby, the mother’s role is that of both *patient* (postpartum/interconception) and, together with the father or other identified partner, and others, *family* of the patient-baby. In this aspect of perinatal care, the parents of the baby define the family and how they wish to be involved in their infant’s care.

As the concepts of patient- and family-centered care have evolved, so have principles relevant to perinatal care (see Appendices). These concepts and principles focus primarily on the woman and family as informed, supported participants, and decision makers.

Key components of patient- and family-centered care:	
respect	support
collaboration	empowerment
information sharing	active participation
diversity	individualized.

Patient- and family-centered perinatal care focuses on women’s experience of care. It encompasses compassion, empathy and responsiveness to the strengths, needs, values and expressed preferences of women and families.⁵

The Evolving Roles of Women and Families in Improving Perinatal Care

With hospitals’, ambulatory clinics’, and other health care organizations’ explicit commitment to a patient- and family-centered approach to care, women and families are encouraged and supported to be involved at two levels: first, in their own care, and second, to participate in quality improvement, health care redesign and systems change, which, ultimately, will

improve care for others. Specific examples of patient and family involvement in perinatal quality improvement are detailed later in this chapter.

Examples of the Successful Involvement of Women and Families in Their Care Experiences Across the Perinatal Continuum

The full involvement of women and families in their own health care has been shown to improve perinatal health outcomes. The following section provides evidence-based examples of ways in which women and families can become actively engaged in their own health care: learning about their family history, participating in CenteringPregnancy®, a group prenatal care model that has reduced the incidence of preterm birth among high-risk populations,⁶ and using family support and palliative and end-of-life care programs when necessary. Further information about CenteringPregnancy® is included in Chapter 10. Skin-to-skin, or baby-to-parent, kangaroo care holding is another example, recommended in the *Guidelines for Perinatal Care*,⁷ which improves the health of the neonate and decreases parental stress. It is discussed in Chapter 8.^{8,9}

Family history

One way that women and families can take an active role in their care is to learn about their family history. In this genomic era, family history serves as an important tool for understanding inherited risk, not only for rare genetic conditions but also for adverse perinatal outcomes and common chronic conditions.

In 2004, the United States Surgeon General initiated National Family History Day,¹⁰ which is celebrated on Thanksgiving Day each year. Individuals are encouraged to speak with family members and learn about their family history. Learning one’s family history can equip individuals to take steps, such as behavior modification or preventive measures, to reduce their inherited risk for disease.

Patient- and family-centered perinatal care focuses on women’s experience of care. It encompasses compassion, empathy and responsiveness to the strengths, needs, values and expressed preferences of women and families.

*One way that
women and
families can take
an active role in
their care is to
learn about their
family history.*

In the preconception and prenatal periods, family history can be a screening tool for some birth defects, single gene disorders, adverse birth outcomes and common complex conditions.¹¹ An important example in the area of structural birth defects is neural tube defects (NTD). In the preconception period, women who report having a personal or family history of neural tube defects are advised to take a higher-dose folic acid supplement of 4 mg daily, in contrast to the routine recommendation of a 0.4 mg folic acid supplement, during the month before and continuing through the first trimester.¹² Such a targeted recommendation has been shown to reduce the risk of recurrent NTDs by approximately 70 percent.¹³

Knowing their family history also allows women to identify various ancestries for which carrier screening is offered. A woman of Ashkenazi Jewish ancestry can undergo carrier screening for a panel of serious autosomal recessive conditions,¹⁴ and if she is identified as a carrier, then her partner should also be tested to see if he is a carrier of the condition. Similarly, South Asian or Mediterranean ancestry can suggest carrier screening for hemoglobinopathies.¹⁵ Also, a family history of undiagnosed developmental delay or intellectual disability serves as a red flag for Fragile X syndrome carrier screening.¹⁶ In the case of these recessive genetic conditions, knowing one's family history can allow identification of pregnancies at risk by identifying couples with both partners as carriers.

Finally, learning of a family history of common complex conditions, such as diabetes or heart disease, may motivate individuals to attain a healthy lifestyle.¹⁷ Adult onset cancers, such as hereditary breast or ovarian cancer, can be detected in a family history, and women can now receive genetic testing, preventive treatments and surgical interventions to decrease risk.¹⁸ Adverse birth outcomes, such as preterm birth and stillbirth, which follow a complex disease model in which genetic and environmental factors

contribute, can be identified in families and allow women to take risk-reducing measures, such as quitting smoking or treating infections.¹⁹

CenteringPregnancy®

CenteringPregnancy is a model of prenatal care which uses the power of groups and relationships to guide women through the prenatal period. Women who participate in such care have demonstrated improved birth outcomes. A 2003 study showed that group prenatal care resulted in higher birth-weight, especially for preterm infants,²⁰ and a randomized controlled trial published in 2007 demonstrated a 33 percent reduction in preterm births among women participating in CenteringPregnancy.⁶

The model, developed by Sharon Rising, a certified nurse midwife in Connecticut, and popularized throughout North America, brings women together with their providers for monthly group meetings, where they meet with their provider and engage in group discussions on topics related to their particular stage of pregnancy, such as: nutrition, exercise, relaxation techniques, understanding pregnancy problems, infant care and feeding, postpartum issues, including contraception, communication and self-esteem, comfort measures in pregnancy, childbearing, abuse issues, parenting and childbirth preparation and postpartum depression.²¹ Groups are composed of women with similar due dates, so that their experiences parallel as their pregnancies progress. The CenteringPregnancy model brings together all three components of prenatal care: risk assessment, education and support within the group.²²

CenteringPregnancy embraces a patient- and family-centered approach with relationship building at its core. Relationships between women and their families, providers and other pregnant women provide a strong support network and empower participants. Women who participate in group prenatal care report overall satisfaction and often indicate they prefer group prenatal

care to individual care.²² This highly successful model of patient- and family-centered care, offered under the auspices of the Centering Health Care Institute,²³ is presented during pregnancy as Centering-Pregnancy; during the first year of parenting as CenteringParenting; and, as Centering-Lifecycle during periods of chronic illness.

NICU Family Support®

In 2001, as a core component of its national Prematurity Campaign, the March of Dimes Foundation embarked on a nationwide initiative, NICU Family Support, to provide information and comfort to families during the hospitalization of their newborn in a newborn intensive care unit (NICU), during the transition home and in the event of a newborn death (marchofdimes.com/nicu). Built upon a family-centered philosophy and incorporating NICU families into every level of the project, NICU Family Support serves the mothers, fathers, siblings, grandparents and extended family of newborns admitted to the NICU. The initiative also includes a professional development component for NICU staff and promotes the philosophy of family-centered care throughout the entire NICU.

March of Dimes NICU Family Support has been shown to have a positive impact on the stress level, comfort level and parenting confidence of NICU families.²⁴ Additionally, it enhances the receptivity of staff to family-centered care, including: open communication between professionals and parents; sharing of information and the meaning of information with parents; involvement of parents and families in the decision-making process; and the development of policies and programs to promote parenting skills and family involvement.

Palliative and End-of-Life Care

Palliative and End-of-Life (EOL) care are critical parts of perinatal and neonatal care. Palliative care refers to comfort care and may be used in life-threatening situations or in end-of-life (EOL) cases. Why is this necessary? In 2006, 66.8 percent of all infant deaths in the United States occurred during the neonatal period. The neonatal mortality rate per 1,000 live births was 4.5.²⁵

In 2003, the City of Hope National Medical Center and the American Association of Colleges of Nursing (AACN) recognized the need for specific neonatal/pediatric content in their End-of-Life Nursing Education Consortium (ELNEC) train-the-trainer materials. These training materials emphasize that a perinatal or neonatal life-threatening event or death contradict the expected, and that family is central to all interventions.²⁶ They incorporate the work of Catlin and Carter²⁷ who developed a protocol for end-of-life palliative care. Key to this care is communication among health care team members and inclusion of the family in decision making. Other important aspects involve fully informing families about what to expect, the prognosis, symptom control, anticipated pain and pain relief.²⁷

Decisions, especially to initiate or discontinue life support, can be made as a team that includes the family. The goal is to anticipate and minimize the potential regrets of the family, support grieving and predict their support needs before, during and after the death. If this event is only life-threatening, then the family may still fear a death and need support long after the child recovers.

While there is evidence that palliative, end-of-life care is more cost effective and improves the child and family's quality of life more than in-hospital therapy, insurance and managed care plans often do not cover it. Parents who experience a stillbirth, a miscarriage or a diagnosis prenatally that predicts an early neonatal death also must be offered support and, in some instances, referral to perinatal hospice in order to work through

Women who participate in group prenatal care report overall satisfaction and often indicate they prefer group prenatal care to individual care.

their grief.^{28,29} Table 1 below displays a few of the successful models of palliative and end-of-life pediatric care.

Perinatal and neonatal hospice and palliative care protocols are relatively new, but many groups recognize the need for them. Training programs such as ELNEC for nurses and other health professionals make access to education possible. More work must go into supporting research to test care models that result in positive family-centered outcomes. Evidence must be gathered to support models of excellence. Grassroots efforts must continue to increase public and policy-maker awareness of this area of care. Support must be garnered for insurance coverage for perinatal, neonatal hospice and respite care for parents. Above all, the voices of parents must be heard to shape the care that these vulnerable infants and families so richly deserve.

regarding the safety and quality of perinatal care and recommendations for change in a variety of ways: patient satisfaction surveys, focus groups, daily feedback in patient rounds, advisory councils, as well as serving as members of key unit, clinic and hospital committees.^{1,3}

Childbearing women and families have collaborated with health care professionals from many disciplines and settings to improve the health and well-being of women, infants and families and to improve systems of care. For example, a public family member actively participates on the American College of Obstetricians and Gynecologists Patient Education Editorial Board. This section describes examples of partnerships between families and health care professionals, specifically through the Vermont Oxford Network (VON), in perinatal quality improvement initiatives. VON is a nonprofit organization that works to improve the quality and safety of medical care for newborn infants and their families.

VON has conducted multiyear quality improvement collaboratives, since 1995. As of 2010, there have been a total of six collaboratives. Except for the first, families have been involved in a variety of ways in the improvement work. When the second collaborative began in 1998, 11 out of 34 centers chose to focus on developing potentially better practices (PBPs) for family-centered newborn intensive care. Families joined clinicians and other staff in site visits to exemplary hospitals, face-to-face collaborative meetings and improvement projects within their units. They also helped to identify PBPs and develop measurement tools. After the collaborative ended, many of these centers established formal structures for continued family involvement. This included creating family advisory councils, parent-led peer support programs and families-as-faculty programs for staff and trainees.^{32,33}

In the collaborative that began in 2002, three centers chose to build on the work of the previous collaborative. They focused on several PBPs developed by the earlier collaborative that related to the experience of care

Table 1: Successful Models of Palliative and End-of-Life Care

The Children’s Hospice International (www.chionline.org)	Features models of excellence in pediatric hospice and palliative care
The Initiative for Pediatric Palliative Care (www.ipcweb.org)	Promotes family-centered care during life-threatening or death experiences
Children’s Hospice and Palliative Care Coalition (www.childrenshospice.org)	Promotes positive pediatric palliative care
Pediatric Advanced Care Team (PACT) project with Dana-Farber Cancer Institute and Children’s Hospital, Boston, MA; FOOTPRINTS ^(SM) ³⁰	Combines inpatient and community-based care using educational modules
Pediatric Palliative Care Project by Children’s Hospital and Regional Medical Center, Seattle, WA ³¹	Uses a case management approach to pediatric palliative care ²⁶

Women and families as partners in perinatal quality improvement efforts

The informed and empowered consumer is vital to creating quality improvement initiatives, setting appropriate goals and measuring results. The contribution of women and families to systems change and quality improvement processes may include sharing their perspectives and experiences

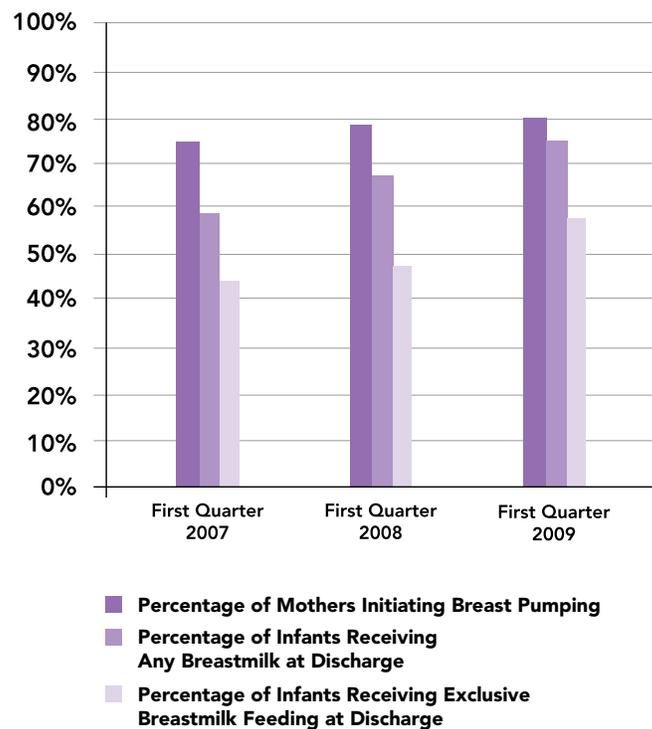
and family participation in care. These centers created and tested the *Family-Centered Care Map*, a web-based tool designed to facilitate the delivery of family-centered newborn intensive care throughout the clinical pathway of the infant and family from pre-admission through the transition to home (<http://www.fccmap.org>). This tool specified improvement strategies at critical points throughout an infant and family's NICU experience. VON leadership also hired a family member to serve as a consultant to this collaborative.^{34,35}

Increasing the involvement of families as members of the quality improvement teams became a primary goal. In alignment with its commitment to partnering with families, VON leadership appointed a family member to the newly formed advisory board for both the 2007 and 2009 collaboratives. All 46 participating centers were encouraged to collaborate with families in their improvement work during the face-to-face meetings, as well as in the work between meetings. Teams used a tool developed by staff at the Institute for Patient- and Family-Centered Care and a family advisor to measure their success in engaging families in quality improvement.³⁶

An example of a project that has emerged from these collaboratives is a volunteer Breastfeeding Peer Mentor program, initiated by the multidisciplinary Nutrition Group at the Intensive Care Nursery at Children's Hospital at Dartmouth. The program was co-developed with a parent advisor whose twins received care in the NICU. The scope and goals of the program, as well as a volunteer job description and plan for ongoing recruitment of volunteer mentors (mothers who have had experience breastfeeding and pumping in the NICU), were developed with the advisor. Plan-Do-Study-Act cycles were developed, tested and implemented by the Nutrition Group and are ongoing. Assessments of the program via monthly meetings with the mentors and ongoing training sessions are led by the most experienced mentors, ensuring that the program

meets the goals of the program and that the work is meaningful. The initial goal of the program was to encourage and support breastfeeding and breast pumping mothers and their partners, but additional ideas and enhancements to the NICU environment also have been developed. Results show increases in percentages of mothers initiating breast pumping, as well as infants receiving breastmilk at discharge (Figure 1). The collaborative nature of the program has been an integral part of its success in the promotion and support of breastfeeding and has led to measurable improvements.³⁷

Figure 1: Trend Information on Breastfeeding



Conclusions and Recommendations

- Providers should embrace patient- and family-centered care across the spectrum of perinatal care, including group prenatal care, family support in the NICU and palliative care.
- Patients and families should be encouraged to learn about their family history in an effort to partner with providers to predict and manage risks for potential adverse birth outcomes.
- National organizations, such as AAP, ACOG and AWHONN, as well as health care facilities, should consider including patients and families on some of their committees as one important way of demonstrating their support for patient- and family-centered care.
- The health care system should embrace family involvement in perinatal quality improvement initiatives.

Patient- and family-centered care is now recognized as a standard of care.^{5,7,38,39} Patients and families are vital in improving perinatal care, including being key partners in perinatal quality improvement efforts. Knowing their family history, actively participating in group prenatal care (CenteringPregnancy®) and having access to family support programs and perinatal palliative care programs are also ways in which patients and families can become more integrally involved in improving perinatal care outcomes.

Appendices

Core Concepts of Patient- and Family-Centered Care

- **Dignity and Respect.** Health care practitioners listen to and honor patient and family perspectives and choices. Patient and family knowledge, values, beliefs and cultural backgrounds are incorporated into the planning and delivery of care.
- **Information Sharing.** Health care practitioners communicate and share complete and unbiased information with patients and families in ways that are affirming and useful. Patients and families receive timely, complete and accurate information in order to effectively participate in care and decision making.
- **Participation.** Patients and families are encouraged and supported in participating in care and decision making at the level they choose.
- **Collaboration.** Patients and families are also included on an institution-wide basis. Health care leaders collaborate with patients and families in policy and program development, implementation and evaluation; in health care facility design; and in professional education, as well as in the delivery of care.

Source: Institute for Patient- and Family-Centered Care

10 Principles of Family-Centered Maternity Care

1. Childbirth is seen as wellness, not illness. Care is directed to maintaining labor, birth, postpartum and newborn care as a normal life event involving dynamic emotional, social and physical change.
2. Prenatal care is personalized according to the individual psychosocial, educational, physical, spiritual and cultural needs of each woman and her family.
3. A comprehensive program of perinatal education prepares families for active participation throughout the evolving process of preconception, pregnancy, childbirth and parenting.
4. The hospital team helps the family make informed choices for their care during pregnancy, labor, birth, postpartum and newborn care, and strives to provide them with the experience they desire.
5. The father and/or other supportive persons of the mother's choice are actively involved in the educational process, labor, birth, postpartum and newborn care.
6. Whenever the mother wishes, family and friends are encouraged to be present during the entire hospital stay including labor and birth.
7. Each woman's labor and birth care are provided in the same location unless a cesarean birth is necessary. When possible, postpartum and newborn care also are given in the same location and by the same caregivers.
8. Mothers are encouraged to keep their babies in their rooms at all times. Nursing care focuses on teaching and role modeling while providing safe, quality care for the mother and baby together.
9. When Mother-Baby care is implemented, the same person cares for the mother and baby couplet as a single-family unit, integrating the whole family into the care.
10. Parents have access to their high-risk newborns at all times and are included in the care of their infants to the extent possible given the newborn's condition.

From Phillips, C. Family-Centered Maternity Care. 1st ed. Sudbury (MA): Jones and Bartlett Learning; 2003.

American Academy of Pediatrics and the Institute for Patient- and Family-Centered Care Statement on Family-Centered Care and the Pediatrician's Role

1. **Respecting** each child and his or her family
2. Honoring racial, ethnic, cultural and socioeconomic **diversity** and its effect on the family's experience and perception of care
3. Recognizing and building on the **strengths** of each child and family, even in difficult and challenging situations
4. Supporting and facilitating **choice** for the child and family about approaches to care and support
5. Ensuring **flexibility** in organizational policies, procedures and provider practices so services can be tailored to the needs, beliefs and cultural values of each child and family
6. **Sharing** honest and unbiased **information** with families on an ongoing basis and in ways they find useful and affirming
7. Providing and/or ensuring formal and informal **support** (e.g., family-to-family support) for the child and parent(s) and/or guardian(s) during pregnancy, childbirth, infancy, childhood, adolescence and young adulthood
8. **Collaborating** with families at all levels of health care, in the care of the individual child and in professional education, policy-making and program development
9. **Empowering** each child and family to discover their own strengths, build confidence and make choices and decisions about their health

From American Academy of Pediatrics. Family-centered care and the pediatrician's role. Pediatrics 2003;112: 691-7.

The Role of Patients
and Families in
Improving
Perinatal Care



References

1. Johnson B, Abraham M, Conway J, et al. Partnering with Patients and Families to Design a Patient- and Family-Centered Health Care System: Institute for Family-Centered Care; April 2008.
2. Thomas LM. The changing role of parents in neonatal care: a historical review. *Neonatal Netw* 2008;27:91-100.
3. Phillips C. *Family-Centered Maternity Care*. 1 ed. Sudbury, MA: Jones and Bartlett Learning; 2003.
4. Harrison H. The principles for family-centered neonatal care. *Pediatrics* 1993;92:643-50.
5. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: The National Academies Press, 2001.
6. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and perinatal outcomes: a randomized controlled trial. *Obstet Gynecol* 2007;110:330-9.
7. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 6th Ed. Grove Village, Ill.: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists; 2007.
8. Bauer K, Uhrig C, Sperling P, Pasel K, Wieland C, Versmold HT. Body temperatures and oxygen consumption during skin-to-skin (kangaroo) care in stable preterm infants weighing less than 1500 grams. *J Pediatr* 1997;130:240-4.
9. Burkhammer MD, Anderson GC, Chiu SH. Grief, anxiety, stillbirth, and perinatal problems: healing with kangaroo care. *J Obstet Gynecol Neonatal Nurs* 2004;33:774-82.
10. US Surgeon General. Surgeon General's Family Health History Initiative. 2010.
11. Dolan SM, Moore C. Linking family history in obstetric and pediatric care: assessing risk for genetic disease and birth defects. *Pediatrics* 2007;120 Suppl 2:S66-70.
12. Cheschier N. ACOG practice bulletin. Neural tube defects. Number 44, July 2003. (Replaces committee opinion number 252, March 2001). *Int J Gynaecol Obstet* 2003;83:123-33.
13. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study. MRC Vitamin Study Research Group. *Lancet* 1991;338:131-7.
14. ACOG Committee Opinion No. 442: Preconception and prenatal carrier screening for genetic diseases in individuals of Eastern European Jewish descent. *Obstet Gynecol* 2009;114:950-3.
15. ACOG Practice Bulletin No. 78: hemoglobinopathies in pregnancy. *Obstet Gynecol* 2007;109:229-37.
16. ACOG committee opinion. No. 338: Screening for fragile X syndrome. *Obstet Gynecol* 2006;107:1483-5.
17. Awareness of family health history as a risk factor for disease--United States, 2004. *MMWR Morb Mortal Wkly Rep* 2004;53:1044-7.
18. ACOG Practice Bulletin No. 103: Hereditary breast and ovarian cancer syndrome. *Obstet Gynecol* 2009;113:957-66.
19. Dolan S, Biermann J, Damus K. Genomics for health in preconception and prenatal periods. *J Nurs Scholarsh* 2007;39:4-9.
20. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and preterm birth weight: results from a matched cohort study at public clinics. *Obstet Gynecol* 2003;102:1051-7.
21. Massey Z, Rising SS, Ickovics J. CenteringPregnancy group prenatal care: Promoting relationship-centered care. *J Obstet Gynecol Neonatal Nurs* 2006;35:286-94.
22. Rising SS. Centering pregnancy. An interdisciplinary model of empowerment. *J Nurse Midwifery* 1998;43:46-54.
23. Centering Health Care Institute. 2010. (Accessed September 21, 2010, at www.centeringhealthcare.org.)

24. Cooper LG, Gooding JS, Gallagher J, Sternesky L, Ledsky R, Berns SD. Impact of a family-centered care initiative on NICU care, staff and families. *J Perinatol* 2007;27 Suppl 2:S32-7.
25. Mathews T, MacDorman M. Infant mortality statistics from the 2006 period linked birth/infant death data set. Hyattsville, MD; 2010 April 30, 2010.
26. End-of-life care. 2010. (Accessed September 21, 2010, at www.aacn.nche.edu/ELNEC.)
27. Catlin A, Carter B. Creation of a neonatal end-of-life palliative care protocol. *J Perinatol* 2002;22:184-95.
28. Feudtner C, Feinstein JA, Satchell M, Zhao H, Kang TI. Shifting place of death among children with complex chronic conditions in the United States, 1989-2003. *Jama* 2007;297:2725-32.
29. Corr C, Balk D, eds. *Children's Encounters with Death, Bereavement, and Coping*. New York, New York: Springer Publishing Company; 2010.
30. Toce S, Collins MA. The FOOTPRINTS model of pediatric palliative care. *J Palliat Med* 2003;6:989-1000.
31. Byock IR. To life! Reflections on spirituality, palliative practice, and politics. *Am J Hosp Palliat Care* 2006;23:436-8.
32. Saunders RP, Abraham MR, Crosby MJ, Thomas K, Edwards WH. Evaluation and development of potentially better practices for improving family-centered care in neonatal intensive care units. *Pediatrics* 2003;111:e437-49.
33. Moore KA, Coker K, DuBuisson AB, Swett B, Edwards WH. Implementing potentially better practices for improving family-centered care in neonatal intensive care units: successes and challenges. *Pediatrics* 2003;111:e450-60.
34. Dunn MS, Reilly MC, Johnston AM, Hoopes RD, Jr, Abraham MR. Development and dissemination of potentially better practices for the provision of family-centered care in neonatology: the family-centered care map. *Pediatrics* 2006;118 Suppl 2:S95-107.
35. Johnston AM, Bullock CE, Graham JE, et al. Implementation and case-study results of potentially better practices for family-centered care: the family-centered care map. *Pediatrics* 2006;118 Suppl 2:S108-14.
36. Conway J, Celenza J, Abraham M. Advancing patient- and family-centered newborn intensive care. In: Horbar J, Leahy K, Handyside J, eds. *NICQ 2007: Improvement in Action*. Burlington, VT: Vermont Oxford Network; 2007.
37. Celenza J, Lamadriz L. The Volunteer Breastfeeding Peer Mentor Program at Dartmouth: An Ongoing Quality Improvement Project to Support Lactating Mothers of Hospitalized Infants in our intensive Care Nursery. In: 23rd Annual Graven's Conference on the Physical and Developmental Environment of the High Risk Infant. Clearwater Beach, Florida; 2010.
38. Leape L, Berwick D, Clancy C, et al. Transforming healthcare: a safety imperative. *Qual Saf Health Care* 2009;18:424-8.
39. Association of Women's Health, Obstetric and Neonatal Nurses. *Standards for Professional Nursing Practice in the Care of Women and Newborns*. 7th ed. Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses; 2009.



Quality
Improvement
Opportunities in
Preconception
and
Interconception
Care



Merry-K. Moos, Maribeth Badura,
Samuel F. Posner, Michael C. Lu

Chapter 5: Quality Improvement Opportunities in Preconception and Interconception Care

Merry-K. Moos, Maribeth Badura, Samuel F. Posner, Michael C. Lu

*This chapter is
dedicated to
the memory of
Maribeth Badura.*

Nearly 30 years ago, a movement began in this country to rethink traditional efforts to decrease the occurrence of poor pregnancy outcomes by addressing the health status of a woman or couple before pregnancy. This new framework, known as preconception care, consists of related activities that offer an avenue for the primary prevention of many poor pregnancy outcomes, such as congenital anomalies, which are difficult or impossible to alter through prenatal care. Preconception care also provides a timely opportunity to positively influence factors associated with poor pregnancy outcomes, such as interconception length, chronic disease control and unintended conception.

National attention on the rationale and opportunities for addressing risk factors for poor pregnancy outcomes prior to pregnancy gained significant momentum in 2005, when the Centers for Disease Control and Prevention (CDC) convened a Select Panel on Preconception Care and Health Care. The CDC and Select Panel created a consensus definition for preconception care:

Preconception care is a set of interventions that aim to identify [as part of routine health care] and modify biomedical, behavioral and social risks to a woman's health or pregnancy outcome through prevention and management.¹

In addition, it identified four goals and 10 recommendations (see Appendices) to guide expansion of preconception activities across the nation.¹

The fundamental elements of preconception care are broad and include screening and interventions for medical and social risk

factors; providing vaccinations; assessing reproductive intentions; supporting the use of appropriate contraceptive methods and delivering health promotion counseling and health education tailored to an individual woman or couple's risk profile. Based on recognition that everything that could be recommended in routine preconception health care would benefit a woman's health, irrespective of pregnancy intentions, the preconception framework has shifted in the last decade from a focus on reproductive health to a wellness initiative for all women of reproductive age.²

In addition to the Select Panel definition for preconception care, other related vocabulary has begun to evolve and includes:

Preconception health promotion. Includes but is not limited to clinical care, because many influences interact to encourage or undermine high levels of wellness in individuals of childbearing age. Influences include: family and community relationships and supports, environmental exposures in

neighborhoods and workplaces, public policies and individual choices. Activities in any or all of these arenas could promote preconception health.

Interconception. The time between the end of one pregnancy and the conception of the next pregnancy. It is important to note that the interconception period must be treated as an open-ended span of time, as it can only be accurately defined after the next conception has been diagnosed or the woman is no longer able to conceive. The word “preconception” is often used to denote both preconception and interconception.

Integrated care. A comprehensive framework for health assessment and health maintenance across the life span, which brings together childbearing and contraceptive considerations with women’s general health.³

Life-course perspective. An examination of the longitudinal interplay of biological, behavioral, psychological and social/environmental protective and risk factors related to birth outcomes, including intergenerational effects.⁴

Reproductive life planning. Activities to help individuals plan, based on their own values and resources, how to achieve a set of personal goals about whether or when to have children.⁵

Challenges to Implementation of the Preconception Agenda

Numerous challenges exist in reframing the perinatal prevention paradigm from one that starts with prenatal care to one that starts long before pregnancy occurs. Both the public and health care providers need encouragement to recognize and embrace the wisdom of such a shift. Because women’s care tends to be organized into silos, such as contraceptive services, prenatal care and chronic disease management and is generally divided between reproductive and non-reproductive foci, it is often fragmented and episodic. These divisions in service

delivery increase the chances of missing important considerations in a woman’s total health, which can result in unnecessary risks during her life course, her future pregnancies and to her future children.⁶ The categorical organization of services also results in uneven access to care, depending on whether the woman is pregnant. Whether the Patient Protection and Affordable Care Act (2010) will successfully engage women and clinicians in more inclusive and comprehensive services is unknown.

Current State of the Science

Two journals have devoted issues to examination of the science, practice, challenges and opportunities of the preconception agenda.^{7,8} In addition, a subgroup of the CDC’s Select Panel on Preconception Health and Health Care undertook a systematic review of the scientific evidence surrounding 80 topics that might be considered in the provision of clinical care. The group used the framework of the United States Preventive Services Task Force to determine the strength and quality of the evidence for endorsing specific clinical content. Findings were published in a supplement to the American Journal of Obstetrics and Gynecology in 2008.⁹

Examples of Promising Initiatives

Despite expanding science on the content and processes of preconception and interconception health promotion and clinical care, there is much that is not yet known, particularly around translation of concepts into practice. The CDC and Select Panel’s recommendations for improving preconception health and health care unleashed a cascade of creativity, resulting in hundreds, if not thousands, of projects being developed in the last 5 to 6 years by state and local health departments, hospitals and private practices, community-based clinics and coalitions, religious groups, professional organizations, volunteer groups

and others. Because most of the projects are young, few have yet collected data that documents impact. Particularly promising in the identification of best practices is the national Healthy Start Interconception Care Quality Collaborative, which involves teams from all 102 Healthy Start grantees.¹⁰ Table 1 highlights this project as well as others

with different foci, funding and strategies. A comprehensive list of initiatives is available at: www.beforeandbeyond.org/?page=model-programs.

Table 1: Promising Practices in Preconception and Interconception Care

Model Federal Initiative	
Healthy Start Interconception Care Learning Community (ICCLC) funded through the Maternal and Child Health Bureau, Health Resources and Services Administration (MCHB-HRSA)	Grounded in the quality improvement model, this project was begun in the summer of 2009 to identify and implement evidence-based best interconception care practices. Teams from all of the 102 Healthy Start Projects have joined learning collaboratives to work in one of six areas: case management, interconception risk assessment, family planning, healthy weight, primary care linkages and maternal depression. At least three rapid improvement cycles will take place over 3 years. ¹⁰
Model State Initiative	
Preconception Health Council of California (PHCC)	PHCC is a public/private council created to develop a California plan for preconception health. PHCC serves as a forum for statewide planning and decision making on issues and programs related to preconception health. It is also an information clearinghouse, networking center and coordinating hub for preconception health activities in the state. ¹¹
Peer-to-Peer (P2P) Learning for State Medicaid Programs funded by the Commonwealth Fund and CDC	Seven states have begun working together to develop programs, policies and infrastructures needed to improve primary and interconception care for women enrolled in Medicaid. Each state put together learning teams that include representation from Medicaid, Title V and other agencies. The teams interact through online meetings and other forums to identify best practices. ¹²
Model Regional Initiative	
Every Woman SE [Southeast]	Through a partnership between the University of North Carolina Center for Maternal & Fetal Health and the Florida March of Dimes, Healthy Woman SE established a consortium of the eight states in the Department of Health and Human Services (DHHS) Region IV to explore opportunities for partnerships between the states. Current activities are aimed at states identifying and disseminating information about existing projects, including those in the public, private and nonprofit sectors, creating research opportunities, identifying and expanding emerging best practices, collaborating to maximize limited resources and stimulating state capacity building. ¹³

Model Clinical Initiatives

LA [Los Angeles] Best Babies Network

The LA Best Babies Network coordinates a Healthy Births Initiative that unites more than 100 perinatal organizations in Los Angeles County. Its focus includes preconception, perinatal and interconception activities. Strategies to improve pregnancy and birth outcomes highlight multidisciplinary, comprehensive interventions that work on individual, family, community and societal levels. Specific preconception/interconception projects include interconception case management and home visits for at-risk families; working with employers to provide on-the-job workshops on preconception care in Spanish and English; and, use of learning collaboratives to promote preconception care messaging. The Network also has established the Healthy Births Care Quality Collaborative (HBCQC), which involves learning collaboratives in 10 ambulatory care sites aimed at improving the quality of perinatal and postpartum care through adoption of evidence-based practices.¹⁴

Magnolia Project

Established in Jacksonville, Florida, in 1999, through a partnership between the Northeast Florida Healthy Start Coalition, the Duval County Health Department and other community partners, the Magnolia Project is a prenatal and interconception initiative aimed at reducing racial disparities in infant mortality. Funded by the federal Healthy Start program, activities include targeted outreach, screening, case management, health education, community development and well-woman care. Evaluation of 100 at-risk women enrolled in the interconception case management program revealed a positive association between enrollment and reductions in sexually transmitted infections, low birthweight and infant mortality.^{15,16}

Interconception Care for At-Risk Women

Through cooperative agreement with the CDC's Division of Reproductive Health, the March of Dimes has supported projects that provide interconception care for high-risk women in Georgia, Florida and North Carolina. All sites recruit women with a previous poor birth outcome, often through newborn intensive care units, and follow them for at least 6 months postpartum. Services include, at a minimum, education, counseling and support to assist women in making positive behavior changes that have the potential to enhance their own health status and pregnancy outcomes should they become pregnant again. Process and outcome results from the projects are expected to guide development of best practices for the interconception care of high-risk women.

Grady Memorial Hospital Interpregnancy Care Project (ICP)

Begun in 2003, the Grady Memorial Hospital ICP was developed as a pilot project to explore the feasibility and acceptability of primary care case management and social support services for low-income, African-American women following birth of a very low-birthweight infant. An individualized care plan was created for each woman and included 24 months of integrated primary health care and dental services. Care provided by a family physician, nurse midwife and laypersons doing community outreach included facilitated group visits, incorporating elements of CenteringPregnancy.[®] Assessment of the experiences of the 29 women followed for 24 months revealed these women had less likelihood of a short interconception period and poor pregnancy outcome in their subsequent pregnancy than a comparison group.¹⁵

WOW (WIC Offers Wellness) and KEEP (Keep Energized and Empowered for Pregnancy) funded by March of Dimes

The Los Angeles Women, Infants and Children (WIC) Supplemental Nutrition Program created a project called WOW (WIC Offers Wellness), which provides postpartum women who have had a poor pregnancy with comprehensive care coordination services, individual counseling and peer group support sessions.¹⁷ The Texas Chapter of the March of Dimes, in partnership with the Texas WIC program, adopted and adapted the WOW program to meet the needs of women in its state. The Texas program is called KEEP (Keep Energized and Empowered for Pregnancy).

Conclusion and Recommendations

All of the projects detailed in Table 1 offer great promise, although it is too early to assess their impact or to endorse specific best practices. However, numerous recommendations for building the infrastructure necessary for the success of these and other projects are already apparent:

Surveillance

- Quality improvement measures are needed to measure interim and long-term progress in addressing health before, between and beyond pregnancies. A seven-state team has developed a set of public health indicators for use at the state level.¹⁸ The seven states (California, Delaware, Florida, Michigan, North Carolina, Texas and Utah), varied in size and resources, will provide rich experiences for replication or modification by other states.
- Performance measures must be developed, endorsed and monitored. Currently, the National Committee on Quality Assurance, the Physicians Consortium for Performance Improvement and the American College of Obstetricians and Gynecologists have developed recommendations that are being considered for endorsement by the National Quality Forum.

Research

- An unambiguous research agenda that is accompanied by adequate funding to support robust, multisite demonstration projects is needed. The Eunice Kennedy Shriver National Institute of Child Health and Human Development has shown a longstanding interest in this area, and some federal funding opportunities that could include preconception

initiatives have recently become available. In addition, some of the provisions of the Patient Protection and Affordable Care Act could be directed to fund preconception health promotion activities. However, looking beyond government funding to foundations and third-party payors to support demonstration projects is likely to create important partnerships and momentum.

- Research is needed to understand the relationship between persistent stress and other environmental influences and the development of chronic diseases, pregnancy outcomes and racial disparities in health status.
- Longitudinal studies such as the Community and Child Health Network¹⁹ are needed to understand the intergenerational and cumulative impact of stressors on the health status of women and their offspring.
- A commitment to and appreciation of qualitative research is required to understand how the concepts of women's wellness, preconception and interconception health, reproductive life planning and the life-course perspective are understood and valued by women and men of various socioeconomic, ethnic, racial and geographic backgrounds.
- Evaluation and dissemination of strategies for translating science into clinical practice and patient behaviors are essential to realize proven benefits of preconception interventions. For instance, it is well documented that preconception supplementation with folic acid decreases neural tube defects by 50 to 70 percent²⁰ but only 40 percent of women of child-bearing age report taking a folic acid supplement.²¹

Clinical

- Clinical care must be guided by scientific evidence, such as that compiled in *The Clinical Content of Preconception Care*.⁹ Strategies for disseminating current evidence-based practices to clinicians in a timely and user-friendly manner are urgently needed.
- The primary care of every woman should include routine assessment of her reproductive life plan, her health promotion needs and identification of risks in her health profile, as well as relevant counseling and interventions.²² While evidence-based guidelines exist on the content of this care, alternatives to the traditional clinic-based approach to counseling are needed to make the delivery of preventive care realistic and manageable.²³
- Demonstration projects are needed to assess the opportunities, costs and benefits of moving away from the current silo-organization of care to more integrated horizontal models. Private insurers, publicly afforded programs such as Medicaid and Title X, and employers that provide health coverage are important stakeholders and potential funders for demonstration projects.
- The postpartum visit needs to be reshaped so that it helps women anticipate and address their own future health risks, as well as risks to any future pregnancies and offspring.
- Beginning with the postpartum visit, women who have had a previous poor pregnancy outcome (e.g., infant death, fetal loss, congenital anomaly, low birthweight, preterm birth, maternal complication) should be offered specific recommendations and opportunities to minimize the likelihood of a subsequent poor outcome.

Collaboration and dissemination

- Strategies are needed to streamline dissemination of research and demonstration projects either through publication, meeting proceedings or Internet postings.
- Partnerships between clinicians and other important influences on lifestyle choices and health status are required if women and men of reproductive age are to achieve higher levels of wellness.
- Approaches such as collaborative innovative networks (COINs) are needed to speed dissemination of preconception health innovations. COINs are virtual communities of innovators who are connected through the Internet to collaborate around common goals.²⁴ COIN networks have been used to promote innovations in technology, business, government and other areas of medicine.

Preconception and interconception health care have the potential to improve the health of women and men, decrease pregnancy complications and improve pregnancy outcomes. To succeed, engagement of women, families, clinicians, communities, religious leaders, employers, educators and others is needed. Promising initiatives and practices are evolving, but much more work is needed to translate the concept of preconception care into clinical services and to identify best practices for promoting preconception health within and beyond the clinical arena. Funding for the creation, evaluation and dissemination of models of collaboration and synergy is necessary if the opportunities of preconception health are to be realized.

Appendices

Goals for Preconception Health Care¹

Goal 1: Improve the knowledge, attitudes and behaviors of men and women related to preconception health.

Goal 2: Assure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion and interventions) that will enable them to enter pregnancy in optimal health.

Goal 3: Reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children.

Goal 4: Reduce the disparities in adverse pregnancy outcome.

CDC Preconception Health and Health Care Recommendations¹

1. **Individual Responsibility Across the Lifespan.** Each woman, man and couple should be encouraged to have a reproductive life plan.
2. **Consumer Awareness.** Increase public awareness of the importance of preconception health behaviors and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.
3. **Preventive Visits.** As a part of primary care visits, provide risk assessment and educational and health promotion counseling to all women of childbearing age to reduce reproductive risks and improve pregnancy outcomes.
4. **Interventions for Identified Risks.** Increase the proportion of women who receive interventions as follow-up to preconception risk screening, focusing on high priority interventions (i.e., those with evidence of effectiveness and greatest potential impact).
5. **Interconception Care.** Use the interconception period to provide additional intensive interventions to women who have had a previous pregnancy that ended in an adverse outcome (i.e., infant death, fetal loss, birth defects, low birthweight or preterm birth).
6. **Preconception Checkup.** Offer, as a component of maternity care, one preconception visit for couples and persons planning a pregnancy.
7. **Health Insurance Coverage for Women with Low Incomes.** Increase public and private health insurance coverage for women with low incomes to improve access to preventive women's health and preconception and interconception care.
8. **Public Health Programs and Strategies.** Integrate components of preconception health into existing local public health and related programs, including emphasis on interconception interventions for women with previous adverse outcomes.
9. **Research.** Increase the evidence base and promote the use of the evidence to improve preconception health.
10. **Monitoring Improvements.** Maximize public health surveillance of preconception health and related research mechanisms.

References

1. Johnson K, Posner SF, Biermann J, et al. Recommendations to improve preconception health and health care — United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep* 2006;55:1-23.
2. Atrash H, Jack BW, Johnson K, et al. Where is the “W”oman in MCH? *Am J Obstet Gynecol* 2008;199:S259-65.
3. Walker LO, Tinkle MB. Toward an integrative science of women’s health. *J Obstet Gynecol Neonatal Nurs* 1996;25:379-82.
4. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J* 2003;7:13-30.
5. Ad Hoc Committee on Reproductive Life Planning of CDC Select Panel on Preconception Health and Health Care. 2009.
6. Moos MK. From concept to practice: reflections on the preconception health agenda. *J Womens Health (Larchmt)* 2010;19:561-7.
7. *Maternal and Child Health Journal* 10(5), 2006.
8. *Women’s Health Issues* 18(6), 2008.
9. Jack BW, Atrash H, Coonrod DV, Moos MK, O’Donnell J, Johnson K. The clinical content of preconception care: an overview and preparation of this supplement. *Am J Obstet Gynecol* 2008;199:S266-79.
10. Badura M, Johnson K, Hench K, Reyes M. Healthy start lessons learned on interconception care. *Womens Health Issues* 2008;18:S61-6.
11. California Department of Health. Preconception Health Council of California. *Every Woman California*. 2009;2010.
12. The Commonwealth Fund and the Centers for Disease Control and Prevention’s (CDC) Preconception Health and Health Care Initiative. *Improving Primary and Interconception Care for Women in Medicaid: Peer-to-Peer (P2P) Learning for State Agencies*. 2010.
13. *Every Woman Southeast*. 2010. www.everywomansoutheast.com
14. *LA Best Babies Network*. 2010. www.labestbabies.org
15. Biermann J, Dunlop AL, Brady C, Dubin C, Brann A, Jr. Promising practices in preconception care for women at risk for poor health and pregnancy outcomes. *Matern Child Health J* 2006;10:S21-8.
16. Livingood WC, Brady C, Pierce K, Atrash H, Hou T, Bryant T, 3rd. Impact of preconception health care: evaluation of a social determinants focused intervention. *Matern Child Health J* 2010;14:382-91.
17. Texas Department of State Health Services. *WIC Wellness Works*. 2010.
18. Broussard DL, Sappenfield WB, Fussman C, Kroelinger CD, Grigorescu V. Core State Preconception Health Indicators: A Voluntary, Multi-state Selection Process. *Matern Child Health J* 2010.
19. The Pennsylvania State University. *Community and Child Health Network*. 2010. www.communitychildhealthnetwork.org
20. Goh YI, Bollano E, Einarson TR, Koren G. Prenatal multivitamin supplementation and rates of congenital anomalies: a meta-analysis. *J Obstet Gynaecol Can* 2006;28:680-9.
21. Centers for Disease Control and Prevention (CDC). Use of supplements containing folic acid among women of childbearing age — United States, 2007. *MMWR Morb Mortal Wkly Rep* 2008;57:5-8.

22. Moos MK, Dunlop AL, Jack BW, et al. Healthier women, healthier reproductive outcomes: recommendations for the routine care of all women of reproductive age. *Am J Obstet Gynecol* 2008;199:S280-9.
23. Moos MK. Speeding the progress to improved health and wellness for North Carolina's women. *N C Med J* 2009;70:427-31.
24. Gloor P. *Swarm Creativity: Competitive Advantage through Collaborative Innovation Networks*. United States: Oxford University Press, 2006.



Quality Improvement Opportunities in Prenatal Care



Vincenzo Berghella, Jay D. Iams, Nancy Jo Reedy,
Bryan T. Oshiro, John S. Wachtel

Chapter 6: Quality Improvement Opportunities in Prenatal Care

Vincenzo Berghella, Jay D. Iams, Nancy Jo Reedy,
Bryan T. Oshiro, John S. Wachtel

Prenatal care is the care provided to pregnant women in order to prevent complications and decrease the incidence of perinatal and maternal morbidity and mortality.¹ The general content of prenatal care is described in Table 1.² However, the primary purpose, value and effectiveness of prenatal care continue to be debated, because there are no randomized studies comparing pregnancy outcomes among women who have and have not had prenatal care. • Since global prenatal care as a “whole” intervention has never been compared to “no prenatal care” in a randomized trial, efforts to improve its quality should focus on evidence-based screening, identification of effective interventions that may improve pregnancy outcomes and monitoring. Various aspects of prenatal care clearly offer benefits; the challenge is to figure out exactly which tests and interventions should be part of prenatal care and to make sure they are universally and routinely offered and accessible.

Prenatal care should begin with a preconception visit, the most important visit regarding pregnancy.

Basic Elements of Prenatal Care

Prenatal care should begin with a preconception visit, the most important visit regarding pregnancy. Approximately 50 percent of conceptions are unplanned.³ Therefore, every woman of reproductive age (15 to 45) should have a preconception visit to review her pregnancy risks and learn about strategies for preventing maternal and fetal/neonatal morbidity and mortality (Tables 1 and 2).^{2,4} Since 85 percent of women have some kind of doctor visit within the 12 months before conception,⁵ it is feasible for health care practitioners to incorporate preconception messaging during that visit. (see Chapter 5).

There is no certainty about the optimal number of prenatal visits, and while women may feel less satisfied with fewer prenatal visits, there is no evidence that more visits lead to better outcomes.⁶ In low-risk

women, four (minimum) to seven visits may be sufficient.⁶ More visits should occur only if individual risk factors warrant closer follow up. As soon as a pregnancy test is positive, a woman should schedule a prenatal visit, where a provider reviews her health history, performs a physical examination, screens for risk factors and provides patient education. A woman should schedule additional visits between 11 and 14 weeks and 18 and 22 weeks, both of which should include ultrasounds. The 24- to 28-week visit should include glucola screening (Table 1). A visit at 35 to 37 weeks should include screening for genital group B streptococcus. The frequency of visits after 32 weeks depends mostly on the risk of preeclampsia. A 39-week visit is important for planning care in case the pregnancy does not spontaneously deliver by the due date.

Who provides care should depend on identification of risk factors. There is no evidence that obstetricians need to be involved in the prenatal care of every woman experiencing an uncomplicated pregnancy. Nurse-midwives, family physicians or obstetricians can safely provide care to women of low risk or without risk factors. In some communities, physicians may not be available or may not be the predominant health care provider. In fact, prenatal care provided by midwives has been associated with less need for pain relief in labor, decreased incidence of cesarean delivery, less need for neonatal resuscitation, and improved patient satisfaction.⁷

Key to prenatal care is qualified basic care with an effective system for consultation and referral to a higher level of care when indicated, including assurance that high-risk patients are followed in consultation with the appropriate specialists (e.g., obstetricians or maternal-fetal medicine specialists).⁸ This always includes effective communication and may include multidisciplinary care based on the needs of the patient and family. It is important that the entire care team is involved in the development and review of care, with shared accountability.

Current State of Science: Screening

Certain prenatal care recommendations apply to all pregnant women (Table 1), while women with specific risk factors require targeted interventions (Table 2). In every case, the first page of a woman's medical chart or electronic medical record should clearly display a list of her pregnancy risk factors by detailed history taking and testing, where appropriate. Family and genetic history should also be carefully collected.^{1,5}

Every pregnant woman should have at least two ultrasounds, one in the first and one in the second trimester.^{9,10} Ultrasound reduces the incidence of post-term pregnancies and rates of labor induction for post-term pregnancy. It increases early detection of multiple pregnancies, as well as earlier detection of major fetal anomalies and fetal malformations. Routine ultrasound, compared to selective ultrasound, also decreases

admission to the special care nursery, as well as certain cognitive impairments that could lead to academic problems.⁹

Ultrasound examination in the first trimester provides a more precise estimate of gestational age, compared to ultrasound done later in the pregnancy, and it is associated with women worrying less and feeling more relaxed about their pregnancy.⁹ Accurate dating of the pregnancy helps prevent inadvertent preterm or post-term deliveries.^{4,10} First-trimester ultrasound also allows earlier detection of multiple pregnancies, screening for Down syndrome with nuchal translucency and diagnosis of non-viable pregnancies.¹⁰ The second ultrasound should take place at approximately 20 weeks to evaluate the fetal anatomy.^{1,5,11}

Nutrition, Exercise and Weight Gain

Proper maternal weight and weight gain are paramount for a successful pregnancy.¹² Weight gain recommendations vary depending on a person's body mass index (BMI). Obese women, for instance, should not gain much weight in pregnancy,¹³ and women with class II and III obesity should probably not gain any weight. For all women, eating the right foods is as important as consuming the recommended amount of calories.

Exercise during all low-risk and most high-risk pregnancies is beneficial to overall maternal fitness and sense of well-being, although there is insufficient data to assess its impact on maternal or fetal outcomes.¹⁴ What is known, however, is that regular physical activity leads to improved fitness for pregnant women by keeping the heart, mind and entire body healthy. It can ease many common discomforts of pregnancy, such as constipation, backache, fatigue, sleep disturbances and varicose veins. Regular exercise also may help prevent pregnancy-related forms of diabetes and high blood pressure. Fit women also may be able to cope better with labor and recover faster after birth.^{15,16,17}

The U.S. Department of Health and Human Services (HHS) recommends that healthy pregnant women get at least 2½

Nurse-midwives, family physicians or obstetricians can safely provide care to women of low risk or without risk factors.

Quality Improvement Opportunities in Prenatal Care

hours of moderate-intensity aerobic activity a week, spreading this exercise throughout the week.¹⁵ This means that pregnant women should try to do 30 minutes of an aerobic activity on most, if not all days. But short bouts of physical activity (at least 10 minutes each) spread throughout the week are also effective. Light exercise, such as walking, swimming, cycling on a stationary bicycle, aerobics (low-impact or a class for pregnant

women), yoga classes for pregnant women or other sports that are not likely to cause loss of balance, is recommended.

Pregnant women who have not been physically active prior to becoming pregnant can gain health benefits by slowly engaging in physical activities. However, it is important that pregnant women ask their health care providers before starting any exercise program.¹⁸

Table 1: Main Visits and Routine Content of Prenatal Care (Modified from ref. 2)

Initial Visit ≤ 12 weeks	Visits occurring 12 to 24 weeks	Visits occurring at 24 to 28 weeks	Visits occurring 28 to 34 weeks	Visits occurring 34 to 41 weeks
Comprehensive history, including family history	Review, discuss and record results of screening tests	Review, discuss and record results of screening tests	Review, discuss and record results of screening tests	Review, discuss and record results of screening tests
Genetic screening*	BP, FH, weight, urine dipstick	BP, FH, weight, urine dipstick	BP, FH, weight, urine dipstick	BP, FH, weight, urine dipstick
Screening & counseling for lifestyle/workplace issues	Lab screening: Offer 2nd trim. quadruple screen (to complete sequential screen)	Lab screening: GDM Screening Repeat Hgb/Hct Repeat antibody screen		Preeclampsia precautions
Directed physical exam (include weight, BMI, BP, and urine dipstick)	18-22 wk ultrasound	Administer RhD immunoglobulin to appropriate women		Screening for GBS at 35 to 37 weeks
Calculate EDC & arrange dating scan if necessary	Discuss quickening, lifestyle, physiology of pregnancy	Reassess infectious disease risk and test accordingly		Assess fetal presentation ≥34 weeks: offer ECV if breech
Lab Screening: Hgb/Hct, Blood type, Rh, antibody screen				Offer membrane sweeping at ≥38 weeks, if indicated
Rubella Titer				Induction or elective cesarean should not be offered before 39 weeks unless clearly indicated by maternal or fetal conditions
RPR				
HBSAg				
HIV				
Asymptomatic Bacteriuria				
Gonorrhea/Chlamydia				
Pap				
Identify women who may need additional care				
Additional laboratory screening as needed				
Offer 1st trimester screening, including dating ultrasound <14 weeks				
Seasonal flu vaccine in flu season				

*including sequential screening for fetal aneuploidy, and maternal screen for cystic fibrosis, and fragile X (see text)
 BMI, body mass index; BP, blood pressure; ECV, external cephalic version; EDC, estimated date of confinement or "due date"; FH, Fetal Heart Rate;
 GBS, group B streptococcus; GDM, gestational diabetes; HBSAg, hepatitis B surface antigen; Hct, hematocrit; Hgb, hemoglobin;
 HIV, human immunodeficiency virus; RhD, Rhesus D; RPR, rapid plasma reagin.

Current State of Science: Interventions

Following screening for and identification of various conditions, interventions and monitoring can begin. There is a wide spectrum of specific interventions, ranging from symptom abatement to reducing risks of maternal and fetal mortality, which have been shown to improve outcomes (Table 2). Examples of effective interventions for some common complaints during pregnancy include:

- Chlorpheniramine (4 milligrams (mg) three times per day) is recommended to decrease late (>32 weeks) pregnancy itching not associated with liver disease and a rash.
- Magnesium lactate or citrate chewable tablets (5 mmol in the morning and 10 mmol in the evening for 3 weeks) are recommended for women with persistent leg cramps and associated with significant improvement.
- Water gymnastics for 1 hour weekly starting at <19 weeks reduces back pain in pregnancy and allows more women to continue to work, with no adverse effects. A specially shaped pillow used for 1 week when lying in a lateral position reduces back pain from 66 percent to 49 percent (68 percent decrease) in late pregnancy and improves sleep, compared to a regular pillow. Both physiotherapy and acupuncture starting at <32 weeks for 10 sessions might also reduce back and pelvic pain.
- Dietary fiber supplements (such as 10mg per day of either corn-based biscuits or 23g wheat bran) increase the frequency of defecation and are associated with softer stools. Stimulant laxative (such as senna 14mg, dioctyl sodium succinate 120mg or dihydroxyanthroquinone 100mg) resolve constipation better than bulk-forming laxatives but are more likely to be associated with diarrhea and abdominal pain.²

For the purposes of this chapter, however, two specific interventions — antenatal steroids and progesterone to prevent preterm birth — will receive more detailed exploration.

Antenatal corticosteroids, such as betamethasone and dexamethasone, have been shown in several randomized controlled trials (RCTs) to reduce the incidence of neonatal mortality, respiratory distress syndrome, intraventricular hemorrhage and necrotizing enterocolitis by approximately 40 to 50 percent each.¹⁹ They should be administered at around 23 to 33 6/7 weeks to women with a significant risk of delivering within 7 days. Currently, a rescue course is not recommended, but recent RCTs have shown that one rescue course might be beneficial.²⁰

Additionally, 17-alpha-hydroxy progesterone caproate has been shown to reduce preterm birth by roughly one-third in women with prior spontaneous preterm birth when administered starting at 16 to 20 weeks and continued weekly until 37 weeks.²¹ There is also early evidence that vaginal progesterone might be beneficial for women identified to have a short (≤ 15 mm) transvaginal ultrasound cervical length before 24 weeks.²²

Extensive research is currently ongoing in other important areas, such as fetal surgery.²³ Genetic screening with sequential screening as discussed above¹⁰ for cystic fibrosis and Fragile X is now recommended in the United States. Other genetic techniques, such as comparative genomic hybridization (CGH), cannot be currently recommended but show great promise to improve prenatal diagnosis.

Antenatal corticosteroids, such as betamethasone and dexamethasone, have been shown in several randomized controlled trials (RCTs) to reduce the incidence of neonatal mortality, respiratory distress syndrome, intraventricular hemorrhage and necrotizing enterocolitis by approximately 40 to 50 percent each.

Table 2: Recommended Prenatal Interventions for Women with Selected Specific Risk Factors.

(Modified from ref. 3)

Risk factor/population	Intervention	Prevention of
Smoking	Smoking cessation	PTB, LBW, etc.
Alcohol	Avoid all alcohol intake	PTB; Congenital anomalies, mental retardation, growth abnormalities
Other drugs of abuse (cocaine, heroin, etc.)	Avoid all drugs of abuse	PTB, IUGR, neonatal withdrawal, etc. (effect depends on drug of abuse)
Prior spontaneous PTB	17-alpha hydroxy progesterone caproate; screening of cervical length (CL), with cerclage if CL<25mm <23weeks	PTB
Pregestational diabetes	Hemoglobin A1C <7 percent; screening for asymptomatic bacteriuria	PTB*; Congenital anomalies, length of NICU admission, perinatal mortality and long-term health consequences in infant; miscarriage; preeclampsia; maternal hospitalizations; and maternal renal disease
Obesity	Diet and exercise to achieve normal BMI; screening for diabetes	PTB*; Infertility, fetal NTDs, PTB, CD, HTN-disorders, diabetes, VTE
Hypertension	Avoid angiotensin-converting enzyme inhibitors and angiotensin-receptor blockers. If long-standing HTN, assess for renal disease, ventricular hypertrophy and retinopathy	PTB*; Congenital anomalies, HTN complications, CD, IUGR, placental abruption, perinatal death.
Hypothyroidism	Thyroxine supplementation to maintain normal TSH (0.5-2.0mcu/mL)	PTB*; Infertility, maternal HTN, preeclampsia, abruption, anemia, PTB, LBW, fetal death, possibly neurological problems in infant
Hyperthyroidism	PTU (propylthiouracil) supplementation to maintain FT4 in high normal range, and TSH in low normal range	PTB*; spontaneous pregnancy loss, preeclampsia, fetal death, FGR, maternal congestive heart failure, and thyroid storm; neonatal Graves' disease
Asthma	Management as per National Asthma Education and Prevention Program (NAEPP).	PTB*, LBW, preeclampsia, perinatal mortality
Systemic lupus erythematosus	≥6months of quiescence on stable therapy	PTB*; HTN, preeclampsia, fetal death, IUGR, neonatal lupus
HIV	Initiate or modify antiviral agents with goals of: (1) HIV-1 RNA viral load level below the limit of detection of the assay (2) avoid teratogenic agents	PTB: Perinatal HIV infection
Sexually-transmitted disease (e.g., chlamydia)	Screen at risk populations	PTB; Ectopic pregnancy
Social issues (e.g., abuse, etc)	Counseling; Referral to appropriate agency	PTB; Physical and emotional trauma and their consequences
High risk for PTB within 7 days when at 24 to 34 weeks	Steroids (i.e., bethamethasone or dexamethasone) for fetal maturation	Neonatal morbidities (e.g., respiratory distress syndrome, etc.) and mortality

PTB, preterm birth; *, especially iatrogenic PTB; LBW, low birthweight; IUGR, intrauterine growth restriction; NICU, neonatal intensive care unit; BMI, body mass index; NTD, neural tube defects; CD, cesarean delivery; HTN, hypertension; VTE, venous thromboembolism; TSH, thyroid-stimulating hormone; FT4, free thyroxine; HIV, human immunodeficiency virus; RNA, ribonucleic acid; PKU, phenyl ketonuria.

Conclusion and Recommendations

The evidence that prenatal care as a “package” has an impact on pregnancy outcomes is lacking, but we agree there is evidence to support the efficacy of some of its components, including universal screening (Table 1), as well as appropriate interventions and monitoring to improve quality of care (Table 2). While more than 11,000 randomized controlled trials with pregnant women have been done, few have studied the content and efficacy of prenatal care. Despite the lack of randomized controlled trials on the content and efficacy of prenatal care, its quality can be improved. We offer the following recommendations:

- Preconception care is a critical part of reproductive planning and can improve the health of the woman and the outcome of the pregnancy. Preconception care and reproductive planning should be available to all women.
- All pregnancies should have comprehensive risk assessment and screening to identify patients with various risk factors and varying levels of risk (Table 1). Care should be based on levels of risk and predicted outcomes, with the focus on maternal and fetal/neonatal morbidity and mortality (Table 2). High-risk patients should be followed in consultation with the appropriate specialists (e.g., obstetricians or maternal-fetal medicine specialists).⁸
- Vital statistics and outcome data should consider that births at 17 to 20 weeks have the same increased risk for subsequent preterm birth as for women with prior birth at 20 to 26 weeks.^{24,25} The traditional 20-week boundary between birth and spontaneous abortion (pregnancy loss) should be reconsidered. Then, fetal death from 20 weeks on and preterm births from 16 weeks on could be included in outcome data. The perinatal mortality rate is an important outcome measure and should be defined as including deaths from 20 weeks of fetal life through 28 days of neonatal life. It should be reported along with the preterm birth rate and the infant mortality rate by the Centers for Disease Control (CDC), the American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG).
- African-American women have increased risk of adverse pregnancy outcomes, including preterm birth and increased perinatal mortality, even when they have early prenatal care and no medical or social risk factors.^{26,27} Additional research is needed to understand this phenomenon better and to develop interventions to reverse this disparity.
- Every pregnant woman should have a first-trimester ultrasound to provide the most precise estimate of gestational age, and to prevent inadvertent preterm or post-term births. This ultrasound exam should be in addition to another at approximately 20 weeks to evaluate fetal anatomy.
- All mothers in labor at 24 to 34 weeks should receive one course of antenatal steroids for fetal maturation more than 48 hours before birth.
- Women with prior spontaneous preterm birth should be identified early in prenatal care and considered for screening with transvaginal ultrasound for cervical length and prophylactic treatment with progesterone for recurrence prevention.
- Women should have complete access to and be reminded to always carry their prenatal record.²⁸ They also should receive as much information as they need to make informed choices about their care. Women should be referred to easily available and trusted sources for evidence-based guidelines such as:
www.obguide.org
www.acnm.org
www.uptodate.com
www.acog.org.²

Additionally, 17-alpha-hydroxy progesterone caproate has been shown to reduce preterm birth by roughly one-third in women with prior spontaneous preterm birth when administered starting at 16 to 20 weeks and continued weekly until 37 weeks.²¹

Quality Improvement Opportunities in Prenatal Care

- The development of electronic medical records will allow pregnancy data to be easily accessible to all appropriate caregivers worldwide. Making electronic records accessible to all health care providers involved with the pregnancy also can improve safety and quality of care.²⁹

More well-controlled clinical studies, such as randomized clinical trials, including those that focus on long-term outcomes of the baby, are necessary to continue to improve the quality of prenatal care and the health of mothers and their babies.



References

1. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Guidelines for perinatal care. 6th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetricians and Gynecologists, 2007.
2. Berghella V, ed. Obstetric evidence based guidelines. London, UK and New York, USA: Informa Healthcare, 2007.
3. Custer M, Waller K, Vernon S, O'Rourke K. Unintended pregnancy rates among a US military population. *Paediatr Perinat Epidemiol* 2008;22:195-200.
4. Berghella V, Buchanan E, Pereira L, Baxter JK. Preconception care. *Obstet Gynecol Surv* 2010;65:119-31.
5. Atrash H, Jack BW, Johnson K, et al. Where is the "W"oman in MCH? *Am J Obstet Gynecol* 2008;199:S259-65.
6. Villar J, Carroli G, Khan-Neelofur D, Piaggio G, Gulmezoglu M. Patterns of routine antenatal care for low risk pregnancy. *Cochrane Database of Systematic Reviews* 2001.
7. Hatem M, Sandall J, Devane D, Soltani H, Gates S. Midwife-led versus other models of care for childbearing women. *Cochrane Database of Systematic Reviews* 2008.
8. Sullivan SA, Hill EG, Newman RB, Menard MK. Maternal-fetal medicine specialist density is inversely associated with maternal mortality ratios. *Am J Obstet Gynecol* 2005;193:1083-8.
9. Neilson JP. Ultrasound for fetal assessment in early pregnancy. *Cochrane Database Syst Rev* 2000;(2):CD000182.
10. ACOG Committee on Practice Bulletins. ACOG Practice Bulletin No. 77: screening for fetal chromosomal abnormalities. *Obstet Gynecol* 2007;109:217-27.
11. Abuhamad AZ, ACOG Committee on Practice Bulletins-Obstetrics. ACOG Practice Bulletin, clinical management guidelines for obstetrician-gynecologists number 98, October 2008 (replaces Practice Bulletin number 58, December 2004). Ultrasonography in pregnancy. *Obstet Gynecol* 2008;112:951-61.
12. Rasmussen KM, Catalano PM, Yaktine AL. New guidelines for weight gain during pregnancy: what obstetricians/gynecologists should know. *Curr Opin Obstet Gynecol* 2009;21:521-6.
13. Artal R, Lockwood CJ, Brown HL. Weight gain recommendations in pregnancy and the obesity epidemic. *Obstet Gynecol* 2010;115:152-5.
14. Kramer MS, McDonald SW. Aerobic exercise for women during pregnancy. *Cochrane Database Syst Rev* 2006;3:CD000180.
15. US Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. 2008.
16. ACOG Committee Obstetric Practice. ACOG Committee opinion. Number 267, January 2002: exercise during pregnancy and the postpartum period. *Obstet Gynecol* 2002;99:171-3.
17. Impact of physical activity during pregnancy and postpartum on chronic disease risk. *Med Sci Sports Exerc* 2006;38:989-1006.
18. Cawthon L. Obesity and Pregnancy. Olympia, Washington: Department of Social and Health Services. Planning, Performance and Accountability. Research and Data Analysis Division, 2010.
19. Roberts D, Dalziel S. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. *Cochrane Database Syst Rev* 2006;3:CD004454.
20. Garite TJ, Kurtzman J, Maurel K, Clark R, Obstetrix Collaborative Research Network. Impact of a 'rescue course' of antenatal corticosteroids: a multicenter randomized placebo-controlled trial. *Am J Obstet Gynecol* 2009;200:248.e1,248.e9.
21. Meis PJ, Klebanoff M, Thom E, et al. Prevention of recurrent preterm delivery by 17 alpha-hydroxyprogesterone caproate. *N Engl J Med* 2003;348:2379-85.

22. Fonseca EB, Celik E, Parra M, Singh M, Nicolaides KH, Fetal Medicine Foundation Second Trimester Screening Group. Progesterone and the risk of preterm birth among women with a short cervix. *N Engl J Med* 2007;357:462-9.
23. National Institute of Health. Eunice Kennedy Shriver National Institute of Child Health and Human Development. Maternal-Fetal Surgery Network 2010.
24. Edlow AG, Srinivas SK, Elovitz MA. Second-trimester loss and subsequent pregnancy outcomes: What is the real risk? *Am J Obstet Gynecol* 2007;197:581.e1,581.e6.
25. Getahun D, Lawrence JM, Fassett MJ, et al. The association between stillbirth in the first pregnancy and subsequent adverse perinatal outcomes. *Am J Obstet Gynecol* 2009;201:378.e1,378.e6.
26. Healy AJ, Malone FD, Sullivan LM, et al. Early access to prenatal care: implications for racial disparity in perinatal mortality. *Obstet Gynecol* 2006;107:625-31.
27. Goldenberg RL, Cliver SP, Mulvihill FX, et al. Medical, psychosocial, and behavioral risk factors do not explain the increased risk for low birth weight among black women. *Am J Obstet Gynecol* 1996;175:1317-24.
28. Brown HC, Smith HJ. Giving women their own case notes to carry during pregnancy. *Cochrane Database Syst Rev* 2004;(2):CD002856.
29. George J, Bernstein PS. Using electronic medical records to reduce errors and risks in a prenatal network. *Curr Opin Obstet Gynecol* 2009;21:527-31.



Quality Improvement Opportunities in Intrapartum Care



Steven L. Clark, Eric Knox,
Kathleen Rice Simpson, Gary D.V. Hankins

Chapter 7: Quality Improvement Opportunities in Intrapartum Care

Steven L. Clark, Eric Knox,
Kathleen Rice Simpson, Gary D.V. Hankins

The intrapartum period represents a time of significant risk to both mother and fetus.^{1,2} While small in an absolute sense, risks experienced during the peripartum period (for example, fetal neurologic impairment due to prematurity and maternal death from hemorrhage) are relatively large in relation to those experienced at other times during pregnancy or infancy.^{1,2} The intrapartum period also represents a time of great opportunity for improving patient outcomes by applying quality improvement principles — process standardization and the use of checklists, teamwork training, crew resource management and evidence-based medicine — to the care of the laboring woman.³⁻⁶

Interdisciplinary communication and multidisciplinary peer review are essential components of any patient safety program directed at labor and delivery care.

This chapter is not intended as a comprehensive treatise on intrapartum care but to highlight several important areas in current obstetric practice where opportunities for improving outcomes are backed by sound scientific data. Additionally, this chapter underscores the importance of systems change in improving outcomes. For instance, interdisciplinary communication and multidisciplinary peer review are essential components of any patient safety program directed at labor and delivery care.^{1,7} To this end, standardized online educational programs, including those directed at fetal heart rate pattern interpretation and the management of shoulder dystocia and postpartum hemorrhage have proven valuable in many facilities. A number of hospitals require successful completion of such educational programs as part of standard credentialing for both physicians and nurses.

Confidential peer review of adverse outcomes is also an essential component of quality improvement and patient safety. Such programs are often made difficult by potential conflicts of interest that exist

when the individual undergoing review is either the practice partner or the economic competitor of the reviewers.¹ In addition, attacks on the confidentiality of the peer review process dramatically weaken the effectiveness of such programs and endanger patient safety.

These areas may serve as valuable focal points for individuals, health care facilities and hospital systems aiming to improve the outcomes of pregnancy.

Select Specific Interventions

Timing of elective delivery

For at least 50 years, “term” pregnancy has been defined as one in which 37 to 42 weeks have elapsed since the last menstrual period.⁸ Until recently, however, birth outcomes within this 5-week range have received little attention. This issue is of particular importance given our current understanding of the significant short- and long-term morbidity associated with late preterm birth (34 to 36 weeks).⁸

While there are many valid medical and obstetric indications for delivery before 39 weeks of gestation, medical justification for a significant proportion of early deliveries is questionable. Of all births in the United States, 10 to 15 percent are currently performed electively (without identifiable medical or obstetric indication) and before 39 weeks of gestation.^{9,10} This includes elective induction of labor and elective primary and repeat cesarean delivery.⁹⁻¹¹ Recent data show that elective delivery prior to 39 weeks of gestation is associated at a minimum with significant short-term morbidity; long-term outcomes in this group, including the type of impaired learning ability and school performance demonstrated in the late preterm infant, have yet to be comprehensively examined.

Figure 1 demonstrates newborn intensive care admissions in infants electively delivered at 37, 38 and 39+ weeks of gestation.⁹ Neonatal morbidity, as assessed by the need for newborn intensive care, is doubled in infants born electively at 38 to 39 weeks and increased 400 percent in those delivered at 37 to 38 weeks, compared to those delivered at or beyond 39 weeks. Infants born before 39 completed weeks of gestation also have a higher incidence of respiratory distress syndrome and infant death than those delivered later.^{9,11}

Confirmation of fetal lung maturity with amniocentesis in order to accomplish elective delivery before 39 weeks probably represents a poor risk/benefit trade-off when elective induction, rather than repeat cesarean, is being considered. Recent data show increased neonatal morbidity with elective delivery prior to 39 weeks even after confirmation of lung maturity.¹² Further, since the rate of primary cesarean associated with induction of labor is directly related to cervical dilatation at the onset of induction, the practice of elective inductions prior to 39 weeks of gestation may also contribute to the rising primary cesarean delivery rate seen in the United States.^{9,13}

Additional drivers of elective deliveries before 39 weeks include physician convenience and patient expectations.¹⁴

Given the frequency of elective, early delivery, spontaneous change is unlikely. However, experiences from several institutions suggest that effective medical leadership and the adoption of strict institutional protocols governing the timing of elective delivery could significantly reduce the rate of elective delivery before 39 weeks of gestation to less than 5 percent of deliveries, with a proportional reduction in associated morbidity (Figure 2).^{10,15,16} Both the National Quality Forum and The Joint Commission have found these measures important enough to include as quality benchmarks.^{17,18} The American College of Obstetricians and Gynecologists also has cautioned against early, elective delivery.¹⁹ The March of Dimes Foundation offers on its website a toolkit for clinicians for use in discouraging elective births before 39 completed weeks of gestation.²⁰

Figure 1: Elective Term Delivery and NICU Admission⁹

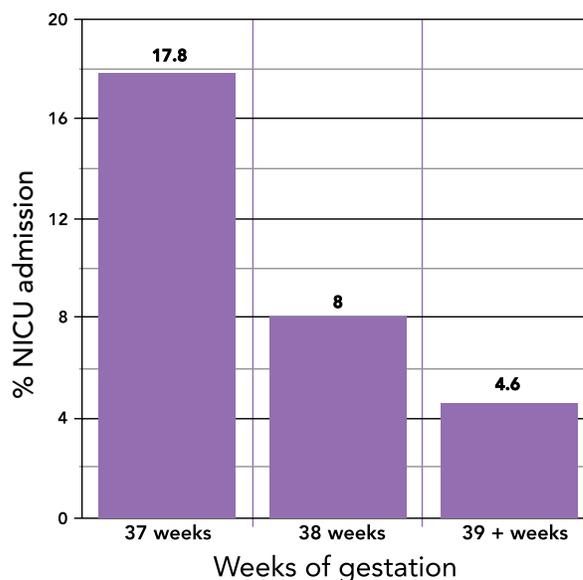
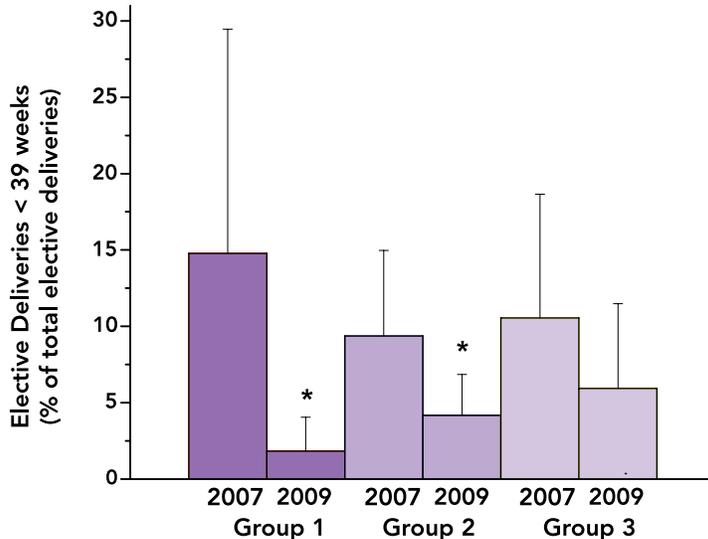


Figure 2: Elective Deliveries < 39 Weeks¹⁰



This figure demonstrates the relative effectiveness of various approaches to the reduction of elective delivery prior to 39 weeks gestation. Group 1 consists of facilities in which a departmental policy against this practice was enforced by hospital personnel. Group 2 represents facilities in which a similar departmental policy was only backed by peer review of outliers. Group 3 consists of facilities in which physician education alone was employed. The change in the latter group was not statistically significant.

The safe use of oxytocin

Oxytocin is the drug most commonly associated with preventable adverse events during childbirth and is also the drug most frequently implicated in professional liability claims.^{21,22} The Institute for Safe Medical Practice recently designated oxytocin a “high alert medication,” bearing a “heightened risk of harm,” which warrants “special safeguards to reduce the risk of error.”²¹

Protocols for the safe administration and monitoring of oxytocin should be based upon several evidence-based physiologic principles:²¹

- Following any change in dose, oxytocin reaches steady state levels after 30 to 40 minutes.
- There is unpredictable variability in individual response to a given dose.

- Adverse fetal effects of oxytocin are exclusively due to excessive uterine activity, which is dose related.
- Fetal pH reliably falls during labor with uterine contractions more frequent than every 2 to 3 minutes.

From these principles it follows that any general regimen for oxytocin infusion would ideally:

- begin at a low dose (1 to 2 milliunits [mU]/minute);
- increase the dose only after sufficient time has elapsed to allow full evaluation of the effects of the initial dose (30 minutes);
- maintain or decrease the dose once a clinically adequate contraction pattern has been obtained;
- institute a protocol to ensure that fetal and uterine effects of the infusion are carefully and uniformly monitored;²³ and
- include adequate nurse staffing (one registered nurse to one woman receiving oxytocin for labor induction or augmentation).

Alternative infusion protocols utilizing higher doses and more frequent dosing intervals have been proposed and extensively studied.²¹ In some cases, such protocols may be carried out without increased morbidity and with shorter labors. However, two meta-analyses have demonstrated increased uterine tachysystole, a lower rate of spontaneous vaginal birth, increased postpartum hemorrhage and increased infection with the use of high- vs. physiologic-dose protocols. In one report, using a protocol in which oxytocin was increased at a rate of 6 mU/min every 20 minutes, labor was shortened, compared to a low-dose protocol. However, uterine tachysystole was seen in half of patients, and cesarean delivery for abnormal fetal heart rate patterns occurred at twice the rate seen with a low-dose regimen.²⁴

While no increase in demonstrable short-term neonatal asphyxial effects was demonstrable in patients experiencing tachysystole and undergoing cesarean delivery for abnormal fetal heart rate patterns in this academic center, the avoidance of near misses is an integral part of current patient safety-based practice. Thus, if patient safety rather than speed of delivery is the primary concern, these data strongly suggest that such high-dose protocols are not ideal for routine use.^{21,25}

In some cases, medical or obstetric indications justify a trade-off between the advantages of shortened labor and the risks of high-dose oxytocin protocols. For example, a woman whose well-being is at risk from severe preeclampsia and falling platelet levels may require more aggressive use of oxytocin to hasten delivery.

Simpson and Lyndon have shown that while 80 percent of nurses at the bedside are aware of the correct clinical action in response to uterine tachysystole (i.e., turn down the rate of oxytocin infusion,) this appropriate action occurs only 22.5 percent of the time, and in some instances, the oxytocin actually is increased.²⁶ The most common cause of discord between the obstetrician and labor nurse is the tendency of the obstetrician not at the patient's bedside to urge the use of oxytocin in a manner that the bedside labor nurse deems unsafe.^{21,27}

Uniformity of approach generally is associated with improved performance or outcomes,^{1,23,25} and all these considerations suggest the need for a more uniform approach to oxytocin administration and monitoring, particularly within a single institution. As a reasonable addition to uniform low-dose infusion rates, standard, highly specific, checklist-driven protocols focusing on uterine and fetal response to oxytocin may improve neonatal outcomes and reduce the primary cesarean delivery rate for abnormal fetal heart rate patterns^{23,25} (see Appendix). Because excessive uterine activity may occasionally be seen with even the most careful clinical care, a

“rescue” protocol allowing independent nursing discontinuation of oxytocin and the administration of terbutaline sulfate should be available in every delivery facility.²⁷

The cesarean delivery rate

The rise in both primary and repeat cesarean delivery rates over the past several decades is a well-described phenomenon.²⁸ With the exception of focused protocols to reduce oxytocin-related abnormal fetal heart rate patterns and restrict the practice of elective inductions prior to 39 weeks of gestation, no programs have effectively curbed the ongoing increase in the primary cesarean rate in large populations. While numerous factors contribute to the increase, we believe that the primary contributors are four-fold:

- lack of a tool to detect developing fetal acidemia during labor with a near perfect sensitivity and a high positive predictive value;²⁹
- lack of clear national guidelines for diagnosing labor arrest requiring cesarean delivery;²⁸
- fear of litigation from failure to perform cesarean delivery;³⁰ and
- a safety profile for cesarean delivery, which closely approaches that of vaginal birth.²

Without any change in the first three factors listed above, we expect to see the cesarean rate remain relatively high in the United States. The cesarean rate is a poor metric for assessing quality of intrapartum care, either individually or institutionally. The ideal rate should be viewed as a secondary parameter that will only be approached as individual components of intrapartum care are perfected.¹

Standard, highly specific, checklist-driven protocols focusing on uterine and fetal response to oxytocin may improve neonatal outcomes and reduce the primary cesarean delivery rate for abnormal fetal heart rate patterns.

We recommend that clinicians consider the administration of magnesium sulfate for neuroprophylaxis in all infants less than 32 weeks of gestation who are at significantly increased risk for preterm delivery.

Magnesium sulfate for neuroprotection and cerebral palsy

Cerebral palsy most commonly results from prematurity, in-utero infection or other, incompletely understood developmental events unrelated to intrapartum care. However, both intrapartum asphyxia and intracranial hemorrhage may lead to cerebral palsy in previously normal infants.³

Scientific and medical organizations dealing with the fetus and newborn now universally accept criteria that support the link between intrapartum asphyxia and cerebral palsy.³ Appropriate intrapartum care can, in some cases, prevent such events. However, extremely premature infants are at particular risk for the later development of cerebral palsy. Until recently, little was known about effective methods of cerebral palsy prevention in these babies.

Several studies, including two meta-analyses, have demonstrated a reduction in cerebral palsy in infants delivered before 32 weeks, who received magnesium sulfate prior to delivery.^{31,32} Other types of neurologic dysfunction, including development delay, intellectual impairment, blindness or deafness are not affected. In the animal model, magnesium prevents post-hypoxic brain injury by blocking the excess release of glutamate in the calcium channel.³³ Both fetal and newborn brains appear to be susceptible to glutamate-mediated injury. Magnesium sulfate also has been shown to alter differential expression of the inflammatory mediator IL-1 and reduce neuronal injury in the mouse model.³⁴

Various doses, durations of therapy and dosing intervals have been studied, and most seem to demonstrate similar benefit. We recommend that clinicians consider the administration of magnesium sulfate for neuroprophylaxis in all infants less than 32 weeks of gestation who are at significantly increased risk for preterm delivery. Institutions should adhere to one of the available, peer-reviewed, published protocols.³⁵ While the reduction in rates of cerebral palsy seen with magnesium sulfate

administration are important, most studies show a reduction in the absolute magnitude of risk on the order of approximately 2 percent. Thus, it would be scientifically invalid to conclude that cerebral palsy in any individual case would probably have been avoided had magnesium sulfate been administered.

As the authors of one meta-analysis noted, “Further studies are required to clarify how magnesium sulfate works, who should receive it, and how best the treatment should be given. Studies comparing the dose, timing of administration, and whether maintenance magnesium therapy is required and whether it should be repeated are needed.”³⁶ Current recommendations allow the use of various doses and dosing intervals for the administration of magnesium sulfate for neuroprotection, and no specific protocol or set of risk factors can be considered superior to another. We do recommend that institutions develop uniform criteria and protocols for such treatment based upon any one of a number of published approaches.

Brachial plexus impairment

Several large clinical studies document that many cases of brachial plexus impairment, including frank nerve root avulsion, result from unavoidable in-utero processes that also predispose the infant to shoulder dystocia at birth.^{36,37} Brachial plexus injury and shoulder dystocia are commonly separate complications with a common origin, namely, fetal-pelvic disproportion during late pregnancy and/or labor. However, some cases of shoulder dystocia may result in brachial plexus injury.

A number of maneuvers are available to the clinician faced with shoulder dystocia. Such maneuvers will generally allow delivery of the infant without brachial plexus injury, excluding those cases described above, in which injury already exists due to the same factors that lead to the shoulder dystocia.

Since shoulder dystocia is both, in an absolute sense, unavoidable and not commonly encountered by the team providing intrapartum care, a uniform team management approach may improve the handling of this emergency. Drills, continuing medical education, interactive online courses and protocols that clarify the duties of each team member are all valuable tools in achieving uniformity of care. We recommend that facilities providing delivery services develop and implement a plan to assure proper team management of shoulder dystocia, utilizing one or more of the above training tools. Accurately documenting the maneuvers utilized and avoided in the management of shoulder dystocia is also essential and could be facilitated by the use of available checklists.

Conclusion and Recommendations

Given the current state of science, evidence-based initiatives to improve intrapartum care appear best suited for:

- introducing facility-based protocols and developing effective medical leadership to eliminate elective birth before 39 completed weeks of gestation and its associated morbidity, while improving patient safety and pregnancy outcomes;
- using standardized, low-dose oxytocin protocols for induction and augmentation of labor;
- implementing unambiguous, uniformly implemented protocols for monitoring oxytocin infusion;
- avoiding inappropriate cesarean deliveries and de-emphasizing cesarean delivery rate as a primary quality indicator;
- adopting protocols for administering magnesium sulfate for neuroprotection in premature infants, modeled after published approaches;
- instituting educational/training methodology designed to enhance team response to obstetric emergencies, including shoulder dystocia and postpartum hemorrhage, to promote clinician understanding of intermediate and abnormal fetal heart rate patterns;
- using available checklists to accurately document the maneuvers utilized and avoided in the management of shoulder dystocia; and
- developing a robust quality improvement program for intrapartum care processes.

Patient safety initiatives based on these principles have resulted in significant improvements in perinatal outcomes in select facilities and hospital systems. Focusing on any of these areas would help individuals and facilities to further improve the outcomes of pregnancy.



HCA

HCA Perinatal Safety Initiative

Recommended

Oxytocin “In Use” Checklist for Women with Term Singleton- Babies

“This Oxytocin “In Use” Checklist represents a guideline for care: however, individualized medical care is directed by the physician.”

Checklist will be completed every 30 minutes. Oxytocin should be stopped or decreased if the following checklist cannot be completed.

Date and time completed _____

Fetal Assessment indicates:

- At least 1 acceleration of 15 bpm x 15 seconds in 30 minutes or adequate variability for 10 of the previous 30 minutes.
- No more than 1 late deceleration occurred.
- No more than 2 Variable decelerations exceeding 60 seconds in duration and decreasing greater than 60 bpm from the baseline within the previous 30 minutes.

Uterine Contractions

- No more than 5 uterine contractions in 10 minutes for any 20minute interval
- No two contractions greater than 120 seconds duration
- Uterus palpates soft between contractions
- If IUPC is in place, MVU must calculate less than 300 mm Hg and the baseline resting tone must be less than 25 mm Hg.

***If Oxytocin is stopped the Pre-Oxytocin Checklist will be reviewed before Oxytocin is reinitiated.**

FINAL: March 21, 2005

References

1. Clark SL, Belfort MA, Byrum SL, Meyers JA, Perlin JB. Improved outcomes, fewer cesarean deliveries, and reduced litigation: results of a new paradigm in patient safety. *Am J Obstet Gynecol* 2008;199:105.e1,105.e7.
2. Clark SL, Belfort MA, Dildy GA, Herbst MA, Meyers JA, Hankins GD. Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. *Am J Obstet Gynecol* 2008;199:36.e1,5; discussion 91-2. e7-11.
3. American College of Obstetricians and Gynecologists and American Academy of Pediatrics. Neonatal Encephalopathy and Cerebral Palsy: Defining the Pathogenesis and Pathophysiology. Washington, DC: 2003.
4. Kuban KC, Leviton A, Pagano M, Fenton T, Strassfeld R, Wolff M. Maternal toxemia is associated with reduced incidence of germinal matrix hemorrhage in premature babies. *J Child Neurol* 1992;7:70-6.
5. Nelson KB, Grether JK. Can magnesium sulfate reduce the risk of cerebral palsy in very low birthweight infants? *Pediatrics* 1995;95:263-9.
6. Doyle LD, Crowther CA, Middleton P, Marret S, Rouse D. Magnesium sulphate for women at risk of preterm birth for neuroprotectin of the fetus. *Cochrane Database of Systematic Reviews* 2009.
7. Simpson KR, James DC, Knox GE. Nurse-physician communication during labor and birth: implications for patient safety. *J Obstet Gynecol Neonatal Nurs* 2006;35:547-56.
8. Fleischman AR, Oinuma M, Clark SL. Rethinking the definition of “term pregnancy.” *Obstet Gynecol* 2010;116:136-9.
9. Clark SL, Belfort MA, Miller DK, et al. Neonatal and Maternal Outcomes associated with elective term delivery. *Am J Obstet Gynecol* 2009;200:156e1-4.
10. Clark SL, Frye DR, Meyers JA, et al. Reduction in elective delivery at <39 weeks of gestation: comparative effectiveness of 3 different approaches to change and the impact on newborn intensive care admissions and stillbirths. *Am J Obstet Gynecol* 2010;203.
11. Tita AT, Landon MB, Spong CY, et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes. *N Eng J Med* 2009;360:111-20.
12. Bates E, Rouse D, Chapman V, et al. Fetal lung maturity testing before 39 weeks and neonatal outcomes. *Am J Obstet Gynecol* 2009;201:S17.
13. Reisner DP, Wallin TK, Zingheim RW, et al. Reduction of elective inductions in a large community hospital. *Am J Obstet Gynecol* 2009;200:e1-7.
14. Goldenberg RL, McClure EM, Bhattacharya A, Groat TD, Stahl PJ. Women’s perceptions regarding the safety of births at various gestational ages. *Obstet Gynecol* 2009;114:1254-1258.
15. Oshiro BT, Henry E, Wilson J, Branch DW, Varner MW. Decreasing elective deliveries before 39 weeks of gestation in an integrated health care system. *Obstet Gynecol* 2009;113:804-11.
16. Iams J for the Ohio Perinatal Quality Collaborative. A statewide initiative to reduce scheduled births without appropriate indication. *Am J Obstet Gynecol* 2009;201:S19.
17. The National Quality Forum. NQF #0469. Elective delivery prior to 39 completed weeks gestation. Endorsed on: October 28, 2008;2010.
18. The Joint Commission. The Joint Commission Introduces Perinatal Care Core Measures. 2010.
19. ACOG Committee on Practice Bulletins. ACOG Practice Bulletin. No. 107. Induction of Labor. *Obstet Gynecol* 2009;114:386-97.
20. March of Dimes. Elimination of Non-medically Indicated (Elective) Deliveries Before 39 Weeks Gestational Age. 2010. www.marchofdimes.com/files/_39_Weeks_Toolkit.pdf
21. Clark SL, Rice-Simpson K, Knox E, Garite TJ. Oxytocin: New perspectives on an old drug. *Am J Obstet Gynecol* 2009;209:e1-6.

22. Clark SL, Belfort MA, Dildy GA, et al. Reducing litigation through alterations in practice patterns. *Obstet Gynecol* 2008;112:1279-1283.
23. Clark SL, Belfort MA, Saade GA, et al. Implementation of a conservative, checklist driven protocol for oxytocin administration: Maternal and newborn outcomes. *Am J Obstet Gynecol* 2007;197:e1-5.
24. Satin AJ, Leveno KJ, Sherman ML, et al. High- vs. low-dose oxytocin for labor stimulation. *Obstet Gynecol* 1992;80:111.
25. Hayes EJ, Weinstein L. Improving patient safety and uniformity of care by a standardized regimen for the use of oxytocin. *Am J Obstet Gynecol* 2008;198:e1-7.
26. Simpson KR, Lyndon A. Clinical disagreements during labor and birth: How does real life compare to standards of care? *The American Journal of Maternal Child Nursing* 2009.
27. Simpson KR. Failure to rescue: Implications for evaluating quality of care during labor and birth. *Journal of Perinatal and Neonatal Nursing* 2005;19:23-33.
28. Clark SL, Belfort MA, Hankins GDV, et al. Variation in the rates of operative delivery in the United States. *Am J Obstet Gynecol* 2007;196:526-7.
29. Clark SL, Hankins GDV. Temporal and demographic trends in cerebral palsy — Fact and fiction. *Am J Obstet Gynecol* 2003;188:628-33.
30. Lumalcuri J, Hale RW. Medical Liability. An ongoing nemesis. *Obstet Gynecol* 2010;115:223-30.
31. Rouse DJ, Hirtz DG, Thom E, et al for the Eunice Kennedy Shriver NICHD Maternal-Fetal Medicine Units Network. A randomized, controlled trial of magnesium sulfate for the prevention of cerebral palsy. *NEJM* 2008;359:895-905.
32. Constantine MM, Weiner SJ for the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units Network (MFMU). Effects of antenatal exposure to magnesium sulfate on neuroprotection and mortality in preterm infants. *Obstet Gynecol* 2009;114:354-64.
33. McDonald JW, Silverstein FS, Johnston MV. Magnesium reduces N-methyl-D-aspartate (NMDA)-mediated brain injury in perinatal rats. *Neuroscience Letters* 1990;109:234-8.
34. Burd I, Breen K, Friedman A, et al. Magnesium sulfate to prevent adverse neurological injury: providing biological evidence. *Am J Obstet Gynecol* 2009;201:S3.
35. Scott JR. Magnesium sulfate for neuroprotection. *What Do We Do Now?* *Obstet Gynecol* 2009;114:500-1.
36. Sandmire H, Morrison J, Racinet C, et al. Newborn brachial plexus injuries: The twisting and extension of the fetal head as contributing causes. *J Obstet Gynaecol* 2008;28:170-2.
37. Gherman RB, Chauhan S, Ouzounian JG, et al. Shoulder dystocia: The unpreventable obstetric emergency with empiric management guidelines. *Am J Obstet Gynecol* 2006;195:657-72.

Applying Quality Improvement Principles in Caring for the High-Risk Infant



Jeffrey B. Gould, Barbara S. Medoff-Cooper,
Edward F. Donovan, Ann R. Stark

Chapter 8: Applying Quality Improvement Principles in Caring for the High-Risk Infant

Jeffrey B. Gould, Barbara S. Medoff-Cooper,
Edward F. Donovan, Ann R. Stark

There is a pressing need for hospital administrative leadership to provide financial support for data collection and membership in a multi-institutional collaborative quality improvement database as a fundamental line item in the NICU budget.

This chapter focuses on the high-risk preterm and term infants who require care in a neonatal intensive care unit (NICU) or other higher level care unit. Each perinatal program should develop criteria for admission to the NICU based on evidenced-based assessment of maternal, neonatal and peripartum factors that determine levels of risk. Quality improvement programs can assess whether these criteria are appropriate and are being applied consistently to result in the best outcomes for mother and child. This chapter describes four aspects of NICU care — measurement, reducing variation in process and outcome, safety and individualized care — that with appropriate attention can result in significant improvements in outcomes within a 1- to 2-year period.

Measurement

All quality assessment and improvement activities require measurement, in order to compare one unit's level of achievement to the achievement of peers¹, guide the improvement process and determine its success. NICUs may undertake individual improvement projects, based on their clinical perception of needed change. Alternatively or simultaneously, more rapid and powerful identification of a need to improve may be achieved when one has access to measurements that are made within the context of a multi-institutional network that uses standard definitions, fair risk adjustment techniques and peer level comparison metrics to serve as benchmarks. Considerable resources are commonly committed to purchase devices to monitor and optimize the health and stability of each NICU infant, while resources to monitor and optimize the safety and overall effectiveness of the NICU may be seen as less essential. There is a pressing need for hos-

pital administrative leadership to provide financial support for data collection and membership in a multi-institutional collaborative quality improvement database as a fundamental line item in the NICU budget.

A number of regional and national multi-institutional neonatal quality improvement collaboratives have made important contributions to improving care for their member NICUs. Quality improvement collaboratives provide opportunities for shared learning, peer competition and testing of multiple strategies simultaneously. Existing multi-institutional systems such as the Vermont Oxford Network (www.vtoxford.org), California Perinatal Quality Care Collaborative (www.cpqcc.org), Ohio Perinatal Quality Collaborative (www.opqc.net), Pediatrix (www.pediatrix.com) and the National Perinatal Information Center (www.npic.org) provide their member NICUs with useful benchmarks on important processes and outcomes. They also provide structured, multi-institutional quality improvement

initiatives. However, each has developed, somewhat independently, an approach to defining specific measures of process and outcome with case definitions, denominators and risk adjustments. A national consensus is needed to develop standard sets of measurement tools, including electronic medical record identification standards for each definition and denominator, appropriate risk adjustment factors, and comparison metrics to assure fair comparison across all NICUs. At a minimum, these tools should address both the effectiveness and safety of the care that the NICU provides to its infants and their families.

As a first step, the Technical Advisory Committee of the Perinatal Section of the American Academy of Pediatrics is currently evaluating differences in the approaches used by the major networks and researchers with respect to the measurement and inter-NICU comparison of nosocomial infection. Unfortunately, until measurement and participation in quality improvement are adopted as essential line items in

the NICU budget, the ability to participate in these activities and the resultant benefits that they offer to the care of high-risk infants remain limited.

Reducing Variation in Process and Outcomes

The care provided and the outcomes of patients vary widely among NICUs (Figures 1, 2).

Some of the variation in outcomes may be explained by differences in baseline risk among patients (for example, extremely low gestational age or transfer rather than inborn), but much is explained by the differences in the care that is received. Variation is typical of most NICU processes and outcomes, even after adjustment has been made for differences in case mix.

The formal display of variation across a group of NICUs serves two important purposes. First, it shows the achievements of a significant number of NICUs in modifying important processes and minimizing morbidity and mortality. Second, it allows a

Figure 1: Late Bacterial Infections in Ohio NICUs, Infants 22 to 29 Weeks Gestation²

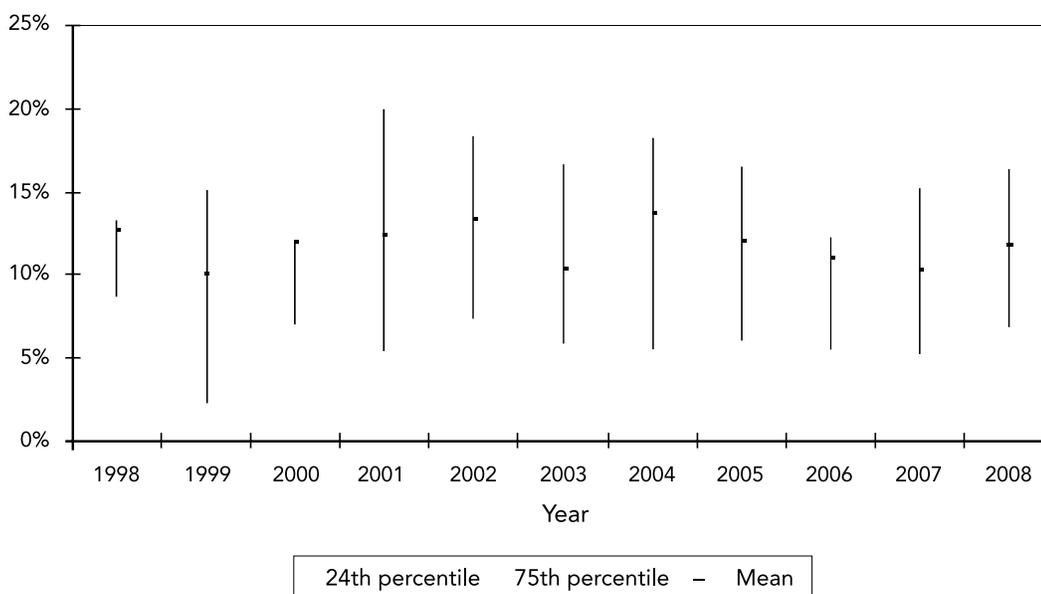


Figure 1: Variation in prevalence of late bacterial infections among 664 to 1,319 infants per year at 22 to 29 weeks gestation in 24 Ohio NICUs participating in the Vermont Oxford Network registry (<https://nightingale.vtoxford.org>)

NICU to compare its performance to those NICUs that have achieved this benchmark performance. The goal of quality improvement is to provide the tools and structure

Figure 2: Impacts of Race/Ethnicity on Breastmilk Feeding at Discharge Home³

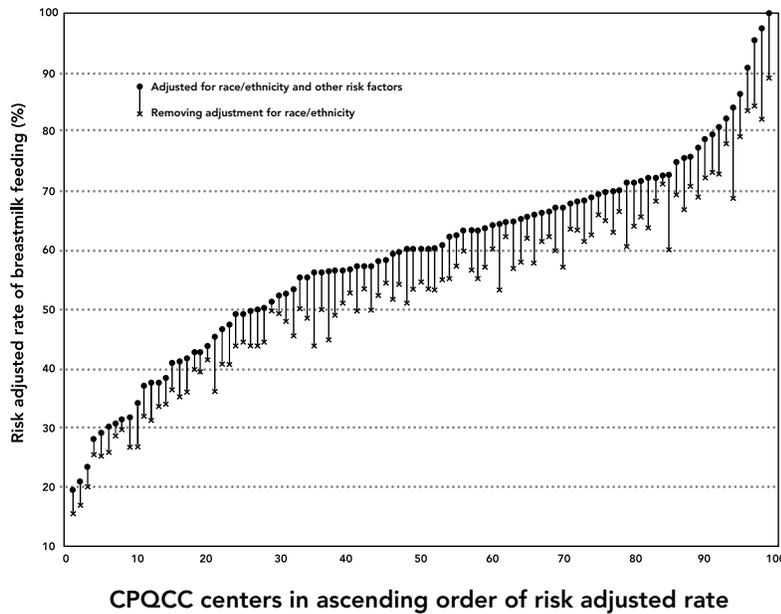
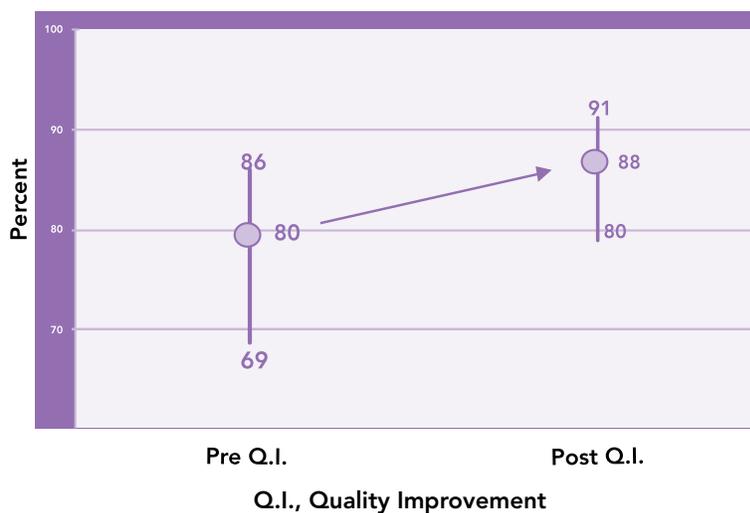


Figure 3: Move the Median and Narrow the Interquartile Range⁴



for all NICUs to achieve or even exceed the outcomes reported by the top performers. When applied to a network of NICUs, effective quality improvement will increase the group's mean rate for a desired outcome and decrease the variability in processes and/or outcomes across the group. Figure 3 demonstrates these changes following an improvement project to increase the rate of antenatal steroids in mothers threatening preterm delivery.⁴

Because the quality of care delivered to NICU patients is ultimately improved by the busy frontline clinicians who provide that care, quality improvement efforts must become part of the routines of everyday care. Using proven improvement methods and respecting the time constraints placed on neonatologists, nurses, therapists and other members of the care team are essential to successful quality improvement.

Examples of Successful Perinatal Quality Improvement Initiatives

A number of perinatal quality improvement initiatives are achieving positive results. In a collaborative, supported by the California Perinatal Quality Care Collaborative (CPQCC), 13 regional NICUs reduced central line-associated blood stream infections by 25 percent within a 10-month period.⁵ Similarly, from 1998 to 2006, a Vermont Oxford Network quality improvement collaborative of eight NICUs caring for 4,065 very low-birthweight infants experienced a statistically significant reduction in health care-associated infections, from 18 percent to 15 percent.⁶

Key Practical Concepts in Perinatal Quality Improvement

Several practical concepts are central to perinatal improvement efforts: timely feedback, transparency, evidence-based decision-making and reliability.

Timely feedback

Setting measurable, time-bounded goals and benchmarks is an irreplaceable component of successful quality improvement efforts.

Measurement must be timely and useful to clinicians. For example, reporting on the performance of nurses and neonatologists soon after they have cared for infants with indwelling intravascular catheters is likely to be a more valuable motivation for change than providing reports several months later. Similarly, timely reports generated from data provided by clinicians who are providing care directly are likely to be more highly valued than reports based on data that others collect.

Transparency

Transparency in health care quality improvement implies that outcomes are shared openly with colleagues, patients, families, payers and competitors. Transparency may invite criticism and risk loss of market share, but also it is likely to enhance shared learning and motivate those working to improve quality of care.⁷ Public release of performance data has been shown to stimulate quality improvement activity at the hospital level.⁸ Posting the ongoing results of a NICU quality improvement initiative in a location that is prominent to both parents and staff has been found to greatly accelerate the enthusiasm for and process of change.

Evidence-based decision making

A central purpose of quality improvement programs in the health care arena is to implement evidenced-based practices that lead to safe and effective care of patients and result in the best possible outcomes. In this context, evidence has a hierarchical definition: the highest level of evidence is supported by multiple, large sample size and scientifically valid trials, while a lower level of evidence is based on the opinions of experienced experts. The U.S. Preventive Services Task Force has summarized current thinking on evidence hierarchy (www.ahrq.gov/clinic/uspstf/grades.htm). Websites such as that of the California Perinatal Quality Care Collaborative have posted quality improvement toolkits using published best practices that are available for free download (www.cpqcc.org).

Reliability: Every patient at every encounter receives the best care.

Reliability is often expressed as an error rate. When errors are costly, such as in the nuclear power industry, “highly reliable” might be defined as less than one error in a million events. In this case, reliability is constructed with the knowledge that any error could harm many individuals. The health care industry, in contrast, tends to be more personally oriented, as clinicians are closely in touch with the relatively few individuals they treat. Thus, error rates expressed at the industry level may lead clinicians to believe that 1 in 100 is not bad, with each patient having a 99 out of 100 chance of not being harmed. Highly reliable health care organizations might measure their effectiveness as the proportion of patient encounters where clinicians do the right thing. From the perspective of a family with an infant in a busy NICU, where 1000 clinical decisions are made daily, however, knowing that the health care system makes 10 harmful errors per day (1 in 100) is hardly reassuring. Developing the essential characteristics of a high-reliability organization, such as effective non-hierarchical communication and teamwork, identification of system vulnerabilities to error and non-judgmental error identification and analysis are well within the reach of all NICUs. As discussed below, an active simulation program is an effective way to encourage and develop these skills.

Patient Safety in the NICU

Three actionable examples of NICU safety initiatives are: a) reduction of nosocomial infections; b) handoffs and improved communication; and c) simulation exercises. These approaches will rapidly advance safety by addressing systems rather than individual issues. Although we think that multi-institutional, voluntary, non-punitive, system-based incident reporting may play an important role in the future, the beneficial effects of such an approach await further evaluation.^{9,10} Other critically important

Because the quality of care delivered to NICU patients is ultimately improved by the busy frontline clinicians who provide that care, quality improvement efforts must become part of the routines of everyday care.

It is also important to eliminate barriers to effective communication, which typically result from physicians' and nurses' perceived differences in roles, including hierarchical barriers.

safety initiatives, such as reducing medication errors, require organization-wide efforts not restricted to the NICU and are not considered here.

Reduction of Health Care-associated Infections

Nosocomial infection and/or catheter-associated systemic infections are among the top safety issues identified in NICU error surveys and trigger studies.¹¹ Quality improvement efforts directed at reducing these infections are effective and substantially decrease morbidity and resource utilization.⁵ Furthermore, these initiatives may achieve levels of improvement that exceed what participants initially thought was possible. For example, as a result of a structured quality improvement initiative, large, high acuity NICUs may have periods of more than 6 months without catheter-associated infections (Table 1).

Handoffs and Improved Communication

Given the intensity and complexity of NICU care and the multiple transitions of personnel across shifts, assuring the accurate transfer of information concerning an infant's condition, anticipated issues and care plan is a high priority. Although no studies report the incidence or consequences of failures in handoffs (also known as sign-out) in the NICU, communication problems are well documented as a major source of medical errors in a variety of hospital settings.¹² Thus, a standardized approach to handoffs, including the development of electronic tools to facilitate them, would be expected to promote safety, as suggested by The Joint Commission 2006 National Patient Safety Goal, requiring organizations to implement a standardized approach to "hand off communications." While several extensive reviews of medical handoffs are available,

Table 1. Selected Evidence-Based Quality Improvement Initiatives for High-Risk Neonates

Outcome/Process	Improvement
NICU infection	
NICU CABS ¹³ *	Decreased 85% ¹³
Neonatal nosocomial infections	Decreased 17% ¹⁴
Coagulase negative staphylococcal bacteremia	Decreased 33% ¹⁵
NICU nosocomial infection	Decreased 29% ¹⁶
Catheter-associated bloodstream infection	Decreased 25% ⁵
Chronic lung disease	
Preterm chronic lung disease	Decreased 56% ¹⁷
VLBW survival without bronchopulmonarydysplasia	Increased 15% ¹⁸
VLBW survival without bronchopulmonarydysplasia	No change ¹⁹
Receipt of surfactant after age 2 hours	Decreased 62% ²⁰
Retinopathy of Prematurity	
Severe retinopathy of prematurity	Decreased 47% ²¹
NICU admission temperature	
VLBW admission temperature	Increased 0.8°C ²²
Improving growth of VLBW infants ²³	

* Neonatal intensive care unit, catheter-associated blood stream infection
VLBW, very low birthweight

including those that describe the impact of poorly executed handoffs, little research has been done to identify best practices.

Recommendations stipulate that handoffs occur at a set time and be face-to-face to allow direct communication and clarification between the giver and receiver of information. Limiting interruptions during sign-out is also important to ensure accurate transfer of information. Because a lack of formal training in sign-out methods is another potential barrier, designing and implementing a sign-out training module is essential and should be integrated into the overall development of the sign-out process.¹²

It is also important to eliminate barriers to effective communication, which typically result from physicians' and nurses' perceived differences in roles, including hierarchical barriers. Using a standardized structured handoff can decrease barriers to effective communication. Electronic sign-out tools facilitate verbal report by providing a structured approach to information transfer. An electronic sign-out tool that is integrated with an electronic medical record can utilize already available data (demographics, vital signs, medications, laboratory values, to-do items, etc.), improving clinician efficiency and decreasing errors, including medication errors.

A sign-out program appropriate for the specific needs of an individual NICU that is developed with input from the entire staff could lead to innovative solutions and provide the sense of ownership that is important to the success of the program. Each program should include a formal training protocol and a system to monitor its use and effectiveness.

One approach is "A Model for Building a Standardized Handoff Protocol,"²⁴ developed at the University of Chicago and based on the experience of resident handoffs. The authors propose a model of process mapping, critical content identification, implementation and monitoring, although an electronic solution is not included. Given

the increasing implementation of institutional electronic medical records, development of an approach to handoffs should include an integrated electronic tool to facilitate the process.²⁵ As part of a Vermont Oxford Network quality collaborative, improvement projects were undertaken to improve communication in the NICU by using electronic reports to aid in the transfer of information.

Simulation. Safe patient care in NICUs depends on a high-functioning, multidisciplinary team. As in all intensive care settings, individuals and the team need to maintain procedural skills and must be able to respond appropriately to relatively infrequent life-threatening events. Participation in a simulation program facilitates maintenance of skills without involving actual patients and promotes team training for common scenarios and less frequent events. Simulation-based training in health care realistically recreates the key visual, auditory and tactile cues of actual clinical situations to provide learning experiences that closely mimic the conditions encountered when caring for real patients. By engendering authentic responses in trainees, simulation-based training allows them to identify and address areas for improvement.²⁶

Simulation is an activity that begins to integrate the key characteristics of a high-reliability organization, such as standardized procedures, effective communication among all team members, non-hierarchical teamwork and committed attention to detecting and discussing near errors and actual errors in a non-judgmental setting. Simulation resuscitation exercises offer an effective approach to reducing social/hierarchical barriers to communication among members of the perinatal care team. This approach was strongly recommended by The Joint Commission (JC) after analysis of sentinel events demonstrated that faulty communication and teamwork contributed to neonatal and maternal morbidity and mortality. In "Preventing Infant Death and Injury During Delivery," a 2004 JC Sentinel Event Alert, ineffective communication

Simulation-based training in health care realistically recreates the key visual, auditory and tactile cues of actual clinical situations to provide learning experiences that closely mimic the conditions encountered when caring for real patients.

It is important that providers all along the continuum — including neonatal care — embrace the concept of patient- and family-centered care, to empower women and their families to be active participants of their health care team and decision-making.

played a role in 72 percent of the 47 cases of neonatal mortality or severe neonatal morbidity reported to that agency.²⁷ A 2010 JC Sentinel Event Alert, “Preventing Maternal Death,” focused on adverse events in labor and delivery.²⁸

Evidence from clinical studies also supports the value of simulation. A recent review of the evidence for the International Liaison Committee on Resuscitation (ILCOR) identified three prospective randomized controlled trials and 19 other studies that support the use of simulation for the acquisition and maintenance of cognitive, technical and behavioral skills required for effective and safe neonatal resuscitation; they found no study that refuted the value of simulation. Similarly, the introduction of simulation-based training in emergency obstetrics was associated with a reduction in perinatal asphyxia and neonatal hypoxic-ischemic encephalopathy (HIE).²⁹

In a retrospective, cohort observational study of 19,460 births in a tertiary referral maternity unit in a teaching hospital, the incidence of infants with 5-minute Apgar scores of ≤ 6 decreased from 86.6 to 44.6 per 10,000 births ($P < 0.001$), and those with HIE decreased from 27.3 to 13.6 per 10,000 births ($P = 0.032$), following the introduction of simulation-based training in the management of the difficult delivery.²⁹ In another retrospective, observational study of 29,025 births by the same group, the management and neonatal outcome of births complicated by shoulder dystocia was compared before and after the introduction of shoulder dystocia training at Southmead Hospital in Bristol, United Kingdom. Simulation training was associated with both improved use of indicated delivery maneuvers (McRoberts’ maneuver, suprapubic pressure, internal rotational and delivery of posterior arm) and a significant reduction in neonatal injury at birth after shoulder dystocia, from 9.3 percent to 2.3 percent.³⁰ Despite the use of historical controls, these studies demonstrate impressive improvement in profound neonatal problems that are often medical legal issues.

The first simulation-based learning program in neonatal-perinatal medicine is the NeoSim program developed at the Center for Advanced Pediatric and Perinatal Education (CAPE), located at Packard Children’s Hospital on the campus of Stanford University in Palo Alto, California. Since 1997, NeoSim has provided training in the cognitive, technical and behavioral skills necessary for optimal care of the newborn in distress.^{31,32} NeoSim serves as the basis for a series of changes taking place in the current national standard for training in neonatal resuscitation, the Neonatal Resuscitation Program (NRP) of the American Academy of Pediatrics (AAP).³³ Cost should not be a limiting factor in simulation training. Although full-scale simulation environments have many advantages, simulation scenarios can be created and trainings conducted using standard resuscitation mannequins.

Individualized Care

Individualized or developmentally appropriate care was introduced in the mid-1980s by Als³⁴ to address concerns that the NICU environment, with its high levels of noise and light, would adversely influence neurodevelopmental outcomes for the high-risk preterm infant.³⁵ Developmentally appropriate care is dependent on the concept of individualization and involves thoughtful consideration about the type, amount and timing of interventions based on the infant’s physiologic status and behavioral cues. Interventions are designed to help the preterm or high-risk infant become as stable, well organized and competent as possible. The delivery of developmentally appropriate care facilitates infant behavioral state as the caregiver attends to infant needs. It should, therefore, be integrated into all aspects of caregiving and serve as a foundation for all decision-making and interactions with the infant and family. Most importantly, individualized care must adjust with the changing developmental needs of the maturing preterm or high-risk infant, and, therefore, it requires frequent evaluation.³⁶

Concerns about preterm infant experiences in the NICU and their impact on developmental outcomes have led to numerous developmental-based intervention programs.³⁷ Some of the most common elements in developmental care include: (a) control of the external stimuli (vestibular, tactile and auditory); (b) facilitating uninterrupted sleep by clustering care; and (c) swaddling or positioning the infant to provide a sense of containment.³⁵ Parental participation is also considered an important element of these programs.³⁸ One systematic implementation of developmental interventions is the Neonatal Individualized Developmental Care and Assessment Program (NIDCAP).³⁹ NIDCAP uses a behavioral observation tool to assess an infant's tolerance of environmental and caregiving stimuli. Other programs also support the integration of supportive interventions, such as the use of maternal skin-to-skin holding (kangaroo care), and integration of families into caregiving, as well as providing high-risk infants with the support to develop more “normally,” given their different beginning. Although the impact of these developmental care practices overall is difficult to establish because of conflicting findings and studies with small sample sizes, a Cochrane review found evidence of limited benefit of interventions overall and no major harmful effects.³⁵ One practice associated with positive benefits is kangaroo care.⁴⁰ In one trial, kangaroo care was associated with reductions in nosocomial infection at 41 weeks of corrected gestational age, severe illness, lower respiratory tract disease at 6 months follow-up, not exclusively breastfeeding at discharge, and more weight gain per day by discharge.⁴¹

As discussed in Chapter 4, it is important that providers all along the continuum — including neonatal care — embrace the concept of patient- and family-centered care, to empower women and their families to be active participants of their health care team

and decision-making. An emerging area of investigation in individualized care is in training parents to observe signs of stress and coping in their hospitalized infant and to interact in ways that ameliorate stress. In one report, sensitivity training using the Mother Infant Transactional Program (MITP) was associated with improved cerebral white matter micro-structural development as measured by MRI. More mature white matter has been associated with enhanced neurobehavioral scores at 2 weeks and 9 months of age.⁴²

Although developmentally appropriate and individualized care is a basic tenet of pediatric care, successful implementation in a NICU setting may be challenging. An index to assess Developmentally Appropriate Neonatal Intensive Care Practice (DANIP) may be helpful to characterize the overall developmental environment and to quantify the care and support of preterm infants and their families in the domains of parental and family involvement, environmental controls and individualized care and assessment.³⁶ The DANIP is comprised of three subscales: parental and family involvement, environmental controls and individualized care and assessment. The first section of eight items provides background and demographic details of the NICU, such as staff numbers, size of unit and number of clinicians. Thirty-six items describe organizational aspects of the unit, such as visiting hours and follow-up clinic, and environment (noise control, cycled lighting and intervention programs, like kangaroo care). The last section of 13 items addresses attitudes and beliefs of the staff member about practices and interventions that influence premature infant development. The instrument, which is the first of its kind, provides a quantitative measure to monitor the implementation of developmentally-based care. The tool can serve as a compass for guiding improvements in care by further enhancing the application of developmentally sensitive care for the preterm infant.

Although developmentally appropriate and individualized care is a basic tenet of pediatric care, successful implementation in a NICU setting may be challenging.

Conclusion and Recommendations

Ongoing, evidence-based, results-driven improvement is an essential activity for all NICUs. The following recommendations include readily actionable, highly effective activities that should be pursued by all NICUs seeking to achieve the very best outcomes for their infants:

- NICU budgets should include support for outcomes measurement and at least one ongoing, active quality improvement initiative on a continuous basis.
- Improvement initiatives should include measurable, time-bounded goals, timely feedback, transparency, evidence-based practices, as well as attention to individualized care of patients and their families.
- NICUs should develop actionable, evidence-based safety initiatives. These should include the high-priority areas of reducing nosocomial infections, improving handoffs and communication and simulation exercises.
- As part of improvement efforts, neonatal care providers should embrace concepts of patient- and family-centered care, encouraging active participation of women and families in their health care decision-making.
- Quality improvement initiatives should incorporate a multidisciplinary educational component that utilizes experience to provide practical training in the design and execution of quality improvement projects.

The demands for high-quality care in neonatal/perinatal practice are articulated by parents, payers, hospital administrators, professional organizations and the American Board of Pediatrics (ABP). To that end, ABP maintains a certification program that includes participation in ABP-approved quality improvement projects designed to assess and improve the quality of patient care.

References

1. Horbar J, Gould J. Evaluating and Improving the Quality and Safety of Neonatal Intensive Care. In: Martin R, Fanaroff F, Walsh M, eds. Neonatal Perinatal Medicine. 8th ed: Mosby-Year Book Inc.; 2006:63-79.
2. Data from the Vermont Oxford Network Internet Reporting System. Nightingale. (Accessed at <https://nightingale.vtoxford.org>.)
3. Lee HC, Gould JB. Factors influencing breast milk versus formula feeding at discharge for very low birth weight infants in California. *J Pediatr*. 2009;155(5):657-62.e1-2.
4. Wirtschafter DD, Danielsen BH, Main EK, et al. Promoting antenatal steroid use for fetal maturation: results from the California Perinatal Quality Care Collaborative. *J Pediatr* 2006;148(5):606-12.
5. Wirtschafter DD, Pettit J, Kurtin P, et al. A statewide quality improvement collaborative to reduce neonatal central line-associated blood stream infections. *J Perinatol* 2009;30:170-81.
6. Payne NR, Finkelstein MJ, Liu M, Kaempf JW, Sharek PJ, Olsen S. NICU practices and outcomes associated with 9 years of quality improvement collaboratives. *Pediatrics*;125:437-46.
7. Quinton HB, O'Connor GT. Current issues in quality improvement in cystic fibrosis. *Clin Chest Med* 2007;28:459-72.
8. Fung CH, Lim YW, Mattke S, Damberg C, Shekelle PG. Systematic review: the evidence that publishing patient care performance data improves quality of care. *Ann Intern Med* 2008;148:111-23.
9. Snijders C, van Lingen RA, Molendijk A, Fetter WP. Incidents and errors in neonatal intensive care: a review of the literature. *Arch Dis Child Fetal Neonatal Ed* 2007;92:F391-8.
10. Subhedar NV, Parry HA. Critical incident reporting in neonatal practice. *Arch Dis Child Fetal Neonatal Ed* 2009;95:F378-82.
11. Sharek PJ, Horbar JD, Mason W, et al. Adverse events in the neonatal intensive care unit: development, testing, and findings of an NICU-focused trigger tool to identify harm in North American NICUs. *Pediatrics* 2006;118:1332-40.
12. Arora VM, Manjarrez E, Dressler DD, Basaviah P, Halasyamani L, Kripalani S. Hospitalist handoffs: a systematic review and task force recommendations. *J Hosp Med* 2009;4:433-40.
13. Bizzarro MJ, Sabo B, Noonan M, Bonfiglio MP, Northrup V, Diefenbach K. A quality improvement initiative to reduce central line-associated bloodstream infections in a neonatal intensive care unit. *Infect Control Hosp Epidemiol*;31:241-8.
14. Kaempf JW, Campbell B, Sklar RS, et al. Implementing potentially better practices to improve neonatal outcomes after reducing postnatal dexamethasone use in infants born between 501 and 1250 grams. *Pediatrics* 2003;111:e534-41.
15. Kilbride HW, Wirtschafter DD, Powers RJ, Sheehan MB. Implementation of evidence-based potentially better practices to decrease nosocomial infections. *Pediatrics* 2003;111:e519-33.
16. Schelonka RL, Scruggs S, Nichols K, Dimmitt RA, Carlo WA. Sustained reductions in neonatal nosocomial infection rates following a comprehensive infection control intervention. *J Perinatol* 2006;26(3):176-9.
17. Birenbaum HJ, Dentry A, Cirelli J, et al. Reduction in the incidence of chronic lung disease in very low birth weight infants: results of a quality improvement process in a tertiary level neonatal intensive care unit. *Pediatrics* 2009;123:44-50.
18. Payne NR, LaCorte M, Karna P, et al. Reduction of bronchopulmonary dysplasia after participation in the Breathsavers Group of the Vermont Oxford Network Neonatal Intensive Care Quality Improvement Collaborative. *Pediatrics* 2006;118 Suppl 2:S73-7.
19. Walsh M, Laptook A, Kazzi SN, et al. A cluster-randomized trial of benchmarking and multimodal quality improvement to improve rates of survival free of bronchopulmonary dysplasia for infants with birth weights of less than 1250 grams. *Pediatrics* 2007;119:876-90.

20. Horbar JD, Carpenter JH, Buzas J, et al. Collaborative quality improvement to promote evidence based surfactant for preterm infants: a cluster randomised trial. *Bmj* 2004;329:1004.
21. Ellsbury DL, Ursprung R. Comprehensive Oxygen Management for the Prevention of Retinopathy of Prematurity: the pediatric experience. *Clin Perinatol*;37:203-15.
22. Lee HC, Ho QT, Rhine WD. A quality improvement project to improve admission temperatures in very low birth weight infants. *J Perinatol* 2008;28:754-8.
23. Ducloy-Bouthors AS, Ducloy JC, Sicot J. Impact of a perinatal network medical practice improvement program on postpartum hemorrhage-related morbidity. *Int J Gynaecol Obstet* 2009;104:68-9.
24. Arora V, Johnson J. A model for building a standardized hand-off protocol. *Jt Comm J Qual Patient Saf* 2006;32:646-55.
25. Frank G, Lawless ST, Steinberg TH. Improving physician communication through an automated, integrated sign-out system. *J Healthc Inf Manag* 2005;19:68-74.
26. Halamek LP. The simulated delivery-room environment as the future modality for acquiring and maintaining skills in fetal and neonatal resuscitation. *Semin Fetal Neonatal Med* 2008;13:448-53.
27. Sentinel event alert issue 30 — July 21, 2004. Preventing infant death and injury during delivery. *Adv Neonatal Care* 2004;4:180-1.
28. The Joint Commission. Preventing maternal death. *Sentinel Event Alert*. 2010 Jan 26;44:1-4.
29. Draycott T, Sibanda T, Owen L, et al. Does training in obstetric emergencies improve neonatal outcome? *BJOG* 2006;113:177-82.
30. Draycott TJ, Crofts JF, Ash JP, et al. Improving neonatal outcome through practical shoulder dystocia training. *Obstet Gynecol* 2008;112:14-20.
31. Halamek LP, Kaegi DM, Gaba DM, et al. Time for a new paradigm in pediatric medical education: teaching neonatal resuscitation in a simulated delivery room environment. *Pediatrics* 2000;106:E45.
32. Murphy A, Halamek L. Simulation-based Training in Neonatal Resuscitation *NeoReviews* 2005;6:489-92.
33. Halamek L. The genesis, adaptation, and evolution of the Neonatal Resuscitation Program. *NeoReviews* 2008;9:142-9.
34. Als H. Infant Individuality: Assessing patterns of very early development. In: Call J, Galenson E, Tyson R, eds. *In Frontiers of Infant Psychiatry*. New York, NY: Basic Books, Inc; 1983.
35. Symington A, Pinelli J. Developmental care for promoting development and preventing morbidity in preterm infants. *Cochrane Database Syst Rev* 2006:CD001814.
36. Aita M, Snider L. The art of developmental care in the NICU: a concept analysis. *J Adv Nurs* 2003;41:223-32.
37. Atun-Einy O, Scher A. Measuring developmentally appropriate practice in neonatal intensive care units. *J Perinatol* 2008;28:218-25.
38. Tedder JL. Give Them The HUG: An Innovative Approach to Helping Parents Understand the Language of Their Newborn. *J Perinat Educ* 2008;17:14-20.
39. Sizun J, Westrup B. Early developmental care for preterm neonates: a call for more research. *Arch Dis Child Fetal Neonatal Ed* 2004;89:F384-8.
40. Legault M, Goulet C. Comparison of kangaroo and traditional methods of removing preterm infants from incubators. *J Obstet Gynecol Neonatal Nurs* 1995;24:501-6.
41. Conde-Agudelo A, Diaz-Rossello JL, Belizan JM. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev* 2003:CD002771.
42. Als H, Duffy FH, McAnulty GB, et al. Early experience alters brain function and structure. *Pediatrics* 2004;113:846-57.



Quality Improvement Opportunities in Postpartum Care



Margaret Comerford Freda, Cheryl Tatano Beck,
Deborah E. Campbell, Diana L. Dell, Stephen Ratcliffe

Chapter 9: Quality Improvement Opportunities in Postpartum Care

Margaret Comerford Freda, Cheryl Tatano Beck, Deborah E. Campbell, Diana L. Dell, MD, Stephen Radcliffe

The experiences that a woman has immediately after giving birth and for the first 6 weeks after birth (postpartum care) could seriously affect her health, the health of her child, her perception of childbirth and even her attachment to her newborn. Postpartum care has been shown to improve perinatal health outcomes. And yet, there are aspects of postpartum care that could improve these outcomes even further: immediate and sustained breastfeeding; Family-Centered Maternity Care, in which the mother and infant are not separated at all throughout the hospital stay and the new family's needs are paramount; teaching new mothers and fathers about smoking cessation in order to improve their health and that of their new infants and children at home; universal screening for postpartum depression; and screening for postpartum post-traumatic stress disorder.

Immediate and Sustained Postpartum Breastfeeding

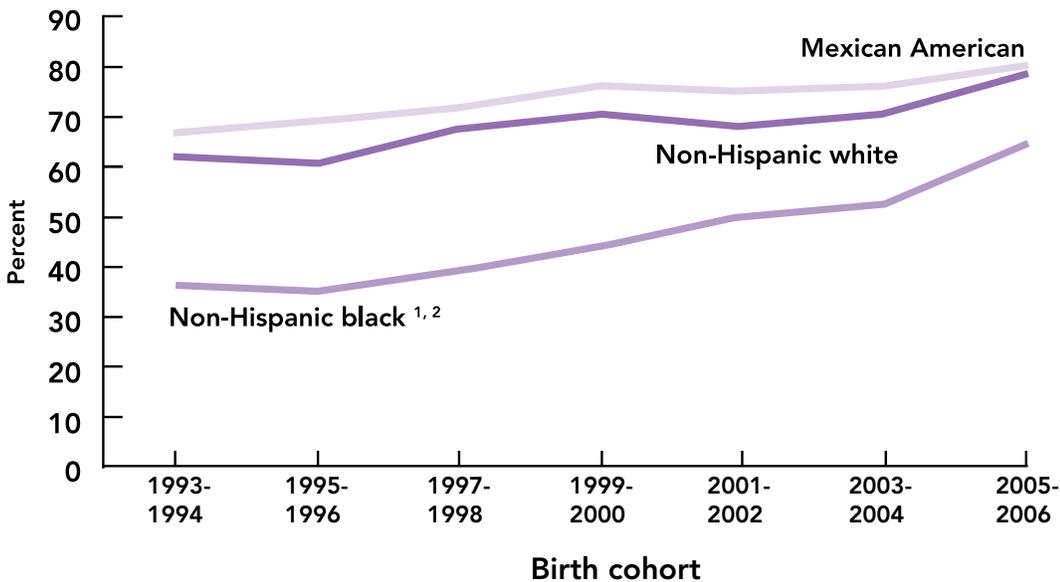
Exclusive breastmilk feeding — giving no food or liquid other than breastmilk to the infant from birth — benefits newborns and their mothers physically and psychologically. According to the American Academy of Pediatrics (AAP)¹ the benefits of breastfeeding include, but are not limited to: helping to create a strong bond between mother and child, providing immunity to many communicable diseases and reducing infectious diseases in the newborn (including respiratory illnesses, diarrhea and ear infections), and reducing the risk of developing atopy and asthma.² The benefits of breastfeeding are dose-related: exclusive breastfeeding for 6 months is recommended to achieve these health benefits. Although the percentage of infants ever breastfed in the United States has increased 60 percent from 1993 to 1994 to 77 percent in 2005 to 2006 (Figure 1), there has been no significant change in the rate of breastfeeding at 6 months of age.³ There remain significant racial, ethnic, economic,

age-related and geographic variations in breastfeeding rates in the United States.

For the mother, breastfeeding helps to decrease postpartum bleeding and promotes more rapid involution, as well as return to prenatal weight. Additional maternal benefits include improved maternal mental health, cancer (breast, ovarian, endometrial) risk reduction and a lowered risk for type II diabetes and osteoporosis. Despite its proven benefits, however, immediate and sustained postpartum breastfeeding is not as widespread among U.S. hospitals and birthing centers as it could be.

In 1991, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) launched the Baby-Friendly Hospital Initiative (BFHI), a global effort to implement practices that promote and support breastfeeding, measure quality and identify centers of breastfeeding excellence.⁴ BFHI employs *The Ten Steps to Successful Breastfeeding for Hospitals* as the framework for designating all maternity services (hospitals and birthing centers)

Figure 1: Breastfeeding Rate Trends Over Time Among Non-Hispanic and Mexican American Women



¹ Significant increase in trends over time for non-Hispanic black infants.

² Non-Hispanic black infants are significantly different from non-Hispanic white and Mexican-American infants in each birth cohort.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey.

as centers of breastfeeding support and has been shown to increase breastfeeding rates.^{4,5,6} There has been a relatively low participation rate by U.S. facilities in achieving “Baby-Friendly” status, and awareness should be raised about this opportunity.

The Ten Steps include practices that are known to promote and support breastfeeding initiation, duration and exclusivity, such as:

1. formal breastfeeding education for mothers and families;
2. direct support of mothers during breastfeeding;
3. training of primary care staff (including maternity care personnel) about breastfeeding and techniques for breastfeeding; and
4. peer support.^{7,8}

The Ten Steps to Successful Breastfeeding¹⁷

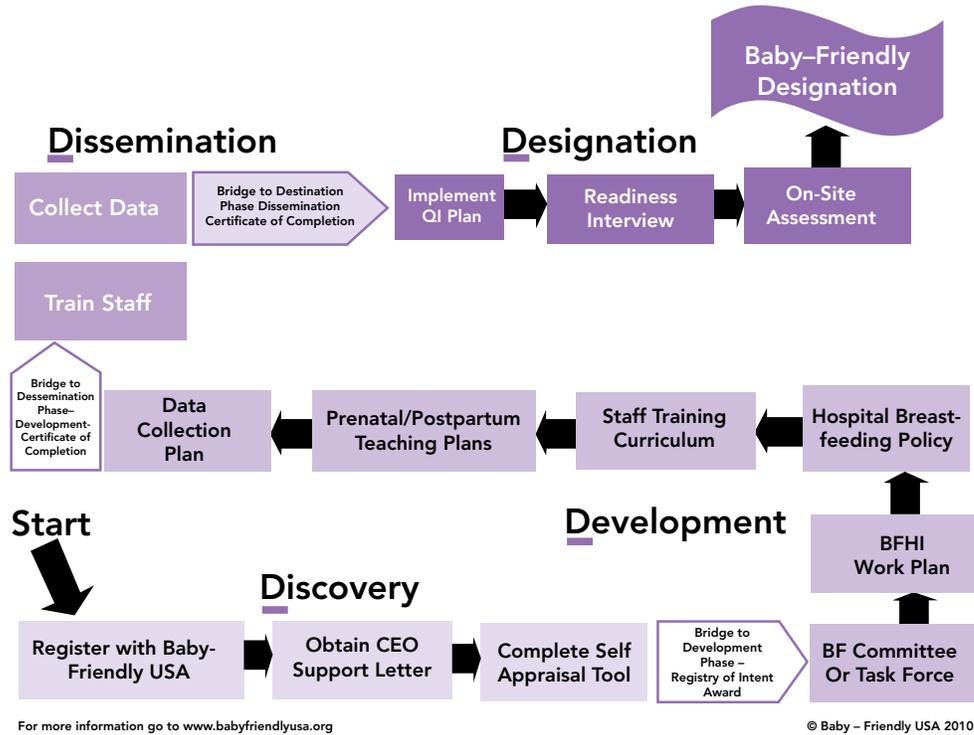
The Baby-Friendly Hospital Initiative promotes, protects and supports breastfeeding through The Ten Steps to Successful Breastfeeding for Hospitals, as outlined by UNICEF/WHO.

The steps for the United States are:

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within 1 hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.
6. Give newborn infants no food or drink other than breastmilk, unless medically indicated.
7. Practice “rooming in”— allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no pacifiers or artificial nipples to breastfeeding infants.**
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

** The American Academy of Pediatrics does not support a categorical ban on pacifiers¹⁶

Figure 2: The 4-D Pathway to Baby-Friendly™ Designation



We advocate development of additional state and regional breastfeeding coalitions and collaboratives to help accomplish a national breastfeeding initiative, which emphasizes the initiation of breastfeeding immediately after birth, adoption of BFHI and the continuity of breastfeeding care.

Baby-Friendly USA, the nonprofit organization that implements the Baby-Friendly Hospital Initiative in the United States, has recently published the *4D Pathway to Baby-Friendly Designation*, to assist hospitals in achieving Baby-Friendly status (Figure 2).

A number of factors undermine successful initiation of breastfeeding and reduce its duration. For example, failure to initiate skin-to-skin contact and breastfeeding within the first hour, to exclusively breastfeed and to provide infant rooming-in with the mother significantly reduces breastfeeding duration.^{9,10} Lack of rooming-in and on-demand breastfeeding during the postpartum hospital stay¹¹ contribute to increased maternal and infant fatigue and curtail the time needed for practical lactation support. Avoiding pacifier use and post-discharge lactation support are also important factors in sustaining breastfeeding. Distribution of commercial hospital infant formula packs also discourages breastfeeding, reducing its duration by as much as 10 weeks.¹² Maternal insecurity about her ability to produce

sufficient breastmilk to satisfy her infant and reported nursing difficulties are the most frequently cited reasons for early discontinuation of breastfeeding.¹³

The US Preventive Services Task Force has identified a series of primary care interventions to promote and support breastfeeding that increase rates of initiation, duration and exclusivity of breastfeeding. These include formal education for mothers and families, direct lactation support, primary care staff training and peer support. Interventions that combine both prenatal and postnatal components are most effective at increasing breastfeeding duration.¹⁴ The Centers for Disease Control and Prevention conducted a national survey of maternity care and infant nutrition practices (mPINC) and issued a report on *Breastfeeding-related Maternity Practices at Hospitals and Birthing Centers — United States, 2007*, that provided facility-specific benchmark reports to each facility, comparing individual birth centers to like facilities in their state.¹⁵

In 2009, the AAP endorsed the WHO/UNICEF 10 Steps to Successful Breastfeeding and published a sample Hospital Breastfeeding Policy for Newborns and developed *A Safe and Healthy Beginnings Toolkit*¹⁷ containing breastfeeding guidance and practice tools for hospitals and primary care professionals. Tools for breastfeeding support include a clinical care path, a sample breastfeeding policy, assessment tools (IBFAT, LATCH, and Mother-Baby Assessment tool), breastfeeding assessment for mothers, assessment of breastfeeding resources, and suggested questions for use in-hospital and during the early newborn follow-up care visits to assess the need for additional care.

Other quality improvement approaches to breastfeeding include educational initiatives for hospital decision makers, oversight by accrediting organizations, public reporting of indicators of the quality of breastfeeding care, “pay-for-performance” incentives to hospitals that meet specific quality standards and regional learning collaboratives that work together to implement quality improvement goals.¹⁸

Increasingly, health professional organizations are beginning to integrate best practices into clinical toolkits to support the initiation of breastfeeding immediately after birth and sustain breastfeeding after hospital discharge. For example, state health departments in California, New York and Texas have developed programs to help hospitals train staff and implement policies that promote exclusive breastfeeding. In 2009, New York State passed the *Breastfeeding Mother’s Bill of Rights*, which specifies the right to early and immediate initiation of breastfeeding after delivery, continuous contact (rooming-in) with the infant, lactation resources and the right to refuse therapies or practices that impede successful initiation of breastfeeding, such as formula feeding, pacifiers, take-home formula samples and advertising packs.¹⁹ Several states, including California, Illinois, Massachusetts, Michigan, Missouri and Pennsylvania, have developed regional and statewide breastfeeding coalitions and

collaboratives, whose members include maternal and infant care providers. These coalitions focus on public and professional education, outreach, information dissemination (practice guidelines and clinical tools) and quality improvement.

Finally, The National Quality Forum (NQF), a nonprofit, public-private partnership that consists of members from consumer organizations, accrediting and certifying bodies, hospitals, research societies, professional societies and other stakeholders in quality care, has included the rate of exclusive breastfeeding among healthy newborns²⁰ among its 17 national consensus standards for quality metrics in perinatal care. The Joint Commission led the creation and dissemination of these standards. Research is needed to determine which of the Baby-Friendly practices are the most effective in promoting the initiation and continuation of breastfeeding. Metrics for quality assessment and strategies to improve the quality of breastfeeding care need further development.

In the meantime, we advocate development of additional state and regional breastfeeding coalitions and collaboratives to help accomplish a national breastfeeding initiative, which emphasizes the initiation of breastfeeding immediately after birth, adoption of BFHI and the continuity of breastfeeding care.

Family-Centered Maternity Care

Family-Centered Maternity Care (FCMC)⁶ approaches childbirth as wellness, not illness, and it prioritizes the involvement of the mother and the family. FCMC is based on the following core principles:

- making care personalized and collaborative
- engaging families in a comprehensive program of perinatal education
- providing the family with the experience, including individualized care, they desire
- honoring a mother’s wishes to have family and friends present during the entire hospital stay
- encouraging mothers to keep their babies in their rooms at all times

- focusing nursing care on teaching and role modeling, while providing safe, quality care for the mother and baby together
- assuring that the same nurse cares for a mother and baby couplet as a single family unit, integrating the whole family into the care

Family-Centered Maternity Care should become the theoretical underpinning for postpartum care, where the needs of the family prevail and hospital staff view mother-baby care as a collaboration during which important patient education can occur.

The benefits of keeping mothers and newborns together have been recognized in the literature since Kennell and Klaus's early groundbreaking research on maternal-infant bonding.²¹ Enkin also has written of the benefits of early and continual mother-infant contact.²² FCMC helps to: enhance the mother-infant bond; increase the opportunity for nurses to provide essential teaching about maternal and newborn care, family planning and other key topics; and provides a supportive atmosphere for the new mother and her family to get to know their new family member and to become the expert about their child. Postpartum care that is neither family-centered, nor family-driven, but provided at the convenience of the providers has been shown to result in mothers being less satisfied with their entire childbearing experience.²³

Postpartum care is often organized around meeting the needs of hospital staff rather than the needs of new mothers. According to Declercq et al, 49 percent of newborns are currently not kept with their mothers in the immediate postpartum period; 24 percent of newborns on postpartum units are with their mothers only during the day; and no more than 59 percent of newborns are kept with their mothers continually.^{23,24}

FCMC is inconsistently practiced and often used more as a marketing message than a philosophy of care. Some institutions may advertise a "home-like" atmosphere with redesigned labor/birth rooms, while maintaining rigid visitation policies that restrict or bar sibling visits or "allow" new mothers to see their babies only at prescribed feeding times. When Spear examined sibling visitation on 69 U.S. hospital postpartum units, she found 17.4 percent of

the hospitals practiced restrictive visitation for children postpartum.²⁵

The common practice of separating mothers from their newborns soon after birth interrupts the infant interaction and care women need after giving birth. It is easier for postpartum staff to teach a woman about self and newborn care during the short period of hospitalization when she is next to her infant and can experience on-demand feeding and caretaking as infant needs arise.²⁶

FCMC is consistent with the approach that the Institute of Medicine describes in *Crossing the Quality Chasm*,²⁷ which calls for transforming health care into a high-quality, safe, patient-centered collaboration among clinicians, patients and families.

FCMC gives nurses the opportunity to care for both the mother and the newborn right in the woman's room, to "mother the mother"²¹ and establish a mutual, responsive and nurturing relationship with mother and family. It allows nurses to show mothers how to respond to their newborns. So, for example, breastfeeding is taught when the infant is hungry; calming techniques are taught when the infant is crying. Lessons about newborn bathing become lessons about the newborn's behavioral states, neurologic integrity, motor strength, behavioral cues and reflexes.²¹ This kind of teaching boosts a new mother's sense of competence as she learns about her infant, using the nurse as a role model and practicing the skills she will need at home to care for her baby.

Hospitals that have successfully instituted and advocated for FCMC include: Evergreen Hospital Medical Center, Kirkland, Wash.; St. Luke's Hospital, Chesterfield, Mo.; Good Samaritan Hospital, Lebanon, Pa.; Texas Children's Hospital, Houston, Tex.; and Gaston Memorial Hospital, Gastonia, N.C. FCMC should become the theoretical underpinning for postpartum care, where the needs of the family prevail and hospital staff view mother-baby care as a collaboration during which important patient education can occur.

Smoking Cessation in the Postpartum Period

It is well known that maternal smoking endangers fetal development. During pregnancy, maternal smoking is associated with increased risks of prematurity, low birthweight and perinatal mortality. But the risks of maternal smoking continue long after a baby is born. During the postpartum period, maternal smoking and other environmental smoke exposure are associated with increased risks of sudden infant death syndrome, asthma and middle ear infections in children.²⁹ While U.S. smoking rates during pregnancy have decreased overall by 42 percent during the past 20 years, only 25 percent of women are able to stop smoking during pregnancy. Of these, approximately 70 percent relapse and are smoking postpartum, within 1 year of childbirth.²⁹ Helping women to stop smoking tobacco can help to improve their health and the health of their children and other family members.³⁰

Smoking cessation in the postpartum period does not lend itself to a “one size fits all” solution. Women who face the highest risk of smoking relapse often live under very stressful circumstances. Historically heavy smokers, they tend to be poor and less educated than women who don’t smoke. They do not breastfeed and may experience moderate-to-severe postpartum depression. Plus, their partners often are smokers. By comparison, women who manage to avoid a smoking relapse are historically light-to-moderate smokers who are white, married, have more education and breastfeed their infants.²⁹

Some randomized trials have been conducted with postpartum women in an effort to help them quit smoking. Leavitt published a recent systematic review summarizing multiple international randomized controlled trials that used the following interventions:

1. brief advice and printed materials presented at four postpartum visits;
2. nurse-provided counseling at birth, followed by eight telephone counseling sessions for the first 3 months postpartum; and
3. child health nurses to administer an educational intervention for 7 months.³¹

Although none of these interventions aimed specifically at postpartum women resulted in a decrease in smoking relapse rates or improvement in smoking cessation rates, they are still valuable because they were associated with positive attitudinal and knowledge changes. While studies specific to postpartum women have not yet demonstrated the best methods to help them stop smoking, there are many evidence-based interventions that have proven effective in other adult populations. Four of the best interventions are: simple advice from physicians,³² advice and support from nurses,³³ nicotine replacement³⁴ and use of pharmacologic agents such as bupropion and varenicline tartrate.³⁵

There is a program, called Motivational Interviewing (MI), which offers promise and has been found to significantly reduce smoking relapse rates.³⁶⁻³⁸ MI is a patient-centered technique that focuses on a woman’s perceptions and the social context in which she lives. It addresses relationship and support issues that influence her decision to resume smoking or to change entrenched smoking patterns. Nurses, mid-level practitioners and physicians can train to provide this form of counseling. Clinician teams working with women in the postpartum period also can use the following strategies to help women stop smoking:

- Develop/acquire educational materials that succinctly describe the risks of second-hand smoke exposure to infants and young children, and distribute them during the third trimester and postpartum periods.
- Develop resources to maximize support and offer patient and family information to encourage breastfeeding.

It is up to health care providers in obstetrics, pediatrics, primary and family care and psychiatry who have the most regular contact with new mothers during their first year following birth to conduct a postpartum depression screening and make sure that effective follow-up and treatment are readily available.

- Develop resources within the health care team to provide motivational interviewing during the course of several visits to women at increased risk of smoking relapse. This counseling could be incorporated into prenatal, postpartum and well-child care visits or could occur as separate home or office-based visits.
- Integrate strategies into CenteringPregnancy®, a group prenatal care model, in which pregnant women participate in their care (see Chapter 4), or group well-child care visits.

Postpartum Depression Screening

Postpartum depression — an episode of major or minor depression that occurs within the first 12 months after birth — is a major public health problem. As many as 19.2 percent of new mothers may experience major or minor depression in the first 3 months after birth, with up to 7.1 percent experiencing major depression.³⁹

Postpartum depression is a thief that steals motherhood, wreaking havoc in the lives of new mothers and their partners and in the development of infants and children who may suffer its effects later in the form of behavior and emotional problems.⁴⁰ A striking characteristic of this crippling mood disorder is its covertness. Under-diagnosed postpartum depression can result in tragedy, not always in the form of maternal suicide or infanticide that makes headlines, but by plunging women into a living nightmare and turning their cherished first few months of motherhood into blackness. That is why universal, routine postpartum depression screening for new mothers during their first year following birth is essential.

Postpartum depression is treatable, as long as it is identified. It is up to health care providers in obstetrics, pediatrics, primary and family care and psychiatry who have the most regular contact with new mothers during their first year following birth to conduct this screening and make sure that effective follow-up and treatment are readily available.

Women should be screened for postpartum depression at least once between 2 and 12 weeks postpartum. Routine screening earlier than 2 weeks after giving birth may result in false positives, as women often experience “maternity blues” (transient anxiety, tearfulness or mood changes) during this time. If a mother screens negative for postpartum depression during these first few weeks, then she needs to be screened again.

Women can develop postpartum depression at any time during the first year, although most will develop this mood disorder in the first 3 to 6 months. If a woman develops postpartum depression after she has had a negative screening and is not re-screened, then she may fall through the cracks of the health care system with neither diagnosis nor treatment, risking an unnecessarily prolonged bout.

There are two reliable and valid instruments available that screen for postpartum depression: *The Postpartum Depression Screening Scale (PDSS)*⁴¹ and the *Edinburgh Postnatal Depression Scale (EPDS)*.⁴² The PDSS is a 35-item Likert response scale that is composed of seven dimensions: Sleeping/Eating Disturbances, Anxiety/Insecurity, Emotional Liability, Guilt/Shame, Cognitive Impairment, Loss of Self and Suicidal Thoughts. The PDSS also includes an Inconsistent Response Index (INC) as an indicator of whether a woman is completing the items on the scale in a consistent manner. However, there is a *PDSS-Short Form* that contains just the first seven items on the full scale and is highly reliable, with a sensitivity of 94 percent and a specificity of 98 percent.⁴¹

The EPDS is a 10-item self-report scale that also is highly reliable.⁴² It assesses the following symptoms of depression: inability to laugh, inability to look forward to things with enjoyment, blaming oneself unnecessarily, feeling anxious or worried, feeling scared or panicky, feeling like “things have been getting on top of me,” difficulty sleeping because of being unhappy, feeling sad or miserable, crying and thoughts of harming

oneself. Using a score of 12/13 to indicate major depression, the *EPDS* achieved a sensitivity of 86 percent and a specificity of 78 percent.⁴²

There are barriers to postpartum depression screening, which are generally patient-, clinician-, or systems-centered.⁴³ Patient-centered barriers include cost, lack of insurance coverage or other access to care or social stigma; clinician-centered barriers include lack of time, insufficient knowledge and training and restrictive managed care policies; systems-based barriers include the separation of mental health services from primary and obstetrical care.

Barriers are surmountable, however. This is what Mancini, Carlson, and Albers observed in their study of a successful postpartum depression screening program in a high-volume collaborative obstetric and nurse-midwifery practice in Albuquerque, New Mexico.⁴⁴ Key to the program's success was a *PDSS* process flow sheet that enabled providers to refer mothers with positive screens to mental health professionals, who specialize in postpartum mood disorders, for definite diagnosis and treatment.⁴⁴

Screening took place at the 6-week postpartum check-up. Medical assistants asked mothers to complete the *PDSS-Short Form* and scored the results. If a mother scored 14 or above, then she was asked to complete the remaining 28 items on the *PDSS*. When the mother had a positive screen, which produced a score of 80 or higher on the full *PDSS*, then she received a referral to a mental health provider for further evaluation and treatment if necessary. During a 1-year period, 16 percent of the women screened positive for postpartum depression. Mancini et al. concluded that postpartum depression screening using the *PDSS* can be incorporated into a high-volume obstetric and nurse-midwifery practice and that the mothers appreciated clinicians focusing on their mental health.⁴⁴

Universal, routine screening for postpartum depression is essential to the quality of life and mental health of mothers and their entire families, but screening alone cannot ensure improvement in clinical outcomes. It must be coupled with referrals for mental health follow-up, diagnosis and treatment. We urge collaboration among health care providers in obstetrics, pediatrics, primary care and psychiatry to help assure that screening is universal and that effective follow-up and treatment are available.

Postpartum Post-Traumatic Stress Disorder

Screening for postpartum depression should include post-traumatic stress disorder (PTSD). Patients with PTSD typically develop symptoms after exposure to a traumatic event, such as death, serious injury or threat to physical integrity, with an accompanying experience of intense fear, helplessness or horror. Early recognition and intervention can prevent suffering, enhance child-rearing and prevent the development of chronic PTSD.

Although PTSD initially was described in male combat veterans, epidemiologic studies repeatedly show higher rates of PTSD in women than men. Pregnancy, pregnancy loss and childbirth are all potential triggers for PTSD. The birth of an infant who requires neonatal intensive care also is a cause for acute stress and PTSD symptoms in parents, particularly mothers.^{45,46} The potentially traumatizing features of childbirth include fear (about personal safety and safety of the fetus), helplessness, extreme pain and loss of control. In one prospective study of postpartum women, 33 percent identified a traumatic birthing event and 5.6 percent met full criteria for acute PTSD.⁴⁷ Rates of PTSD tended to be associated with greater obstetrical intervention and to decrease over time.⁴⁸

Miscarriage also may trigger PTSD. Another prospective study found very high rates of PTSD (25 percent at 1 month after pregnancy loss), which decreased over

One study concluded that postpartum depression screening using the PDSS can be incorporated into a high-volume obstetric and nurse-midwifery practice and that the mothers appreciated clinicians focusing on their mental health.

Screening women for subjective stress responses after delivery or miscarriage and providing or directing them to appropriate treatment is critical.

time (7 percent at 4 months after pregnancy loss). The study also found significantly higher comorbid depression in women with PTSD than non-PTSD women (34 percent vs. 5 percent); this depression was less likely to decrease over time.⁴⁹ However, rates of PTSD after termination of an unintended pregnancy were low (approximately 1 percent). Women who have a history of traumatic events or psychological problems⁴⁸ or who have current psychological difficulties are at greater risk than others for developing PTSD after delivery or pregnancy loss.

Symptoms of PTSD can take one of three forms. They can cause patients to re-experience the traumatic event through intrusive, distressing recollections, nightmares, flashbacks or memories that spark psychological or physiological distress; they can instill in patients a need to avoid thinking about and an inability to recall details of the event, leaving them disinterested in usual activities and feeling detached from others, with a sense of impending death; alternatively, they can lead to hyperarousal, causing insomnia, irritability, difficulty concentrating, hypervigilance or an exaggerated startle reflex.⁵⁰

The most effective way to prevent PTSD in postpartum women is to identify during pregnancy those at high risk for postnatal trauma so that additional support can be offered during delivery. Screening women for subjective stress responses after delivery or miscarriage and providing or directing them to appropriate treatment is critical. Screening can be written or verbal, using the Primary Care PTSD Screen (PC-PTSD), which asks the following “yes/no” questions⁵¹:

“In your life, have you ever had any experience that was so frightening, horrible or upsetting that in the past month you...

- have had nightmares about it or thought about it when you did not want to?
- tried hard not to think about it or went out of your way to avoid situations that remind you of it?
- were constantly on guard, watchful or easily startled?
- felt numb or detached from others, activities or in your surroundings?”

Three “yes” answers indicate a positive screen and suggest referral to a mental health professional.

Counseling for postpartum women with PTSD can be extremely beneficial, as midwives at Griffith University in Australia found. They developed a counseling model for women after distressing birth events. The intervention emphasizes a safe, therapeutic relationship, working with women’s perceptions of the event, connecting with emotions, filling in missing pieces, reviewing the labor management, enhancing social support, reinforcing positive approaches to coping and exploring solutions.⁵²

Although midwife-led debriefing appears to be effective in reducing traumatic stress symptoms, it is largely untested, and more research is needed.⁴⁸ In addition, it is important to provide long-term follow-up for women who are symptomatic, in order to identify those who will develop chronic PTSD.⁴⁸ We advise that obstetrical providers learn to recognize and screen for PTSD in women after miscarriage and after birth. We also suggest that screening for PTSD be added to postpartum depression screening.

Conclusion and Recommendations

This chapter has focused on five aspects of postpartum care that can serve as an action agenda for changing and improving the quality of such care into the 21st century.

We recommend:

- a renewed focus on the need for immediate and sustained breastfeeding, and increased awareness of successful breastfeeding promotion programs such as the Baby-Friendly Hospital Initiative
- routine postpartum Family-Centered Maternity Care in order to better meet the attachment and educational needs of mothers, infants and families
- standardized smoking cessation programs offered to all new mothers who use tobacco
- routine screening and management for postpartum depression⁵³
- routine assessment and screening for post-traumatic stress disorder during the postpartum period

Revamping postpartum care to include these items will go far toward improving the quality of care after birth and provide support well into the newborn's childhood.



References:

1. American Academy of Pediatrics. Policy Statement on Breastfeeding and the Use of Human Milk. *Pediatrics* 2005;115:496--506.
2. Stark AR, Lannon CM. Systems changes to prevent severe hyperbilirubinemia and promote breastfeeding: pilot approaches. *J Perinatol* 2009;29 Suppl 1:S53-7.
3. McDowell MM, Wang CY, Kennedy-Stephenson J. Breastfeeding in the United States: findings from the national health and nutrition examination surveys, 1999-2006. *NCHS Data Brief* 2008(5):1-8.
4. Baby-Friendly Hospital Initiative. *Ten Steps to Successful Breastfeeding*. 2010.
5. Philipp BL, Merewood A, Miller LW, et al. Baby-friendly hospital initiative improves breastfeeding initiation rates in a US hospital setting. *Pediatrics* 2001;108(3):677-81.
6. Phillips C. *Family centered maternity care*. Sudsbury, MA: Jones and Bartlett Publishers, Inc., 2003.
7. Dyson L, McCormick F, Renfrew MJ. Interventions for promoting the initiation of breastfeeding. *Cochrane Database Syst Rev* 2005(2):CD001141.
8. Britton C, McCormick FM, Renfrew MJ, Wade A, King SE. Support for breastfeeding mothers. *Cochrane Database Syst Rev* 2007(1):CD001141.
9. Murray EK, Ricketts S, Dellaport J. Hospital practices that increase breastfeeding duration: results from a population-based study. *Birth* 2007;34(3):202-11.

10. Moore ER, Anderson GC, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev* 2007(3):CD003519.
11. Forster DA, McLachlan HL. Breastfeeding initiation and birth setting practices: a review of the literature. *J Midwifery Womens Health* 2007;52(3):273-80.
12. Rosenberg KD, Eastham CA, Kasehagen LJ, Sandoval AP. Marketing infant formula through hospitals: the impact of commercial hospital discharge packs on breastfeeding. *Am J Public Health* 2008;98(2):290-5.
13. Li R, Fein SB, Chen J, Grummer-Strawn LM. Why mothers stop breastfeeding: mothers' self-reported reasons for stopping during the first year. *Pediatrics* 2008;122 Suppl 2:S69-76.
14. Chung M, Raman G, Trikalinos T, Lau J, Ip S. Interventions in primary care to promote breastfeeding: an evidence review for the U.S. Preventive Services Task Force. *Ann Intern Med* 2008;149(8):565-82.
15. Breastfeeding-related maternity practices at hospitals and birth centers--United States, 2007. *MMWR Morb Mortal Wkly Rep* 2008;57(23):621-5.
16. The changing concept of sudden infant death syndrome: diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatrics* 2005;116(5):1245-55.
17. American Academy of Pediatrics (ed). *Safe and Healthy Beginnings: A Resource Toolkit for Hospitals and Physicians' Offices*: American Academy of Pediatrics 2008.
18. Bartick M, Stuebe A, Shealy KR, Walker M, Grummer-Strawn LM. Closing the quality gap: promoting evidence-based breastfeeding care in the hospital. *Pediatrics* 2009;124(4):e793-802.
19. The Breastfeeding Mothers' Bill of Rights In: 1107-A; 2009.
20. National Quality Forum (NQF). *National Voluntary Consensus Standards for Perinatal Care 2008: A Consensus Report*. Washington, DC: NQF, 2009.
21. Klaus MH, Kennell JH. *Maternal infant bonding: The impact of early separation or loss on family development*. St. Louis, MO: Mosby, 1976.
22. Enkin M, Keirse MJ, Neilson J, et al. *Effective care in pregnancy and childbirth: a synopsis*. *Birth* 2001;28:41-51.
23. Declercq ER, Sakala C, Corry MP and Applebaum S. *Listening to Mothers II: Report of the second national survey of women's childbearing experiences*. New York, NY: Childbirth Connections, 2006.
24. *New Mothers Speak Out*. Childbirth Connections, 2008.
25. Spear HJ. Child visitation policy and practice for maternity units. *MCN Am J Matern Child Nurs* 2009;34:372-7.
26. Karl DJ, Beal JA, O'Hare CM, Rissmiller PN. Reconceptualizing the nurse's role in the newborn period as an "attacher". *MCN Am J Matern Child Nurs* 2006;31:257-62.
27. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press, 2001.
28. Blackburn S, Bakewell-Sachs S. *Understanding your newborn (video)*. 2007.
29. Fang WL, Goldstein AO, Butzen AY, et al. Smoking cessation in pregnancy: a review of postpartum relapse prevention strategies. *J Am Board Fam Pract* 2004;17:264-75.
30. Lumley J, Chamberlain C, Dowswell T, Oliver S, Oakley L, Watson L. Interventions for promoting smoking cessation during pregnancy. *Cochrane Database Syst Rev* 2009(3):CD001055.
31. Levitt C, Shaw E, Wong S, Kaczorowski J, McMaster University Postpartum Research Group. Systematic review of the literature on postpartum care: effectiveness of interventions for smoking relapse prevention, cessation, and reduction in postpartum women. *Birth* 2007 (34):341-7.
32. Lancaster T, Stead L. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2004;(4):CD000165.

33. Rice VH, Stead LF. Nursing interventions for smoking cessation. *Cochrane Database Syst Rev* 2004;(1):CD001188.
34. Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev* 2004;(3):CD000146.
35. Hughes JR, Stead LF, Lancaster T. Antidepressants for smoking cessation. *Cochrane Database Syst Rev* 2007;(1):CD000031.
36. Thyrian JR, Freyer-Adam J, Hannover W, et al. Adherence to the principles of Motivational Interviewing, clients' characteristics and behavior outcome in a smoking cessation and relapse prevention trial in women postpartum. *Addict Behav* 2007;32:2297-303.
37. Ruger JP, Weinstein MC, Hammond SK, Kearney MH, Emmons KM. Cost-effectiveness of motivational interviewing for smoking cessation and relapse prevention among low-income pregnant women: a randomized controlled trial. *Value Health* 2008;11:191-8.
38. Lai DT, Cahill K, Qin Y, Tang JL. Motivational interviewing for smoking cessation. *Cochrane Database Syst Rev* 2010;(1):CD006936.
39. Gavin NI, Gaynes BN, Lohr KN, Meltzer-Brody S, Gartlehner G, Swinson T. Perinatal depression: a systematic review of prevalence and incidence. *Obstet Gynecol* 2005;106:1071-83.
40. Hay DE, Pawlby S, Angold A, Harold GT, Sharp D. Pathways to violence in the children of mothers who were depressed postpartum. *Dev Psychol* 2003;39:1083-94.
41. Beck CT, Gable K. *Postpartum Depression Screening Scale Manual*. Los Angeles, CA: Western Psychological Services, 2002.
42. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987;150:782-6.
43. Gjerdingen DK, Yawn BP. Postpartum depression screening: importance, methods, barriers, and recommendations for practice. *J Am Board Fam Med* 2007;20:280-8.
44. Mancini F, Carlson C, Albers L. Use of the Postpartum Depression Screening Scale in a collaborative obstetric practice. *J Midwifery Womens Health* 2007;52:429-34.
45. Shaw RJ, Bernard RS, DeBlois T, et al. The relationship between acute stress disorder and posttraumatic stress disorder in the neonatal intensive care unit. *Psychosomatics* 2009;50:131-137.
46. Holditch-Davis D, Bartlett TR, Blickman, AL, Miles MS. Posttraumatic stress symptoms in mothers of premature infants. *JOGNN* 2003;32:161-171.
47. Creedy DK, Shochet IM, Horsfall J. Childbirth and the development of acute trauma symptoms: incidence and contributing factors. *Birth* 2000;27:104-11.
48. Ayers S. Delivery as a traumatic event: prevalence, risk factors, and treatment for postnatal posttraumatic stress disorder. *Clin Obstet Gynecol* 2004;47:552-67.
49. Engelhard IM. Miscarriage as a traumatic event. *Clin Obstet Gynecol* 2004;47:547-51.
50. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders IV-TR*. Washington, DC: American Psychiatric Association, 2000.
51. Weathers FW, Huska JA, Keane TM. *PCL-C for DSM-IV*. Boston, MA: National Center for PTSD — Behavioral Science Division, 1991.
52. Gamble J, Creedy DK. A counselling model for postpartum women after distressing birth experiences. *Midwifery* 2009;25:e21-30.
53. American College of Obstetricians and Gynecologists. Committee on Obstetric Practice. Committee opinion no. 453: Screening for depression during and after pregnancy. *Obstet Gynecol* 2010;115:394-5.



Quality
Improvement
Opportunities to
Promote Equity in
Perinatal Health
Outcomes



Diane M. Ashton, James W. Collins, Karla Damus, Raymond Cox

Chapter 10: Quality Improvement Opportunities to Promote Equity in Perinatal Health Outcomes

Diane M. Ashton, James W. Collins, Karla Damus, Raymond Cox

*“Of all the forms
of inequality,
injustice in
health is the
most shocking
and the most
inhumane.”*

~ Dr. Martin Luther King, Jr.
at the 2nd National
Convention of the
Medical Committee
for Human Rights
on March 25, 1966

Despite more than a decade of federal support for programs to eliminate disparities in health outcomes, many disparities — especially in chronic diseases and perinatal health — continue to plague urban and rural communities, individuals with disabilities and special health needs, and racial and ethnic populations. Racial and ethnic disparities in health care have been defined as “differences in the quality of health care that are not due to access-related factors or clinical needs, preferences, and appropriateness of intervention.”¹ Health disparities are not just influenced by individual behavior but also involve structures which perpetuate racial discrimination in housing, education, and employment. The limited scope of this chapter does not permit a discussion of the structural causes of health disparities. This chapter will focus primarily on African-American women and infants, who experience the greatest burden of disparate outcomes in perinatal health. Programs that address the needs of Hispanic populations will also be presented, as Latinos represent a rapidly growing segment of the U.S. population. Racial and ethnic disparities in health care are well-documented and, among African Americans are demonstrated by disproportionately higher rates of maternal mortality, infant mortality, and significant morbidities associated with premature and low-birthweight infants.

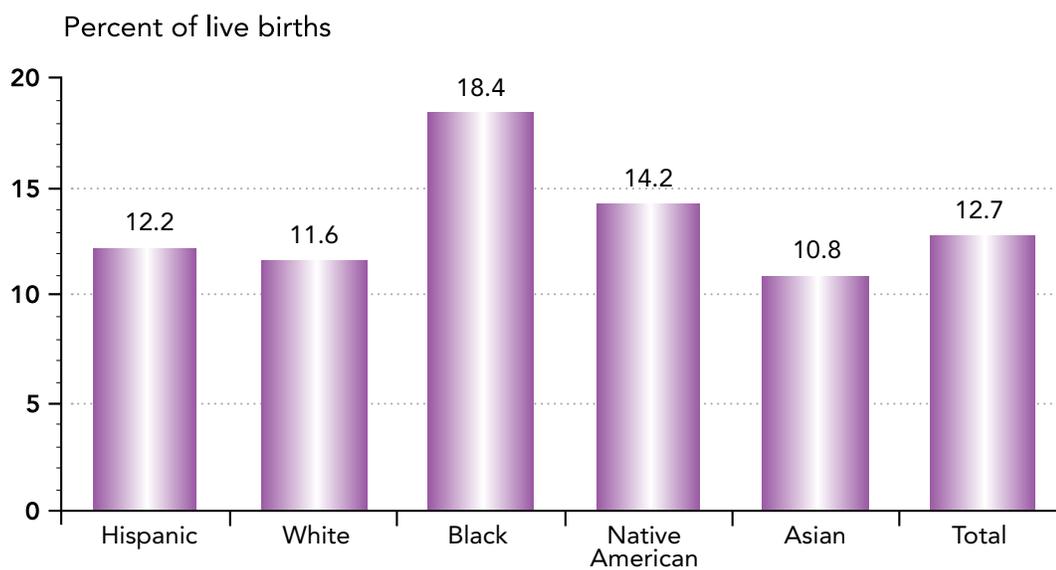
The delivery of equitable health care requires the establishment of evidence-based guidelines, the collection of data by racial and ethnic group categories, the development of strategies to incorporate disparities reduction goals into quality performance measures, and outreach into local communities to understand the context in which people live. The existing circumstance that African-American and white patients are treated at different sites of care and African-American patients are often treated at higher-mortality hospitals with higher mortality rates requires close investigation.² Quality improvement

efforts to address health disparities will require the provision of equitable, patient-centered, high quality care addressing health system factors, patient-level factors, and patient/provider interactions.^{1,3}

Defining the Problem

Residential segregation, racial discrimination, and ethnic group disparities in perinatal health are long-standing defining characteristics of American life.⁴⁻⁶ A disproportionately large percentage of African-American women reside in urban neighborhoods with concentrated poverty, high

Figure 1: Preterm by race/ethnicity: US, 2005-2007 Average⁷



National Center for Health Statistics, final natality data. Retrieved September 28, 2010, from www.marchofdimes.com/peristats.
© 2009 March of Dimes Foundation. All rights reserved

rates of violent crime, and limited access to quality preventative health care services.

Since the 1950s, the racial disparity in infant mortality rates (number of infant deaths per 1,000 live births) has widened.^{5,6} The 2007 infant mortality rate (IMR) of African-American infants was 13.2 compared to 5.7 for white infants.⁸ There are two pathways underlying infant mortality rates: birthweight-specific survival associated with access to neonatal care and infant birthweight distribution associated with maternal overall health status (the most powerful predictor of infant survival). In contrast to the marked improvements in birthweight-specific survival among whites and African-Americans associated with advances in neonatal care during the past 50 years, race-specific rates of low birthweight have stagnated.^{6,9}

In 2007 African-Americans had a low birthweight (<2500g, LBW) rate of 13.9 percent compared to 7.3 percent for whites.¹⁰ Moreover, African-Americans had a very low birthweight (<1500g) rate of 3.2 percent compared to 1.2 percent for whites.¹⁰ Preterm birth (<37 completed

weeks of gestation) is tightly associated with LBW and is more than twice as high among African-American women compared to White women.¹⁰

Although prenatal care may improve birth outcomes, the persistent racial disparity in adverse birth outcomes among college graduated women who receive adequate prenatal care suggests that a singular focus on this time period is too narrow.⁶ By the time women are pregnant, it may be too late to modify important health behaviors, treat chronic illnesses, and address the impact of lifelong underserved minority status.¹¹ From a policy perspective, a broad focus on the health of African-American women from early life until adulthood represents critical periods for a range of risk factors (i.e., low birthweight), behaviors (i.e., family planning), and exposures (i.e., nutrition) that influence reproductive outcomes.^{6, 11-13}

The Search for Solutions

The last 20 years have yielded significant, if uneven, growth in understanding health and health system disparities. The Institute of Medicine (IOM) has published the landmark *Unequal Treatment — Confronting*

Racial and Ethnic Disparities in Healthcare, the first of its kind to provide exhaustive research on how our health system contributes to disparate outcomes.¹ An IOM-sponsored workshop entitled, “Toward Health Equity and Patient-Centeredness” explored the need for integrating health literacy, disparities reduction and quality improvement.³

The 2009 IOM report, *Race, Ethnicity, and Language Data: Standardization for Health Care Quality Improvement*,¹³ proposes that detailed “granular ethnicity” (race and Hispanic ethnicity categories as well as more fine-grained categories of ethnicity based on one’s ancestry) and “language need” data, in addition to the Office of Management and Budget (OMB) categories for race, can assist in improving overall quality and reducing disparities.¹⁴ It points to strong evidence that the quality of health care varies with race, ethnicity, and language. Stratifying quality metrics by race, Hispanic ethnicity, granular ethnicity, and language needs can help improve overall quality and promote equity.

The Office of Minority Health (OMH) published a report by the National Partnership for Action to End Health Disparities called “Changing Outcomes — Achieving Health Equity, The National Plan for Action.”¹⁵ Among the report’s most important findings is that health inequities cause economic burdens. The Disparities Solutions Center at Massachusetts General Hospital made the business case for eliminating health disparities by showing how inequitable care affects quality, safety, cost, and risk management.¹⁶

We are beginning to understand that the most dramatic improvements in health outcomes may not be achieved through technological advances, but by improving interpersonal skills, skills-based learning and communication techniques. Gearing our health care system toward disease prevention and wellness promotion, based on universal coverage and access, could significantly reduce disparities across populations.

Community-focused perinatal regionalization may significantly contribute to reducing disparities in maternal child health.¹⁵

The National Center for Cultural Competence (NCCC) has developed many tools to assess institutional and provider-level cultural sensitivity.¹⁸ The Center is housed within the Department of Pediatrics of the Georgetown University Medical Center. The Joint Center for Political and Economic Studies, a research and public policy institution, has developed a Commission on Paternal Involvement in Pregnancy Outcome.¹⁸ The Office of Minority Health (OMH) in the Department of Health and Human Services (DHHS) has guides, resources and tools available on its cultural competency section of its website, including Standards on Cultural and Linguistically Appropriate Services (CLAS).¹⁹ Other sections of the federal government have additional resources. Health Resources and Services Administration (HRSA) performed a pilot project with selected Federally Qualified Health Center’s under the Health Disparities Collaborative to improve perinatal patient safety.²⁰

Many states have established public agencies to reduce health disparities. New York and California have designed Safe Mother Initiatives through public-private partnerships. These efforts are designed to reduce pregnancy-related deaths and racial disparities in maternal mortality.

Cultural sensitivity among healthcare providers can accomplish much to reduce maternal child health disparities. Perinatal health care professional organizations, such as the American College of Obstetricians and Gynecologists, American Academy of Pediatrics, and the Association of Women’s Health, Obstetric and Neonatal Nurses, have developed several tools and resources. Kaiser Family Foundation, the Office of Minority Health, the American Medical Association in partnership with the Commission to Eliminate Healthcare Disparities, and other organizations have developed materials specific to maternal child health to educate healthcare professionals about

effective patient communication techniques, including culturally sensitive vignettes for simulation training. Implementing these resources requires commitment from physicians, health system leadership, the health-care academic community and all levels of government. Elimination of health and healthcare disparities must be recognized and valued as the capstone to patient safety and quality improvement.

Successful Perinatal Models to Achieve Health Equity

Public health and clinical services

Several public health and clinical services programs have demonstrated promising results in reducing perinatal health disparities. Some of those programs are described in this chapter.

Northern Manhattan Perinatal Partnership

The Northern Manhattan Perinatal Partnership (NMPP) is a not-for-profit maternal child health organization established in 1990 and is one of five Healthy Start sites in New York State. Comprised of a network of public and private agencies, NMPP has adopted a life-course approach to health and offers more than 22 comprehensive health and social services and programs to women and their infants during pregnancy, childbirth, early childhood, adolescence and to women over 35.²¹ Assistance with housing, economic development opportunities and employment are among the services that NMPP provides. NMPP addresses both the medical and social determinants of perinatal health along life's course. This perspective recognizes that some of the important risk factors for poor birth outcomes affect women before pregnancy, and many risk factors are correlated with social circumstances of poverty, minority status, and low education.^{12, 13, 22, 23}

A report commissioned by the Maternal and Child Health Bureau found that among states with more than 10 percent of births to African-American women, New York had the lowest African-American infant

mortality rate (11.7 per 1,000 live births) during 2003-2005. The infant mortality rate (IMR) in Central Harlem at the initiation of the Healthy Start program in 1990 was 27.7. NMPP was responsible for developing and executing a community plan that reduced central Harlem's IMR by 70 percent, to 8.3 in 2007. In comparison, infant deaths in New York City declined 53.4 percent, from 11.6 in 1990 to 5.4 in 2007, and the citywide black non-Hispanic IMR decreased 47.3 percent, from 18.6 in 1990 to 9.8 in 2007.²⁴

This model of community-based regionalization of care, uniting medical facilities and community service providers to provide comprehensive perinatal services may have the greatest impact on improving perinatal health outcomes and reducing disparities.

Parkland Memorial Hospital

Parkland Memorial Hospital is a public hospital serving the inner-city medically indigent population of Dallas County, Texas. The racial and ethnic composition of its patient population is 70 percent Hispanic (predominantly Mexican), 20 percent African-American and 8 percent white. Its annual 16,000 live births represent about 40 percent of all deliveries in Dallas. Parkland Memorial has developed a neighborhood-based, administratively and medically integrated public health care system for inner city pregnant women. In 2009, a study compared the rate of preterm singleton births among African-American and Hispanic women who received prenatal care and delivered at Parkland between 1988 and 2006 with national data.²⁵ Parkland's overall rate of preterm birth was significantly lower than the nation's, including its rates for preterm birth among Hispanic and African-American women. The magnitude of the disparity in preterm birth rates for both African-American and Hispanic populations compared to white women were decreased in the Parkland cohort relative to the U.S. cohort.

Some of the important risk factors for poor birth outcomes affect women before pregnancy, and many risk factors are correlated with social circumstances of poverty, minority status, and low education.

Parkland attributes its success to having a geographically based public health care program, specifically targeting minority populations of pregnant women.

A number of factors may have contributed to the lowered preterm birth rate and decreased disparity. In the early 1990s, the hospital made a concerted effort to improve access to and use of prenatal care and to develop a seamless program of culturally sensitive, obstetrical care. It strategically placed prenatal, comprehensive medical and pediatric clinics throughout the county to provide convenient access for indigent women. Clinics saw pregnant women within a week of their request for an appointment and employed uniform practice guidelines and prenatal protocols using an evidence-based outcomes approach across all sites to guarantee homogeneous quality of care. Significantly, the decline in preterm birth at Parkland Hospital coincided with an increase in prenatal care rates starting in 1992. Parkland attributes its success to having a geographically based public health care program, specifically targeting minority populations of pregnant women.²⁵

Group Prenatal Care: CenteringPregnancy®

Group prenatal care provides an integrated approach to prenatal care in a group setting, incorporating family members, peer support and education. A multisite, randomized controlled trial compared standard prenatal care to group care to determine whether group prenatal care would lead to better reproductive health outcomes, such as reduction in the numbers of preterm birth and low birthweight infants.²⁶ Eighty percent of the participants were African-American and constituted a population of young minority women of low socioeconomic status attending an urban hospital clinic for care. The results showed that women assigned to group prenatal care were significantly less likely to have preterm birth than those in individual care; 9.8 percent compared to 13.8 percent, comprising a 33 percent reduction in risk.²⁷ When African-Americans were examined alone, the impact of group care on reduced risk for preterm birth was strengthened: 10 percent compared with 15.8 percent.

The significance of this program is that it represents a model of prenatal care that favorably impacts birth outcomes in African-American populations.²⁷

Perinatal Home Visitation Programs

Perinatal home visitation programs that encompass social support, health education, and access to services hold promise for reducing adverse birth outcomes, including low birthweight deliveries, among at-risk women and adolescents.²⁸ This model has also shown improved pregnancy outcomes related to preterm delivery and infant mortality rates in subsequent pregnancies. For many African-Americans, poor birth outcomes have been related to the lack of strong support and barriers to accessing quality healthcare. New funding for home visitation programs to improve maternal and child health outcomes as a result of recent health care reform legislation underscores the surge of effort to support and further evaluate this model.

The Nurse-Family Partnership® is a program of prenatal and infancy home visiting for low-income, first-time mothers and their families. The nurses begin visiting families as early as possible during pregnancy and continue visiting until the child's second birthday. Randomized controlled trials have been conducted that target first-time, low-income mothers. A three-year follow-up of a randomized controlled trial in Memphis analyzed a cohort of 743 primarily black women. As compared to a control group, women who received prenatal and infancy home visits by nurses had statistically significant: fewer subsequent pregnancies, fewer closely spaced subsequent pregnancies (< 6 months from previous pregnancy), longer intervals between the birth of the first and second child, and fewer months of using Aid to Families with Dependent Children and food stamps. While these results were smaller in magnitude than those achieved in a previous trial with white women living in a semirural setting, this

study found continuing positive effects of a perinatal home visitation program on black women living in an urban setting.²⁹

Additional Successful Models from Other Medical Disciplines

Best practices from other medical disciplines that promote health equity can help inform strategies for reducing disparities in perinatal health services. Project Dulce used a culturally sensitive approach to target a single chronic disease, diabetes, and the Baylor Health Care System established an organizational structure for addressing health disparities on an institution-wide level.

Project Dulce

In 2000, the San Diego County Medical Services (SD-CMS) contracted with Project Dulce to provide diabetes management training at 17 community health centers.³⁰ SD-CMS is the county's payer for the medically indigent adult health services, covering a low-income, ethnically diverse, predominantly Hispanic population. The clinical component of the program consisted of a nurse-led team with a registered nurse/certified diabetes educator, bilingual/bicultural medical assistant, and a bilingual/bicultural dietician. Participants received an average of five nurse visits and half consulted with the dietician. Patients were also encouraged to participate in a group self-management program. This program had an eight-week curriculum given by trained peer educators who have diabetes, belong to the same cultural/ethnic group as the participants, and were recruited from the patient population. Classes were collaborative and interactive, taught in the patients' native language and allowed them to discuss their personal experiences and beliefs about diabetes. Overcoming misrepresented cultural beliefs and encouraging patients to take charge of managing their disease were emphasized.³⁰

Participants in Project Dulce had significant improvements in HbA1C, blood pressure, total cholesterol and LDL-C compared to controls. While total costs were higher for Project Dulce participants during the first year due to pharmacy supplies and medications for disease management, expenditures on hospital and emergency department visits declined, although the change was not statistically significant. This program provides an example of how implementing culturally sensitive and linguistically appropriate services can result in improved health outcomes in a medically underserved and culturally diverse population. These same concepts can easily be adapted for prenatal and postpartum services as well as preconception and interconception care.³⁰

Baylor Health Care System

To improve quality of care, the Baylor Health Care System, a nonprofit integrated delivery system in the Dallas/Forth Worth area of Texas, created a formal organizational home for its work. It established a new office of health equity and identified a chief health equity officer at the vice president level whose charge involved: identifying opportunities where Baylor could improve in the area of equity and reducing variations due to sociodemographic characteristics that may occur in the areas of health access, health care delivery, and health outcomes.¹⁵

The organizational structure provided by the Office of Health Equity supported the acquisition of \$15 million, needed to fund a health initiative targeting diabetes in an underserved African-American community.³¹

Baylor faced several challenges, including obtaining buy-in from other leaders in the organization; designing appropriate messaging to mitigate the potential for adverse publicity about identified disparities; determining thresholds for variations that constitute a disparity; and determining if additional measures could serve as sensitive markers of equity. The Office of Health

Equity focused its efforts on two areas: measurement along the equity dimension of access to primary and preventive services, and health equity reporting. A significant business case emerged to decrease emergency room (ER) visits, unnecessary hospitalizations and costs. As a result, several successful initiatives have been implemented:

- An increased number of primary care providers were located in community clinics for the uninsured and underinsured.
- Project Access Dallas encouraged private physicians to accept four to five indigent patients into their patient panels, resulting in a decrease of ER visits.
- Community care coordination linked patients to services including housing, transportation and health education.
- The Vulnerable Patient Network Program provided home visits to patients with congestive heart failure who are frequent ER users.
- A health equity performance analysis developed a methodology to track performance by patient demographics in order to identify disparities.

This case presents a clear example of a successful institutional effort to achieve health equity in the area of chronic disease management. Similar steps can be taken to develop an equity plan that focuses on perinatal outcomes or implements activities on a smaller scale within a clinical department if gaining institutional support is challenging.

Conclusion and Recommendations

Perinatal quality improvement efforts must integrate a major focus on reducing disparities among all populations and enhancing equity or they will fall short of their potential to achieve improved perinatal outcomes.

The monograph, *Improving Quality and Achieving Equity*,¹⁶ presents the recommended steps to implement a quality improvement program to address health disparities and achieve health equity in a clinical environment. The steps outlined below have been

adapted to include recommendations specific to obstetric and neonatal practice.

Hospitals should create a broad multidisciplinary committee or taskforce to conduct a self-assessment of obstetrical and pediatric services, and implement a strategic plan to assure that:

- Health care professionals, staff, administration and patients are educated and aware of perinatal health disparities, the importance of cross-cultural communication and cultural sensitivity training for all staff, and the need for interpreter services and medical homes are recognized and provided.
- Data are collected by patient's race/ethnicity, including stratification by race/ethnicity, National Hospital Quality Measures, Healthcare Effectiveness Data and Information Set (HEDIS) Outpatient Measures, Patient Satisfaction; and Patient Safety/medical errors relevant to obstetrical and neonatal outcomes.
- Services are established where the need is identified to address race/ethnicity data collection, disparities and equity measurement and monitoring tools, interpreter services, medical homes, and cultural sensitivity training.
- Community-based relationships with the local public health department, community organizations and leaders are established.
- Monitor for disparities when analyzing high impact perinatal measures, such as infant mortality, late preterm births, and elective cesarean and induction delivery rates prior to 39 weeks.
- When disparities are identified, implement and evaluate interventions that address the root causes such as, language, literacy or cultural barriers.

Recent major reports by IOM,^{1,3,14} the OMH^{15,32} and the Agency for Healthcare Research and Quality (AHRQ)³³ among others have underscored the parameters needed to improve health care quality and outcomes with the following recommendations:

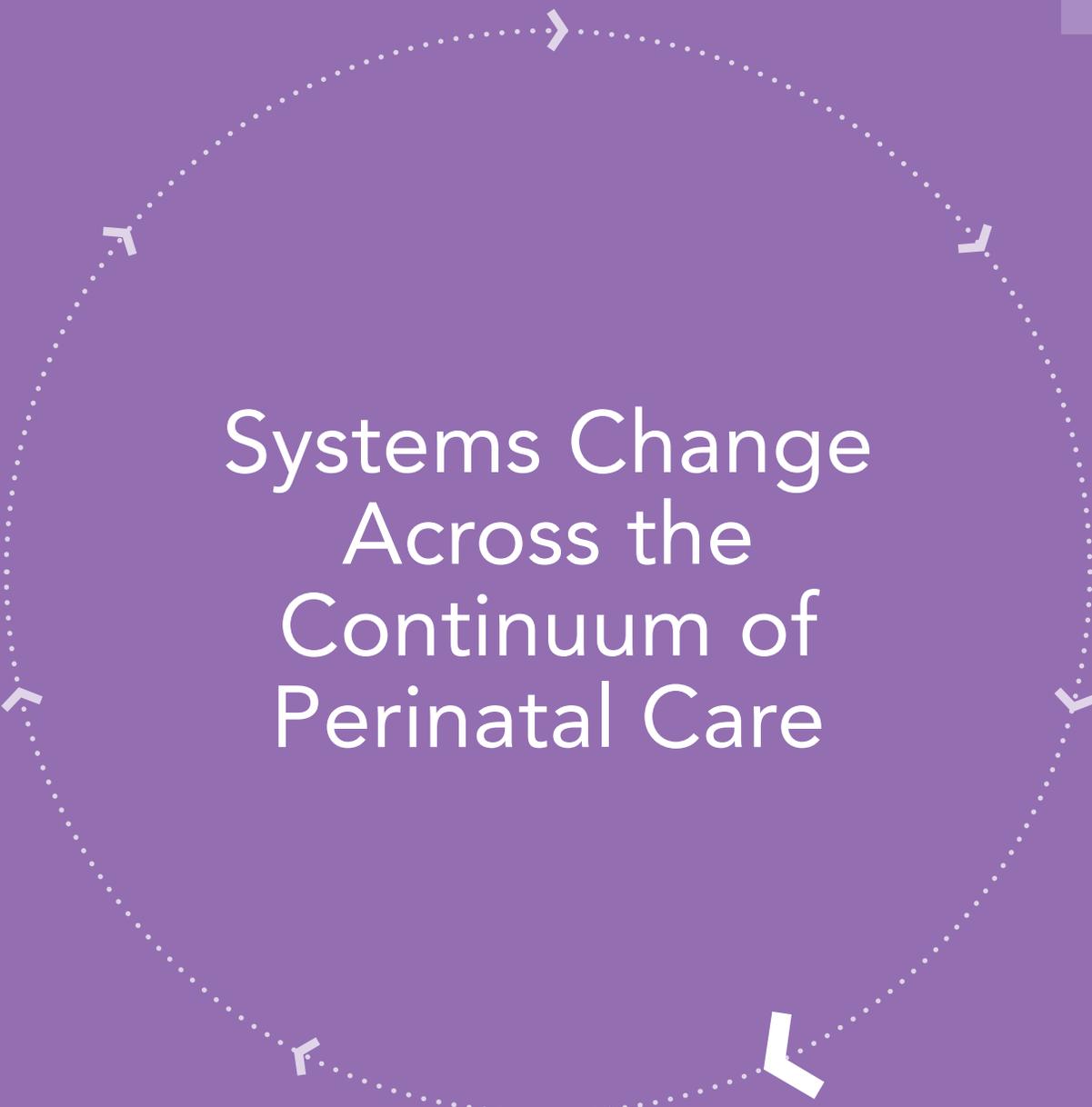
- Build a diverse multidisciplinary health care workforce that is sensitive to the disparities in perinatal health in their community.
- Develop a curriculum for all professional schools that train health care providers (medical school, residency programs, nursing schools, advanced practice nursing programs, physician assistant programs, counselors, etc.), focusing on equity, quality and their interdependence.
- Provide continuing education on equity and quality improvement for all perinatal providers linked to re-licensure.
- Expand perinatal quality indicators to encompass racial, ethnic, granular ethnicity, language-need and literacy components.
- Use comprehensive clinical and epidemiological data systems that utilize the latest technologies such as electronic medical records and ethnic/racial geomapping to allow programs and resources to be targeted to high risk areas within communities.
- Establish a strong public health infrastructure and safety net that emphasize community-based relationships with the local public health departments, community organizations and leaders, hospital committees and medical center administrations.
- Build social support services that integrate economic development through employment, housing, transportation, and education opportunities into comprehensive perinatal, family planning and general medical services.

The need for clinicians, administrators, patient safety and risk management leaders, payers and legislators/policy makers to become immediately engaged in all these efforts is paramount. The culture of each institution must embrace the interdependence of promoting equity and quality improvement to achieve optimal health care and equitable health outcomes.

References

1. Smedley B, ed. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare*. Washington DC: The National Academies Press; 2002.
2. Howell EM, Pettit KL, Kingsley GT. Trends in maternal and infant health in poor urban neighborhoods: good news from the 1990s, but challenges remain. *Public Health Rep* 2005;120:409-17.
3. Institute of Medicine. *Toward health equity and patient-centeredness: integrating health literacy, disparities reduction and quality improvement: Workshop summary*. Washington DC: The National Academies Press; 2009.
4. Jaynes G, Williams R, eds. *A Common Destiny: Blacks and American Society*. Washington DC: National Academy Press; 1989.
5. Guyer B, Freedman MA, Strobino DM, Sondik EJ. Annual summary of vital statistics: trends in the health of Americans during the 20th century. *Pediatrics* 2000;106:1307-17.
6. Collins JW, Jr., David RJ. Racial disparity in low birth weight and infant mortality. *Clin Perinatol* 2009;36:63-73.
7. National Center for Health Statistics, final natality data. Retrieved September 28, 2010, from www.marchofdimes.com/peristats.
8. Xu J, Kochanek K, Murphy S, Tejada-Vera B. *Deaths: Final data for 2007*. Hyattsville, MD: National Center for Health Statistics; 2010 Released May 2010.
9. Brosco JP, Sanders LM, Guez G, Lantos JD. Historical trends in low birth weight. *Arch Pediatr Adolesc Med* Jan 2010;164:99-100.

10. Martin J, BE H, Sutton P, et al. Births: Final data for 2007. Hyattsville, MD: National Center for Health Statistics; 2010.
11. Haas JS, Fuentes-Afflick E, Stewart AL, et al. Prepregnancy health status and the risk of preterm delivery. *Arch Pediatr Adolesc Med* 2005;159:58-63.
12. Misra DP, Guyer B, Allston A. Integrated perinatal health framework. A multiple determinants model with a life span approach. *Am J Prev Med* 2003;25:65-75.
13. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J* 2003;7:13-30.
14. Institute of Medicine. Race, Ethnicity, and Language Data: Standardization for Health Care Quality Improvement. Washington DC: The National Academies Press; 2009.
15. National Partnership for Action to End Health Disparities. Changing Outcomes — Achieving Health Equity, the National Plan for Action: Office of Minority Health; 2010.
16. Betancourt J, Green AR, King R, et al. Improving Quality and Achieving Equity: A Guide for Hospital Leaders: Disparities Solutions Center, Institute for Health Policy, Massachusetts General Hospital; 2009.
17. Go to the National Center for Cultural Competence website at: nccc.georgetown.edu.
18. Commission on Paternal Involvement in Pregnancy Outcomes. Commission Outlook: Best and promising practices for improving research, policy and practice on paternal involvement in pregnancy outcomes. Washington DC: Joint Center for Political and Economic Studies; 2010.
19. Go to the Office of Minority Health website at: <http://minorityhealth.hhs.gov>.
20. Go to the Health Resources and Services Administration website at: www.healthdisparities.net.
21. New York Nonprofit Press. Northern Manhattan Perinatal Partnership: Maternal Health from Womb to Tomb in Agency of the Month. New York Nonprofit Press, February 2007:12-4.
22. Braveman P, Barclay C. Health disparities beginning in childhood: a life-course perspective. *Pediatrics* 2009;124 Suppl 3:S163-75.
23. Kotelchuck M. Building on a life-course perspective in maternal and child health. *Maternal Child Health J* 2003;7:5-11.
24. Koshel J. Promising Practices to Improve Birth Outcomes: What Can We Learn from New York?; 2009.
25. Leveno KJ, McIntire DD, Bloom SL, Sibley MR, Anderson RJ. Decreased preterm births in an inner-city public hospital. *Obstet Gynecol* 2009;113:578-84.
26. Massey Z, Rising SS, Ickovics J. CenteringPregnancy group prenatal care: Promoting relationship-centered care. *J Obstet Gynecol Neonatal Nurs* 2006;35:286-94.
27. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and perinatal outcomes: a randomized controlled trial. *Obstet Gynecol* 2007;110:330-9.
28. Lee E, Mitchell-Herzfeld SD, Lowenfels AA, Greene R, Dorabawila V, DuMont KA. Reducing low birth weight through home visitation: a randomized controlled trial. *Am J Prev Med* 2009;36:154-60.
29. Kitzman H, Olds DL, Sidora K, et al. Enduring effects of nurse home visitation on maternal life course: a 3-year follow-up of a randomized trial. *JAMA* 2000;283:1983-9.
30. Gilmer TP, Philis-Tsimikas A, Walker C. Outcomes of Project Dulce: a culturally specific diabetes management program. *Ann Pharmacother* 2005;39:817-22.
31. Rice D, Kocurek B, Snead CA. Chronic disease management for diabetes: Baylor Health Care System's coordinated efforts and the opening of the Diabetes Health and Wellness Institute. *Proc (Bayl Univ Med Cent)* 2010 Jul;23:230-4.
32. HHS Advisory Committee on Minority Health. Ensuring that health care reform will meet the health care needs of minority communities and eliminate disparities: statement of principles and recommendations. 2009 July.
33. Agency for Healthcare Research and Quality. National Healthcare Disparities Report 2009. Rockville MD, 2009. AHRQ Pub No 10-0004.



Systems Change Across the Continuum of Perinatal Care

Eric Bieber, Wanda D. Barfield, Susan Dowling-Quarles,
Lora Sparkman, Ann Scott Blouin

Chapter 11: Systems Change Across the Continuum of Perinatal Care

Eric Bieber, Wanda D. Barfield, Susan Dowling-Quarles,
Lora Sparkman, Ann Scott Blouin

The delivery of perinatal care, by definition, involves challenges. The prolonged time that care delivery spans, the multiple venues in which it occurs, and its many different participants (patients, providers, hospitals, clinics, government) are all aspects of achieving optimal care. • Integrated delivery systems (IDS) may be optimally situated to perform necessary transitions of care. Such systems may help clinicians deliver increasingly complex facets of care before, during and after pregnancy. Unfortunately, simply belonging to an IDS does not ensure that true integration of care will occur. Only evaluating care delivery throughout the perinatal period and across multiple providers will improve outcomes. • This chapter discusses the importance of quality care delivery and suggests potential strategies for optimizing it across the perinatal continuum, from preconception to postpartum care. We focus on several different mechanisms of integrated delivery of perinatal care across health systems and suggest how this might be more broadly applied. This includes a discussion of the history of perinatal regionalization, a system change in the delivery of risk-appropriate care within geographic areas, led by the March of Dimes, key stakeholders and professional organizations. We also discuss key initiatives by Ascension Health as well as Premier Inc., who have worked to create change in complex and heterogeneous environments that likely have applicability in urban as well as rural systems.

Creating a Continuum of Care for Neonates: The Benefits of Regionalization

A coordinated, continuum of health care systems is necessary to improve the health of women, infants, children and families from cradle to grave. The concept of organizing perinatal services within geographic regions emerged in the late 1960s as a way to maximize access to and capacity of risk-appropriate technology and services to mothers and infants.¹ This regionalization, which has resulted in increased survival of high-risk neonates^{2,3} is cost effective,

because it concentrates relatively rare cases at a few locations, centralizing expensive technologies and the opportunity for provider teams to develop expertise.

Differences in neonatal survival outcomes based on the hospital level at birth were first reported in 1973.⁴ In 1976, the March of Dimes issued *Toward Improving the Outcome of Pregnancy* (TIOP I), outlining a national model of perinatal regionalization, with hospitals in designated geographic regions providing a specific scope of perinatal services: Level I hospitals provided basic, uncomplicated

neonatal care; Level II hospitals cared for moderately ill neonates expected to resolve quickly; Level III hospitals were those equipped to handle serious neonatal illnesses and abnormalities, including very-low birthweight (VLBW) infants (<1500g).⁵

In the more than three decades since the first TIOP was issued, a large international body of evidence on the relationship between hospital level of birth and neonatal outcomes has developed, especially focused on VLBW infants. A recent meta-analysis of 41 studies conducted from 1976 to 2010 shows that VLBW infants born at non-Level III hospitals have increased odds of death during the neonatal period or prior to hospital discharge (adjusted OR, 1.62; 95 percent confidence interval [CI], 1.44-1.83) compared to infants born at Level III hospitals. Similar findings were seen among very preterm (<32 weeks gestation) infants (adjusted OR, 1.55; 95 percent CI, 1.21-1.98). Consistent results remained when the analysis was restricted to high quality studies; there were no significant changes in these risks during the more than 30 years of time.⁶

Maintaining integrated perinatal regionalized systems is an important goal, particularly in an environment of proliferation of neonatal intensive care units (NICUs) and market competition.⁷⁻¹⁰ The Federal Maternal and Child Health Bureau's (MCHB) goal of 90 percent of VLBW infants in each state being born at Level III hospitals or subspecialty perinatal centers^{11,12} showed slow progress, with only five states meeting this goal (however, two states include infants born at Level II NICUs in their measurement). Other states reported less than 40 percent of VLBW infants being born at facilities with the highest level of care. More recent preliminary data does not show significant improvement.¹¹ The lack of consistent definitions for the measurement of adequate level of care for these high-risk infants may be contributing to some states' failure to achieve national goals for tertiary care of VLBW births.¹² Moreover, states' regulations of perinatal systems of care vary considerably.¹³

Financial and geographic issues present difficulties to regionalization; states that have taken definitive action in regulating the organization of perinatal care have overcome these barriers.¹⁴ In 2009, seven states (AK, CA, CO, FL, KY, NY, TN) of diverse geographical locations met to discuss efforts to improve perinatal regionalized systems. States concluded that in order to improve perinatal regionalized systems, state measures of risk-appropriate care need to be comparable through consistent definitions. However, regional systems for care should reach beyond the NICU to include maternal care, antenatal transport and care for newborns beyond discharge. For example, 10.2 million children in the United States, or 1 in 7 children under age 18, have special health care needs¹⁵ and require coordination of primary and subspecialty care. All of these are additional opportunities for enhancing care delivery. In addition, these opportunity areas underscore that the continuum of care truly extends beyond just integrated delivery systems and actually may incorporate IDSs as part of regional care delivery.

Systems Change to Improve Perinatal Safety: The Ascension Health Experience

Ascension Health is a large system with 43 hospitals whose obstetric services deliver approximately 77,000 babies annually. In support of Ascension Health's *Call to Action* for Healthcare That Works, Healthcare That Is Safe and Healthcare That Leaves No One Behind, the clinical excellence team, in conjunction with clinical leaders across the system, set a goal to achieve no preventable injuries or deaths by July 2008. This goal led to a 2003 system-wide clinical strategy known as Healthcare That Is Safe, which identified eight priorities for action to transform inpatient care; perinatal safety was among the eight. Perinatal safety focused on developing and implementing practices aimed at eliminating birth trauma. The perinatal safety work began at three Alpha sites, with the goal of sharing and implementing evidence-based practices

across the Ascension Health system.

In mid-2004, the Alpha sites collaborated in a series of meetings and conference calls, sharing progress and learning from each other. In 2005, Ascension Health partnered with the Institute for Healthcare Improvement (IHI) (see Appendix) and Premier, Inc., to address perinatal harm and associated risk management issues, including medical malpractice in obstetrics. Intensive data analysis of reported obstetric adverse events highlighted common themes and helped to frame the perinatal safety collaborative direction.

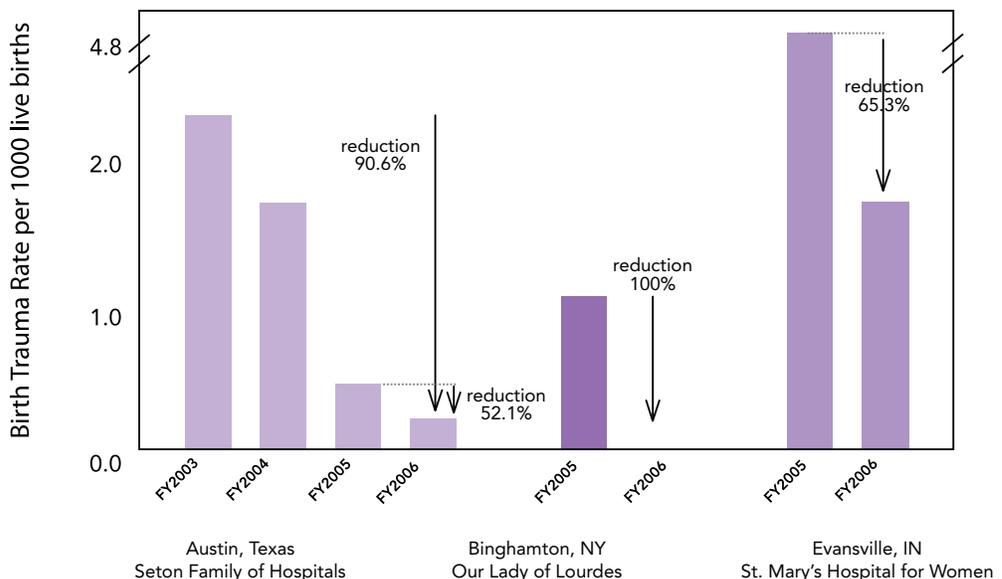
This mutual effort culminated in the development of two “bundles” that addressed the use of oxytocin for induction and augmentation of labor. The IHI concept of a “bundle” includes standardized sets of evidence-based practices that, when performed collectively and reliably, have been demonstrated to improve patient care and outcomes. Three additional safety practices were introduced and tested to improve communication, teamwork and interpretation and response to electronic fetal monitoring

(EFM) strip review.

Data capture through centralized reporting and analysis was a key component of the perinatal safety project. On a monthly basis, each Alpha site provided birth trauma data that included the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator 17 - Birth Trauma data set. Each site also performed 100 percent medical record chart review for confirmation of every identified birth trauma event. Results from the three Alpha sites demonstrated statistically significant reduction in the incidence of birth trauma as defined by AHRQ (Figure 1).

This Alpha work led to a programmatic approach to reducing birth trauma rates across the Ascension Health system. In February 2006, a “SPREAD” or dissemination campaign was launched that included evidence-based protocols and bundles proven to be effective by the Alpha sites and the collaboration with IHI and Premier, Inc. The campaign was named “HANDS” (Handling All Neonatal Deliveries Safely). Standard materials were made available to all 43 obstetric hospitals through a

Figure 1: The Ascension Health Perinatal Safety Alpha Birth Trauma Rate, as Defined by AHRQ¹⁶



multi-dimensional communication strategy, including a large system meeting, Web-based conference calls and onsite visits from Alpha and system team members to build understanding and consensus.

HANDS includes the program elements for perinatal safety listed in Table 1.

HANDS is a dynamic program that integrates additional safety elements as evidence supports the practice. For example, standard oxytocin concentrations and an EFM e-learning program for physicians and nurses were implemented in 2009. Other safety elements are being introduced in 2010, such as simulation and team trainers and shoulder dystocia management programs. Key programmatic components were essential to the adoption of the HANDS program, including:

1. engaging senior medical leadership, including chief executive, medical and nursing officers, as well as chief of obstetrics;
2. obtaining physician buy-in for each element of the HANDS program, by including physicians in the development,

testing and outcome analysis of the work at the Alpha sites. Physicians became proponents of the program and helped to spread the concepts to other physicians across the system;

3. identifying a lead nursing contact on the labor and delivery unit, typically a director or manager, who had oversight responsibilities for the HANDS program at the hospital level;
4. utilizing data as a driver to change practice behaviors; and,
5. sharing stories of harm and success to help communicate the reality of rare events to all labor and delivery team members.

The HANDS program has had substantial impact. Between January 2006 and December 2007, Ascension Health hospitals have seen a 59.6 percent improvement in aggregate birth trauma rates. From August 2008 to July 2009, Ascension Health reduced birth trauma by 62 percent and neonatal mortality by 85 percent, compared to national averages. By leveraging the

Table 1: The Ascension Health HANDS Foundational Safety Elements¹⁶

Safety Element	Description
SBAR Communication	A structured communication tool used between Labor and Delivery (L&D) team members to brief each other about labor status, progress and issues that surface over the course of a laboring and/or delivering patient.
Elective Induction and Augmentation Bundles	The bundles included guidelines from the American College of Obstetricians and Gynecologists (ACOG) on what were known as “sensitive practice areas” for obstetricians such as no elective inductions prior to 39 weeks gestational age and timely and appropriate management of tachysystole.
Physician and Nurse training on EFM using NICHD Common Language	A common interpretation format for EFM education called “Situational Awareness” and regularly occurring EFM strip “rounds” or “huddles” between physicians and nurses using the National Institute of Child Health and Human Development (NICHD) common language. This established a platform for team discussion about EFM strips and associated potential actions by the L&D team.
Teamwork and Communication Training through Simulation	Teamwork and communication skill development and improvement through simulation training using high-fidelity birthing simulators. Ascension Health purchased several Noelle™ birthing simulators and launched an In-Situ simulation training program throughout the System.

ability to function as a system, Ascension Health was able to improve quality across a continuum of care.

The Role of Teamwork in Systems Change: The Premier, Inc., Perinatal Safety Initiative

The Premier health care alliance’s Perinatal Safety Initiative (PSI) is comprised of 16 hospitals across 12 states, where approximately 115,000 babies will be delivered over the course of the 21-month collaborative. PSI is using improved teamwork, effective communications among perinatal teams, and consistent delivery of evidence-based care to significantly lower the incidence of certain infrequent though preventable injuries to mothers and babies that could lead to birth asphyxia or permanent neurological disability.¹⁸

The Premier PSI’s primary goal was to establish appropriate metrics that would accurately measure progress toward reducing harm and creating high reliability perinatal units.

To monitor the 21-month initiative, hospital progress reports on the reduction of harm are being provided to the teams and hospital leadership on a quarterly basis.

The quarterly reports include an analysis of submitted administrative data identifying the selected AHRQ Patient Safety Indicators and the Adverse Outcomes Index (AOI) (Table 2), which measure clinical complications for mothers and newborns.¹⁹

By sharing the results of the monthly chart audits with the entire perinatal unit staff, participant hospitals maintain momentum toward the reduction of harm and support the continued engagement of the health care team.

A pre-project onsite risk assessment gave participants a baseline report against which they could monitor and track performance. The focus on the Elective Induction Bundle was a key strategy to reduce late preterm and early term birth (prior to 39 weeks of gestation). Monthly team conference calls, quarterly webinars and utilization of the Perinatal Safety Initiative website and publication of outcome data allowed participants to view current topics, update team data and view team success.

Miscommunication and lack of teamwork contribute to a number of factors that lead to injuries among some mothers and newborns during labor and delivery. These factors include: failure to recognize fetal distress/non-reassuring fetal status; failure to affect a timely cesarean birth; failure to properly resuscitate a depressed baby; inappropriate use of oxytocin and misoprostol; and inappropriate use of vacuum or forceps. High-reliability health care teams (doctors, nurses, nurse midwives), like high-reliability organizations, consistently provide patient care, using teamwork, structured communication, standardized processes and evidence-based clinical guidelines, which could prevent many of these injuries.²⁰

Like Ascension Health, Premier also used Situation-Background-Assessment-Recommendation (SBAR) as a structured communication tool. SBAR allows relevant case facts to be communicated clearly in a respectful, focused and effective manner, especially during an urgent situation. SBAR is often used during nurse-to-physician

Table 2: Adverse Outcomes Index¹⁹

Index Measure	Weighted Score
Maternal death	750
Intrapartum & neonatal death > 2500g	400
Uterine rupture	100
Maternal admission to ICU	65
Birth trauma	60
Return to OR/Labor & Delivery	40
Admission to NICU > 2500g & for > 24 hours	35
Apgar < 7 at 5 minutes	25
Blood transfusion	20
3rd or 4th degree perineal tear	5

AOI Frequency = % pts with >=1 adverse outcome
AOI Severity = Avg. severity weight per delivery

Table 3: Perinatal Care Bundles²⁰

Elective Induction	Augmentation	Vacuum/Forceps
Gestational age greater than or equal to 39 weeks	Documentation of estimated fetal weight	Alternative labor strategies considered
Normal fetal status (NICHD tiers)	Normal fetal status (NICHD tiers)	Prepared patient
Pelvic assessment prior to oxytocin	Pelvic assessment prior to oxytocin	High probability of success
Recognition and management of tachysystole	Recognition and management of tachysystole	Maximum application time and number of pop-offs predetermined
		Cesarean and resuscitation teams available.

communication or at the change of shift. Premier PSI teams also learned how to perform simulation exercises both with and without the use of mannequins, to practice managing perinatal emergencies.

Perinatal care bundles (Table 3) were developed in adherence to published best practices and national standards. Care bundle use is scored in an “all-or-none” fashion; the care team must provide all elements of care in the bundle to be given credit for its use when auditing medical records. For example, the goal of one care bundle is to reduce the risks associated with elective induction or augmentation using oxytocin. This bundle has four elements that must be used consistently. If a team neglects to document an estimate of the fetal weight before administering the medication, then it would not receive credit for the work, even if team members successfully implement the three other elements of the bundle.²¹

The Premier PSI concluded in early 2010, when the final quarter of data was collected. A concluding metric will be obtained when the AHRQ Culture of Safety Survey is repeated at all participating hospitals. Metrics included eight quarters of baseline data prior to the start of the Initiative (2006-2007); two interim quarters of data (Q1 & Q2 2008), as interventions regarding team training and care bundles were introduced; and six quarters of data (Q3 2008 thru Q4 2009) as the hospital teams actively worked

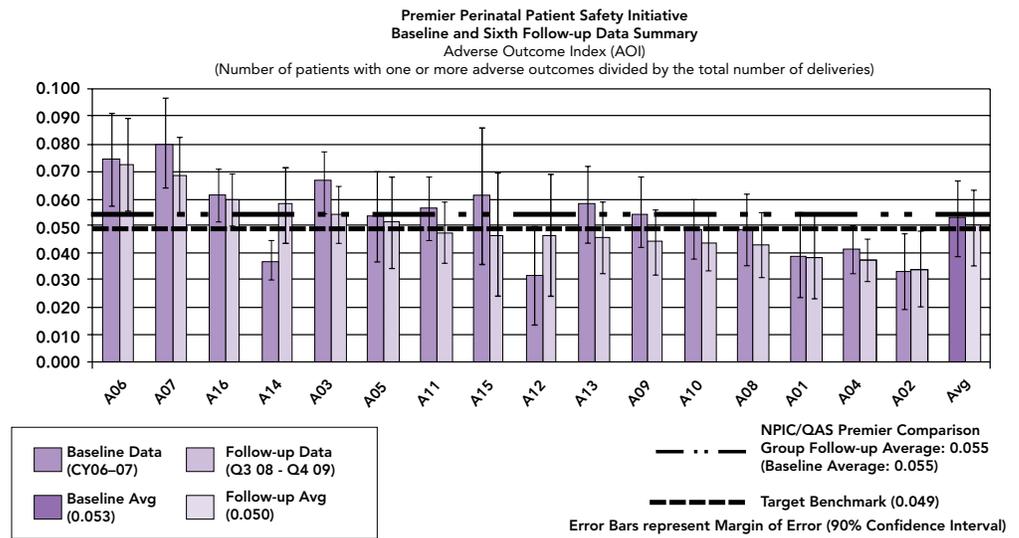
on process changes and improvements with consistent application of evidence-based care guidelines.

Initially, the baseline data from seven of the 16 hospitals showed a lower number of adverse events using the AOI, when compared to a targeted benchmark level. At the time of submission, all six quarters of intervention work had taken place, and 13 of the PSI hospitals had an AOI score below the targeted benchmark level for the AOI metric (Figure 2). Of the remaining three hospitals, two started with low baseline scores (below the national target benchmark) but then had several quarters with an increase in the number of reported adverse events. The remaining hospital started with a high AOI score, and that team has been working to gain consensus on changing processes at their hospital for 4 of the 5 reported quarters.

Elective induction bundle compliance also has shown significant improvement for all hospitals in the initiative. Overall, the elective induction bundle compliance has more than doubled since baseline of March, 2008 through November, 2009 (Figure 3). This is primarily due to the steady reduction of elective inductions in mothers who had completed less than 39 weeks of gestation.

Current trends show that individual hospital team efforts are making a difference in improving perinatal safety. This initiative is positioned to successfully identify the knowledge and tools needed to improve the quality of patient care and reduce patient harm.

Figure 2: 13 of 16 Hospitals Showing A Reduction in Adverse Events Over Time²¹



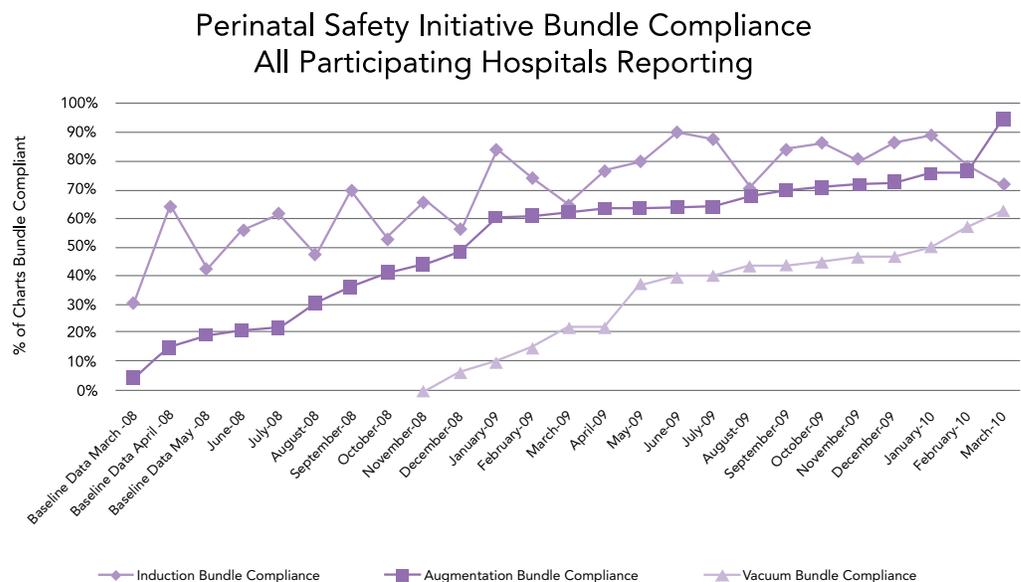
Building on Success: Designing Core Measures for Perinatal Care Improvement

As integrated delivery systems transform their clinical processes, technology and data management, and organizational design in response to regulatory or national health care reform legislation, there is little doubt that both improved quality and cost management present equal challenges for perinatal health care providers. Improving quality

will require new and revised performance measures; transparent perinatal outcomes results; and a renewed emphasis on maternal and neonatal health care improvements through prevention, screening and appropriate use of clinical care across the continuum, from primary to tertiary/quaternary perinatal care.

How will the impact of improvements in perinatal care be evaluated? An increasing emphasis is being placed by patients, payers

Figure 3: Bundle Compliance All Hospitals²²



and providers on process and outcomes measurements. The Joint Commission helped lead the recent development of a revised set of core performance measures. The new set of measures, known as the Perinatal Care (PC) Core Measure Set, was revised from the predecessor pregnancy and related conditions measure set. The set was adapted from the national PC measures endorsed in October, 2008 by the National Quality Forum (NQF). Based upon a multidisciplinary, multi-stakeholder Technical Advisory Panel, a subset of five measures (from the NQF-endorsed total of 17) was selected.²³

How can these new measures (Table 4) improve perinatal care from a systems perspective? For almost three decades, ACOG has had guidelines requiring 39 completed weeks of gestation prior to elective delivery, either vaginal or operative.²⁴ A 2007 survey of almost 18,000 births in Hospital Corporation of America (HCA) hospitals revealed that elective term deliveries make up almost one-third of total deliveries with approximately 10 percent of deliveries deemed nonelective to actually be elective when analyzed in more detail. Many of these are for convenience and result in significant short-term neonatal morbidity, including increased neonatal intensive care unit admissions.²⁵

According to Glantz,²⁶ compared to spontaneous labor, elective inductions result in more cesarean deliveries and longer maternal length of stay. The American Academy of Family Physicians²⁷ also notes that elective induction doubles the cesarean delivery rate. Repeat elective cesarean sections before 39 weeks of gestation also result in higher rates of adverse respiratory outcomes, mechanical ventilation, sepsis and hypoglycemia for the newborns.²⁸ Thus, addressing proper perinatal care by reducing these elective deliveries for convenience can result in both quality improvements and cost avoidance.

Where Do We Go From Here?

As this chapter illustrates, integrated health care systems can unite disparate groups of

institutions and individuals in a common effort to improve quality of care. Many of the tools we tested have wide applicability to small and large, as well as urban and rural hospitals, regardless of the setting. Irrespective of the unique functional anatomy each of our systems possesses, we should begin to strive for this level of integration.

There appears to be increasing pressure from federal agencies to begin to alter the antiquated systems that currently pay for individual pieces of care and instead reward for outcomes achieved and/or attainment of specific care bundles that are known to enhance care and thus improve public health. With these changes, there is additional need for improved metrics, increased public reporting and transparency of outcome measures. Communication and optimizing the multiple hand-offs that occur during care delivery also remain huge opportunities. Because of the time span over which pregnancy occurs and the multiple providers and specialties involved, structured communication like SBAR may be most effective, as it promotes the importance of each team member rather than creating the typical historical silos so often seen in medical care delivery.

Such changes might serve to better align providers, hospitals, as well as others who deliver care to the patient and her newborn. Finally, sharing information about patients and their babies in real time, without geographic constraints, is paramount. Unfortunately, the adoption of electronic medical records remains quite slow. While numerous regional health information organization pilots are ongoing across the country, the real ability to share data across systems that are disparate is quite limited. This may be one of the greatest limitations in trying to encourage solo or group practitioners and their hospitals to function like “virtual” integrated delivery systems. We hope that in the future, information is available to help providers determine, in real time, how and where to best manage the patient and her baby.

Conclusion and Recommendations

- Develop nationally consistent guidelines for regionalization and encourage each state and each hospital to comply with these standards.
- Study effective strategies for enhancing communication across integrated delivery systems or independent hospitals.
- Care bundles (standardized sets of evidence-based practices that when performed collectively and reliably have been shown to improve patient care and outcome) should be broadly implemented to improve safety and outcomes.
- Transparency of performance measures with easily accessible and understandable data on hospital and provider outcomes should be implemented for use by IDss and the public. Fully implementing electronic health records for patients and use of sophisticated information technology for hospitals will enable many of these recommendations to occur in the foreseeable future.
- Clinicians, health care facilities and professional organizations should implement and evaluate relevant perinatal quality improvement measures developed by organizations, such as The Joint Commission. Key stakeholders and others also may have opportunities to participate with these organizations to help disseminate perinatal quality measures.

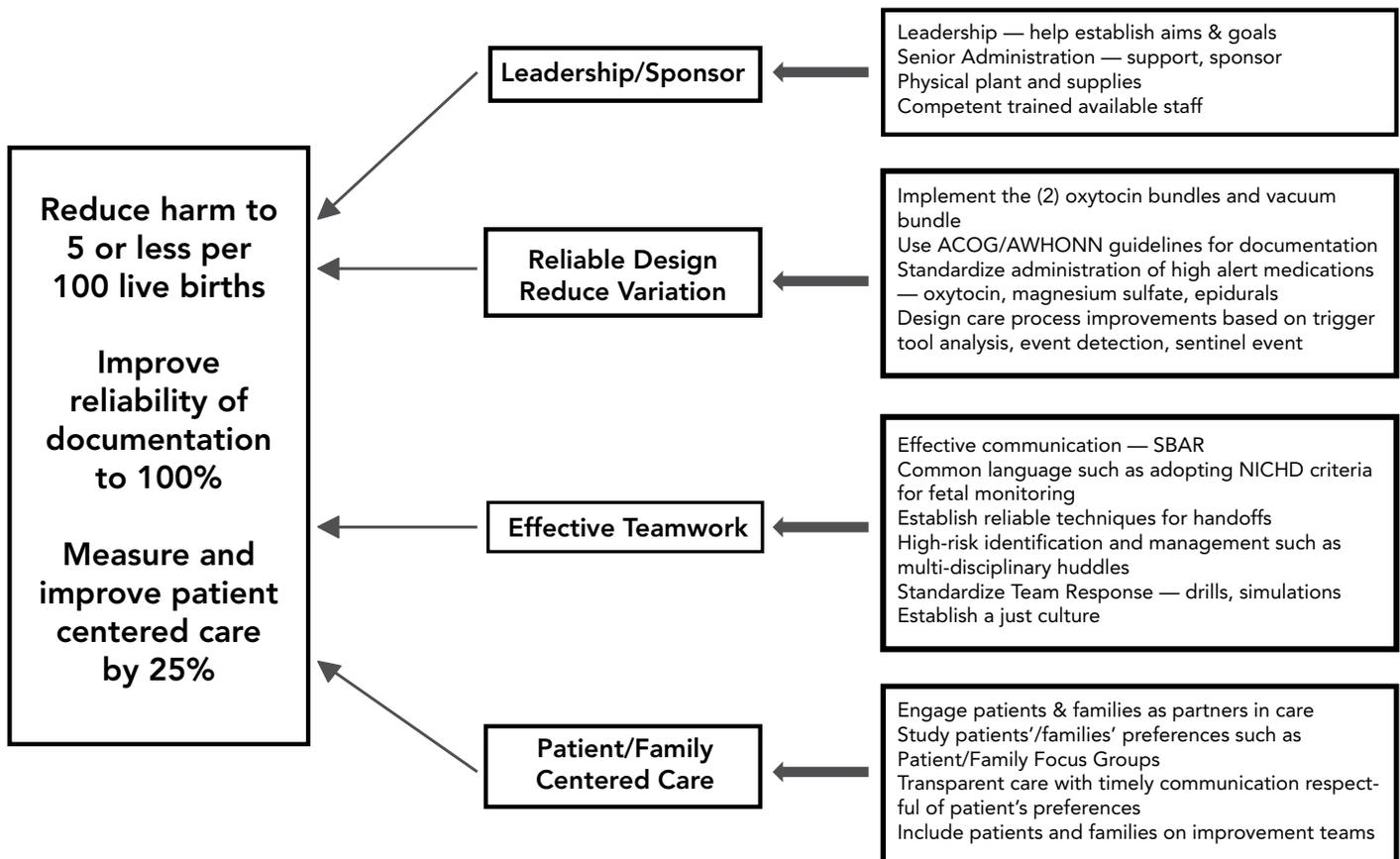
Table 4: The Joint Commission Perinatal Care Core Performance Measures Set (2009)²³

Measure	Measure Name	Numerator	Denominator	Type	Domain
PC-01	Elective Delivery	Patients with elective deliveries	Patients delivering newborns with 37 to 39 weeks of gestation completed	Process	Assessment/ Screening
PC-02	Cesarean Section	Patients with cesarean sections	Nulliparous patients delivered of a live term singleton newborn in vertex presentation	Outcome	Assessment/ Screening
PC-03	Antenatal Steroids	Patients with a full course of antenatal steroids completed prior to delivering preterm newborns	Patients delivering preterm newborns with 24-32 weeks gestation completed	Process	Prematurity Care
PC-04	Health Care-Associated Bloodstream Infections Newborns	Newborns with septicemia or bacteremia	Live-born newborns	Outcome	Prematurity Care
PC-05	Exclusive Breast Milk Feeding	Newborns that were fed breast milk only since birth	Newborns discharged from the hospital	Process	Infant Feeding

Appendix²⁰



Perinatal Community



Perinatal Care Bundles. (Accessed September 21, 2010, at <http://www.IHI.com>)

References

1. Yu VY, Doyle LW. Regionalized long-term follow-up. *Semin Neonatol* 2004;9:135-44.
2. McCormick M, Richardson D. Access to neonatal intensive care. *The Future of Children* 1995;5:162-75.
3. Philip AG. The evolution of neonatology. *Pediatr Res* 2005;58:799-815.
4. Behrman R, Stith Butler A, eds. *Preterm Birth: Causes, Consequences, and Prevention*. Washington, DC: The National Academies Press; 2007.
5. Committee on Perinatal Health. *Toward Improving the Outcome of Pregnancy: Recommendations for the Regional Development of Maternal and Perinatal Health Services*. White Plains, NY: March of Dimes National Foundation; 1976.
6. Lasswell S. *Perinatal Regionalization for Very Low Birth Weight Infants: A Meta-Analysis of Three Decades of Evidence*. Atlanta, GA: Emory University; 2009.
7. Cooke S, RM S, Gagon D. Robert Wood Johnson Foundation Grant: *A Study of the Impact of Recent Developments in the Health Care Environment on Perinatal Regionalization*. Washington, DC: National Perinatal Information Center; 1988.

8. Howell EM, Richardson D, Ginsburg P, Foot B. Deregionalization of neonatal intensive care in urban areas. *Am J Public Health* 2002;92:119-24.
9. Richardson DK, Reed K, Cutler JC, et al. Perinatal regionalization versus hospital competition: the Hartford example. *Pediatrics* 1995;96:417-23.
10. Yeast JD, Poskin M, Stockbauer JW, Shaffer S. Changing patterns in regionalization of perinatal care and the impact on neonatal mortality. *Am J Obstet Gynecol* 1998;178:131-5.
11. Maternal and Child Health Bureau: Multi-Year Report, Performance Measure #17. Health Resources and Services Administration, U. S. Department of Health and Human Services, 2009. (Accessed February 1, 2010, 2010, at <https://perfdata.hrsa.gov/mchb/tvisreports/MeasurementData/StandardNationalMeasureIndicatorSearch.aspx?MeasureType=Performance&YearType=MultiYear>.)
12. U.S. Department of Health and Human Services. Objective 16-8: Obstetrical Care: Increase the proportion of very low birth weight (VLBW) infants born at level III hospitals or subspecialty perinatal centers. In: *Healthy People 2010 2nd ed With Understanding and Improving Health and Objectives for Improving Health 2 vols.* Washington, DC: U.S. Government Printing Office; November 2000.
13. Blackmon LR, Barfield WD, Stark AR. Hospital neonatal services in the United States: variation in definitions, criteria, and regulatory status, 2008. *J Perinatol* 2009;29:788-94.
14. Clement MS. Perinatal care in Arizona 1950-2002: a study of the positive impact of technology, regionalization and the Arizona perinatal trust. *J Perinatol* 2005;25:503-8.
15. U.S. Department of Health and Human Services. *The National Survey of Children with Special Health Care Needs Chartbook 2005–2006.* Rockville, Maryland: U.S. Department of Health and Human Services; 2007.
16. Mazza F, Kitchens J, Kerr S, Markovich A, Best M, Sparkman LP. Eliminating birth trauma at Ascension Health. *Jt Comm J Qual Patient Saf* 2007;33:15-24.
17. Perinatal Safety Initiative: A Collaborative Approach. (Accessed September 21, 2010, at www.premierinc.com/risk/tools-services/perinatal/index.jsp.)
18. Nielsen PE, Goldman MB, Mann S, et al. Effects of teamwork training on adverse outcomes and process of care in labor and delivery: a randomized controlled trial. *Obstet Gynecol* 2007;109:48-55.
19. Knox GE, Simpson KR, Garite TJ. High reliability perinatal units: an approach to the prevention of patient injury and medical malpractice claims. *J Healthc Risk Manag* 1999;19:24-32.
20. Perinatal Care Bundles. (Accessed September 21, 2010, at www.IHI.com.)
21. Data from Premier, Perinatal Safety Initiatives. Received 2010.
22. Ibid.
23. The Joint Commission National Quality Care Measures - Perinatal Care Core Measure Set (Last updated 7/2010). Available at: www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/Perinatal+Care+Core+Measure+Set.htm. November 1, 2010.
24. ACOG Committee Opinion No. 394, December 2007. Cesarean delivery on maternal request. *Obstet Gynecol* 2007;110:1501-4.
25. Clark SL, Miller DD, Belfort MA, Dildy GA, Frye DK, Meyers JA. Neonatal and maternal outcomes associated with elective term delivery. *Am J Obstet Gynecol* 2009;200:156 e1-4.
26. Glantz JC. Elective induction vs. spontaneous labor associations and outcomes. *J Reprod Med* 2005;50:235-40.
27. American Academy of Family Physicians. Tips from Other Journals: Elective induction doubles cesarean delivery rate. *Am Fam Physician* 2000;61.
28. Tita AT, Landon MB, Spong CY, et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes. *N Engl J Med* 2009;360:111-20.



Policy Dimensions of Systems Change in Perinatal Care

Bruce C. Vladeck, Sarah Kilpatrick,
Anne Santa-Donato, Alan R. Fleischman

Chapter 12: Policy Dimensions of Systems Change in Perinatal Care

Bruce C. Vladeck, Sarah Kilpatrick, Anne Santa-Donato, Alan R. Fleischman

Improving perinatal outcomes in the United States requires progress on three interrelated, but conceptually distinct, dimensions: 1) increasing knowledge about the biological, clinical and health services determinants of adverse outcomes, and about ways to prevent or avoid them; 2) increasing adoption of evidence-based best practices by health care providers; and 3) improving access to care for women of childbearing age and their babies. Over the last two decades, public policy has appropriately focused on access to care. But attention also must be paid to improving the quality of services that are provided.

The enactment of the Children's Health Insurance Program Reauthorization Act (CHIPRA) as one of the first accomplishments of the Obama Administration in early 2009 represented the culmination of more than a decade's worth of effort to address problems of access to care for low- and moderate-income children and pregnant women. For states committed to ensuring access to prenatal care for all pregnant women and pediatric care for their children, CHIPRA offered expansive federal financial support and infrastructure assistance.

CHIPRA was widely perceived as a transitional step toward more comprehensive health care reform for women and children. However, it also reflected the growing recognition that access alone is not likely to end the continuing crisis of preterm birth in the United States. Clearly, content of care also matters. During the decade between 1996 and 2006, although births associated with late or inadequate prenatal care fell by 10 percent, preterm and low birthweight births increased by more than 15 percent (See Table 1). More recent data from

2007 and 2008 show a slight reversal of that trend. Prenatal care, in other words, appears to be a necessary, but not sufficient, condition for the reduction of adverse birth outcomes, at least in the United States. This suggests that the availability, accessibility and content of preconception, prenatal and neonatal care need to change.

CHIPRA offered states the opportunity and incentive to ensure that all low- and lower-middle-income children and pregnant women would have health insurance; also it required states to make more proactive and systematic efforts to ensure that the services for which they were paying, under Medicaid as well as the Children's Health Insurance Program (CHIP), met quality standards. Additionally, CHIPRA provided the federal government with the mandate and resources to modernize, expand and improve quality standards. By explicitly requiring, for the first time, the federal government to adopt quality standards for maternal and child health that would be enforced through its health insurance programs, CHIPRA extended to prenatal, perinatal and neonatal

Table 1. Proportion of Births Associated with Late or Inadequate Prenatal Care^{1,2}

	1996	2006	% Change
Mothers with late or no prenatal care	4.0 %	3.6%**	- 10%
Rate of preterm births	11.0 %	12.8%	+16%

** Because of changes in birth certificates, this is a less reliable figure than others in this chart, as it represents the rate for the unrevised birth certificates (51% of U.S. births). However, this number is entirely consistent with long-term trends.

care the approach that had long been institutionalized for acute and long-term care for adults.³ Provisions in the subsequently enacted Patient Protection and Affordable Care (Health Reform) Act of 2010 reinforced and expanded upon these directives (see Appendix).⁴

Defining the Policy Problem: Challenges to Improving the Quality of Perinatal Care

As the preceding chapters have explained, major steps that can and should be taken to improve maternal health and the health of neonates include:

1. improving preconception care for women of childbearing age, especially in the form of behavioral risk reduction around issues of obesity, substance use (especially including tobacco) and unplanned pregnancy
2. promoting quality improvement/quality assurance activities to ensure that pregnant women, throughout the continuum of perinatal care, and newborns receive care that is based on standards and guidelines established by professional organizations, national advisory bodies and regulatory agencies
3. elimination of non-medically indicated (elective) deliveries before 39 weeks gestation
4. greater consolidation and regionalization of neonatal intensive care units

Improving access is, at its simplest, a problem of matching supply to demand: the solution is to give women of childbearing age adequate health insurance and to make sure there is an adequate supply of appropriately trained professionals in the communities in which they live. Improving the quality of care, on the other hand, is even more challenging. It is rooted in finding ways for health professionals and their organizations to practice in ways more fully consistent with the most up-to-date evidence-based standards of care, while requiring that those standards be created, adopted and continuously improved. For mothers and children, improving the quality of care requires greater effectiveness at reducing environmental and behavioral risks. Governments are experienced and can be efficient at providing financing for health insurance and health professionals, but they are far less experienced at affecting either health care professional or patient behavior.

In the decade since the publication of the Institute of Medicine's groundbreaking document, *To Err is Human: Building a Safer Health System*,⁵ considerable progress has been made in addressing the quality problems that are so pervasive in American medical care, but the progress has been uneven and partial, and there is still significant work to do to affect change.⁶ Using a variation of Wachter's categories, health care professionals and organizations have:

1. established and promulgated a first generation of quality standards

2. begun implementing reporting systems and technological capabilities to track the performance of health care providers relative to those standards
3. focused institutional attention on patient safety and quality improvement, and developed organizational structures and processes for quality improvement
4. made measurable quality improvement a public policy priority, including early experimentation with integrating quality standards into payment systems

In all four areas above, progress is uneven, and work remains to be done.

Much of the impetus for quality improvement, broadly defined, has been directed by Medicare and private insurers' focus on working-age populations. Quality improvement efforts in maternal and child health have lagged behind those in other areas, such as myocardial infarction and hospital-acquired pneumonia. Efforts focused on obstetrics and neonatal care have received relatively little attention, which is precisely why the March of Dimes and other advocates for maternal and child health have focused so energetically on those issues through CHIPRA and related activities.

In maternal and child health, the public policy challenge is even more difficult because so much of the financing and quality oversight, through Medicaid, takes place at the state level. Change requires at least 50 programs, not just one. Further, Medicaid programs at the state level have often struggled with issues of quality improvement. Policy-making at most state Medicaid agencies has focused on the balance between budgetary constraint and access expansion, with the more visibly expensive problems of long-term care and prescription drug prices being the major programmatic preoccupations. In maternal and child health, as with nursing homes, the goal of ensuring an adequate level of provider participation in the program has been thought to conflict with the enforcement of stringent quality standards. Further, in most state govern-

ments, the administration of Medicaid has been organizationally quite separate from the maternal and child health functions of state health departments, which, largely, have withered away with the budgetary dominance of Medicaid and the evaporation of Title V funding during the last generation. The clinical expertise has been in one department and the policy levers in another.

The difficulty of mobilizing state governments to focus on quality makes both professional associations and advocacy groups disproportionately important in maternal and child health; while national policy matters, the real quality-improvement struggles must take place on the front lines of state policy and implementation. Of course, in some sense, all health care is local, making the federal government's role in providing health insurance to children indirect and second-hand. Too often in the past, even that leverage has been exercised rather indifferently. Federal administrators have historically been reluctant to intervene too aggressively in non-financial aspects of state Medicaid administration, because the structure of the Medicaid program guarantees considerable discretion to the states, and because the federal government's own resources in the oversight and improvement of clinical care have been so limited. So the grassroots initiatives have been even more important than would otherwise have been the case.

Improving Perinatal Outcomes: The Policy Agenda

Improving preconception care

Some of the most important risk factors for adverse birth outcomes — including maternal obesity, chronic illnesses, tobacco, alcohol and illicit substance use, and sexually transmitted infections — affect many mothers long before they become pregnant. The prevalence of the risk factors, which are all highly correlated with poverty, minority-status, low educational attainment and related social problems, appears to be increasing, at least in some populations. Health services that address the needs of

high-risk women after they become pregnant may come too late to improve outcomes sufficiently.⁷ Programs that provide education and support, and that assist and empower women are needed. Yet such interventions must cross the boundaries of health, education, social service and income-support programs, none of which are particularly amenable to such boundary-crossing, and most of which have inadequate resources themselves. In most instances, governmental or political systems do not provide much support for such complicated and expensive interventions, which touch unavoidably on issues of race, class and sexuality. In the entire comprehensive and compendious bulk of the Patient Protection and Affordable Care Act, for example, such programs receive hardly a mention.

Quality improvement in prenatal and neonatal care

On December 29, 2009, the Department of Health and Human Services (HHS) published in the *Federal Register* a notice of an “Initial Core Set of Children’s Health Care Quality Measures.”⁸ This is the first step in a lengthy and substantially more complex process outlined in CHIPRA. The initial set of quality measures published by HHS is fragmentary, often vague and focused much more on the use of care than its quality. As emphasized several times in the notice, implementing the measures is also purely voluntary — at least until 2013. However, if the experience in quality improvement in other areas of the health care system is any guide, this important step is the start of a process that should yield more comprehensive and scientifically-based quality standards; the development of a timely national data system that will permit providers to evaluate their own performance relative to national norms and peer group activity; and, eventually, development of a set of formal requirements for providers receiving reimbursement from Medicaid, CHIP or other public programs.

In fairness to HHS, the December 29,

2009 notice was published only a few months after CHIPRA was enacted, and there is now substantial activity going on both within the government and in many private-sector organizations to identify, refine and evaluate a range of new quality measures for women and children, which will then be subjected to a formal and relatively rigorous set of reviews within HHS before they are promulgated as the next generation of official standards. In the meantime, using guidelines and standards from professional groups and other well-informed bodies, and the judgment of their own internal clinical leaders, many health care organizations are beginning to apply to their maternal and pediatric services the kinds of quality improvement processes that have been developed and refined in adult medical and surgical services during the last decade.

Reducing non-medically indicated (elective) deliveries before 39 weeks gestation

One area in which the existence of clear professional guidelines for appropriate care has not yet produced marked quality improvement is in the reduction of elective deliveries before 39 weeks gestation. Despite clear guidelines⁹ from the American College of Obstetricians and Gynecologists since 1979 about not performing elective deliveries prior to 39 weeks, late preterm births (34 to 36 weeks), as well as early term births (37 to 38 weeks) continued to increase through 2006.¹⁰ As these data have become more widely known, and the risks of late preterm and early term delivery have become better understood, a downward bending of the curve began in 2007.¹¹ However, full compliance with these guidelines will require more concerted and systematic efforts from professional organizations and insurers to sustain a reverse of the increase. Advocates can play an important role in keeping those groups focused at both the national and, especially, state and local levels.

**Re-regionalizing neonatal
intensive care**

Efforts to improve the regionalization of perinatal services are even more problematic. Such regionalization was the single highest priority identified in the first edition of *Toward Improving the Outcome of Pregnancy*.¹² Considerable progress in that direction was made in the 1970s and early '80s, but since then we have experienced a dramatic “deregionalization”¹³ of neonatal care in the United States. Between 1980 and 1995, while the number of very low-birthweight babies born in the United States increased 38 percent, the number of neonatal intensive care units (NICUs) increased 99 percent, and more than one-quarter of the NICUs in the United States in 1995 were too small to be likely to provide optimal care.¹⁴

There are many reasons for this deregionalization of NICU services, but one of central importance relates directly to public policy. The publication of the first edition of *Toward Improving the Outcome of Pregnancy* in 1976,¹² and related advocacy activities by the March of Dimes, professional groups and others, roughly coincided with the implementation of the National Health Planning and Resources Development Act of 1974.¹⁵ That law expanded and strengthened a national system of regional health planning, reinforced with Certificate-of-Need laws in every state. While the national health planning effort has widely (and not inaccurately) been perceived as a failure, regionalization of perinatal services was a high priority in many states, and the process achieved considerable success.

The demise of organized health planning in the wave of deregulatory enthusiasm of the early 1980s destroyed whatever momentum the regionalization process might have attained. This preceded a period in which the organization and distribution of neonatal intensive care has moved in the opposite direction. More recently, the shortage of pediatric subspecialists and the success of flagship children's hospitals have fueled a boom in the regionalization of pediatric specialty services, but a similar pattern has not occurred with the youngest and smallest children. Without formal regulatory or legal mechanisms in most states requiring the regionalization of obstetric and neonatal services, progress will have to be made one region or one community at a time.

Conclusion and Recommendations

While universal access to prenatal care is essential — and still not achieved in the United States — it is not all we need to reduce adverse birth outcomes, including preterm birth and low birthweight. To realize such improvements, we recommend that:

- providers of perinatal care increasingly be held accountable for providing the most appropriate care, which reflects evidence-based guidelines and clinical standards;
- guidelines and standards continue to evolve on the basis of research, clinical innovation and rigorous evaluation;
- payers — private insurers, Medicaid and CHIP — play a more significant role in quality improvement in maternal and infant health;
- professional groups continue to encourage their members to improve their practice patterns. The national specialty societies, especially the American College of Obstetricians and Gynecologists (ACOG), the American Academy of Pediatrics (AAP) and the Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN), have had a long-standing interest and have intensified their leadership in the development and promulgation of quality standards;
- federal and state governments be encouraged to fund research on the etiology of preterm birth and to identify and replicate innovative and successful approaches to improve perinatal care through the adoption of quality standards. This includes the identification of model programs, barriers to better performance and mobilization of local coalitions and collaboratives;
- clinicians, health care facilities and professional organizations implement and evaluate relevant perinatal quality improvement measures developed by organizations such as The Joint Commission and the National Quality Forum (NQF); and
- key stakeholders create and/or engage in consensus building around core perinatal quality measures.

Appendix

Health Reform Implementation Timeline

Abridged Version

Summarized for TIOP III by
Amanda Jezek and Carolyn Mullen

This Health Reform timeline, accurate as of August 18, 2010, includes only select provisions central to improving the health of women, infants and children and is presented in its abridged form to provide the reader a framework of reference.

March 2010, Upon Enactment

Private Insurance

Tax credits of up to 35 percent of premiums will be available to small businesses (no more than 25 employees) to make employee coverage more affordable.

Medicaid and CHIP

Prohibits states from establishing Medicaid or Children's Health Insurance Program (CHIP) eligibility standards, methodologies and procedures that are more restrictive than current policy until such date determined by the Secretary of Health and Human Services (HHS) that the Exchange established by the state is fully operational. This requirement shall continue for children up to age 19 through September 30, 2019.

States have the option to cover non-pregnant women in Medicaid up to the state's eligibility level for pregnant women. Benefits for this population are limited to family planning services and supplies, including medical diagnosis and treatment services. State Medicaid Director letter released July 2, 2010, providing technical information to states on how to implement this option.

Miscellaneous

Establishes under Title V the Maternal, Infant and Early Childhood Home Visiting Programs. Requires states, within 6 months

of enactment, to submit a needs assessment to the Secretary of HHS identifying at risk communities that could benefit from home visiting. Appropriates funding for the Secretary to make grants to states to develop and carry out evidence-based home visiting programs. One of the goals of the programs may be improved maternal and infant health. First Funding Opportunity Announcement to states released June 10, 2010. Request for Public Comment on Criteria for Evidence of Effectiveness of Home Visiting Program Models released on July 23, 2010.

September 2010, 6 Months After Enactment

Private Insurance

Prohibits insurers from imposing pre-existing condition exclusions on children. Prohibits insurers from rescinding coverage except in cases of fraud. Prohibits insurers from imposing lifetime limits on the dollar value of coverage. Prohibits insurers from imposing annual limits on dollar value of coverage except within limits to be defined by HHS. Interim Final Rule with request for comment on Requirements for Group Health Plans and Health Insurance Issuers Under the Patient Protection and Affordable Care Act Relating to Preexisting Condition Exclusions, Lifetime and Annual Limits, Rescissions, and Patient Protections released June 28, 2010.

Permits young adults up to age 26 who have not been offered employer-based health insurance coverage to remain on their parents' health insurance, at the parents' choice. Interim Final Rule with request for comment on Dependent Coverage of Children to Age 26 released May 13, 2010.

Requires health insurers to provide coverage without cost-sharing for preventive services rated A or B by the U.S. Preventive Services Task Force (includes tobacco cessation counseling for pregnant women), recommended immunizations, preventive

care for children as defined by “Bright Futures” and additional preventive care and screenings for women as defined by a yet-to-be-developed Health Resources and Services Administration (HRSA) document. Interim Final Rule with request for comment on Coverage of Preventive Services released July 19, 2010.

Public Health

Prevention and Public Health Fund

The Office of the Secretary shall appropriate \$500 million by September 30, 2010 for prevention, wellness and public health activities including prevention research and health screenings such as the Community Transformation grant program, the Education and Outreach Campaign for Preventive Benefits and immunization program.

Grants to Promote Positive

Health Behaviors and Outcomes

(Authorization FY10 –FY14) Centers for Disease Control and Prevention (CDC) shall award grants to promote positive health behaviors and outcomes for populations in medically underserved communities through the use of community health workers.

Funding may be used to:

- Educate, guide and provide outreach in community setting
- Educate and provide guidance regarding effective strategies to promote positive health behaviors and discourage risky behaviors
- Educate and provide outreach regarding enrollment in health insurance, including CHIP
- Identify, educate, refer and enroll underserved populations to appropriate health care agencies and community-based programs
- Educate, guide and provide home visitation services regarding maternal health and prenatal care.

2011

Medicaid and CHIP

Requires states to cover tobacco cessation counseling and pharmacotherapy for pregnant women in Medicaid.

Public Health

National Strategy

No later than March 23, 2011 the Surgeon General in consultation with the National Prevention, Health Promotion and Public Health Council shall develop a national prevention, health promotion and public health strategy. The strategy shall:

- Set specific goals and objectives for improving health
- Establish specific and measurable actions
- Make recommendations to improve federal efforts relating to prevention, health promotion, public health and integrative health.

Education Campaign

No later than March 23, 2011 the Secretary of HHS shall implement a national public-private partnership for a prevention and health promotion outreach and an education campaign to raise public awareness of health improvement activities across the life span. Includes dissemination of information that:

- Describes the importance of utilizing preventive services to promote wellness, reduce health disparities and mitigate chronic disease
- Promotes the use of preventive services recommended by the U.S. Preventive Services Task Force (USPSTF) and community preventive services task force
- Encourages healthy behaviors linked to the prevention of chronic disease
- Explains the preventive services covered by health plans offered through Gateway
- Describes additional preventive care supported by CDC, HRSA, Substance Abuse and Mental Health Services Administration (SAMHSA), and Advisory Committee on Immunization Practices (ACIP)
- Includes general health promotion information

- Is designed to address nutrition, regular exercise, smoking cessation, obesity reduction and the 5 leading disease killers

Report No later than July 1, 2010 and annually thereafter the Council shall submit to the President and relevant Committees a report that:

- Describes activities and efforts on prevention, health promotion and public health goals defined in the strategy and further describes actions recommended by the Council
- Describes national progress in meeting specific action steps recommended by the Council and taken by relevant agencies
- Contains a list of national priorities on health promotion and disease prevention to address lifestyle modification (smoking cessation, proper nutrition, appropriate exercise, mental health, behavioral health, substance use disorder and domestic violence screenings) targeting the 5 leading disease killers in the US
- Contains a list of science-based initiatives to achieve goals of Healthy People (HP) 2010 regarding nutrition, exercise and smoking cessation and targeting the 5 leading disease killers in the US
- Plans for consolidating federal health programs and Centers that exist to promote healthy behavior and reduce disease risk (including eliminating programs and offices determined to be ineffective in meeting the priority goals of HP2010)
- Plans are to align with CDC recommendations
- Specific plans to ensure prevention programs are based on scientifically sound guidelines established by the CDC

Prevention and Public Health Fund

The Secretary shall allocate \$750 million by September 30, 2011 for prevention, wellness and public health activities, including prevention research and health screenings such as the Community Transformation grant program, the Education and Outreach Campaign for Preventive Benefits and the immunization program.

2012

Prevention and Public Health Fund

The Secretary shall allocate \$1 billion by September 30, 2012 for prevention, wellness and public health activities including prevention research and health screenings such as the Community Transformation grant program, the Education and Outreach Campaign for Preventive Benefits and immunization program.

2013

Medicaid and CHIP

Beginning October 1, 2013 through September 30, 2019, the federal match for CHIP will be increased by 23 percentage points (but may never exceed 100 percent).

Public Health

Prevention and Public Health Fund

The Secretary shall allocate \$1.25 billion by September 30, 2013 for prevention, wellness and public health activities, including prevention research and health screenings such as the Community Transformation grant program, the Education and Outreach Campaign for Preventive Benefits and immunization program.

2014

Private Insurance

Requires U.S. citizens and legal residents to have qualifying health coverage (phase-in tax penalty for those without coverage).

Assesses fees to employers with more than 50 employees that do not offer coverage or have at least one full-time employee who receives a premium tax credit. Requires employers with more than 200 employees to automatically enroll employees into health insurance plans offered by the employer. Employees may opt out of coverage.

Calls for the creation of state-based American Health Benefit Exchanges and Small Business Health Options Program (SHOP) Exchanges, administered by a governmental agency or non-profit organization, through which individuals and small

businesses with up to 100 employees can purchase qualified coverage. HHS released request for comments on health insurance exchanges August 3, 2010.

Requires guaranteed issue and renewability of health insurance policies and allows only limited rating variation.

Prohibits pre-existing condition exclusions.

Prohibits annual dollar limits on coverage.

Creates an essential health benefits package that provides a comprehensive set of services, including maternity and newborn care, pediatric services, oral and vision care, rehabilitative and habilitative services and supplies, ambulatory patient services, emergency services, hospitalization, mental health and substance abuse disorder services, prescription drugs, laboratory services, preventive and wellness services and chronic disease management. HHS will further define and periodically refine essential benefits, and in doing so shall provide notice and opportunity for public comment.

Provides refundable and advanceable premium credits and cost sharing subsidies to eligible individuals and families with incomes between 133-400% Federal Poverty Level (FPL) to purchase insurance through the Exchanges.

Medicaid and CHIP

Prohibits states from using income disregard (except the automatic 5% income disregard that will be used for all applicants) or assets tests when determining Medicaid and CHIP eligibility, except for elderly individuals dually eligible for Medicaid and Medicare.

Requires states to cover in Medicaid all individuals under age 65 with incomes up to 133% FPL (an option starting in 2010).

Requires states to cover tobacco cessation pharmaceuticals in Medicaid.

Public Health

Prevention and Public Health Fund: Office of the Secretary shall allocate \$1.5 billion by September 30, 2014 for prevention, wellness and public health activities including prevention research and health screenings such as the Community Transformation grant program, the Education and Outreach Campaign for Preventive Benefits and immunization program. For every fiscal year thereafter \$2 billion is provided.

Comparative Effectiveness Research

Establishes a non-profit corporation called The Patient Centered Outcomes Research Institute to assist patients, clinicians, purchasers and policy makers in making informed health decisions by advancing the quality and relevance of evidence concerning the manner in which diseases can be prevented, diagnosed, treated and monitored through research and evidence synthesis. The Institute shall establish a research agenda and take into account the potential for differences in the effectiveness of health care treatments.

Key National Indicators (Authorization FY10-FY18): Establishes a key national indicator system via the National Academy of Sciences and a commission on Key National Indicators which conducts comprehensive oversight of a newly established key national indicators system; makes recommendations on how to improve the key national indicators system; coordinates with federal government users and contracts with the Academy of Sciences.

References

1. National Center for Health Statistics, final natality data. 2010. (Retrieved September 28, 2010, from marchofdimes.com/peristats).
2. Martin JA, Hamilton BE, Sutton PD, et al. Births: Final data for 2006. National vital statistics reports; vol 57 no 7. Hyattsville, MD: National Center for Health Statistics; 2009.
3. Children's Health Insurance Program Reauthorization Act. In: HR 976. First ed; 2009.
4. Jezek A, Mullen C. Health reform implementation timeline abridged version. 2010.
5. Institute of Medicine. To Err is Human: Building a Safer Health Care System. Washington, DC: National Academy Press; 2000.
6. Wachter RM. Patient safety at ten: unmistakable progress, troubling gaps. *Health Aff (Millwood)* 2010; 29:165-73.
7. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J* 2003; 7:13-30.
8. Department of Health and Human Services. Medicaid and CHIP Programs: Initial Core Set of Children's Healthcare Quality Measures for Voluntary Use by Medicaid and CHIP Programs. Notice with comment period In: 74 CFR 68846-49; 2009.
9. ACOG committee opinion No. 404 April 2008. Late-preterm infants. *Obstet Gynecol* 2008; 111(4):1029-32.
10. Hamilton B, Martin J, Ventura S. Births: Preliminary Data for 2008. Hyattsville, MD; 2010 April 30, 2010.
11. Martin JA, Kirmeyer S, Osterman M, Shepherd RA. Born a bit too early: recent trends in late preterm births. *NCHS Data Brief* 2009:1-8.
12. Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy: Recommendations for the Regional Development of Maternal and Perinatal Health Services. White Plains, NY: March of Dimes National Foundation; 1976.
13. Howell EM, Richardson D, Ginsburg P, Foot B. Deregionalization of neonatal intensive care in urban areas. *Am J Public Health* 2002; 92:119-24.
14. Phibbs CS, Baker LC, Caughey AB, Danielsen B, Schmitt SK, Phibbs RH. Level and volume of neonatal intensive care and mortality in very-low-birth-weight infants. *N Engl J Med* 2007;356(21):2165-75.
15. National Health Planning and Resources Development Act of 1974, Pub. L. No 93-641, (Feb. 8, 1974).



Opportunities
for Action and
Summary of
Recommendations

TIOP III Steering Committee

Chapter 13: Opportunities for Action and Summary of Recommendations

TIOP III Steering Committee

Toward Improving the Outcome of Pregnancy: Enhancing Perinatal Health

Through Quality, Safety and Performance Initiatives (TIOP III) is a monograph about the need to improve the quality of care along the entire perinatal continuum, from preconception through the postpartum period. • Using examples of promising and successful initiatives at hospitals and health systems across the country, TIOP III illustrates specific strategies and interventions that incorporate robust process and systems change, including the power of statewide quality improvement collaboratives, to improve the quality of perinatal care.

.....

TIOP III is a tool for the broadest possible audience — from clinicians on the frontline, to public health professionals, researchers, policy-makers, payers, patients and families — anyone committed to improving perinatal health. Each of these stakeholders has a unique role and responsibility in achieving this goal, but success ultimately depends on collaboration, cooperation and commitment to a shared vision of a national system that embraces evidence-based, high-quality and cost-effective care that meets the needs of patients and their families.

TIOP III encompasses a number of cross-cutting themes with action items that all stakeholders will embrace in their efforts to improve pregnancy outcomes. It contains a variety of evidence-based activities and interventions that can be incorporated now into perinatal quality improvement efforts and initiatives in order to improve pregnancy outcomes. It is critical to focus on these themes and action items as the United States implements the quality, safety and performance initiatives needed to enhance perinatal health.

They include:

- **Assuring the uptake of robust perinatal quality improvement and safety initiatives.**
 - Develop, disseminate and support validated perinatal quality and performance measures; collect standardized, comparable data; review practice and assure accountability.
 - Encourage and incentivize use of The Joint Commission Perinatal Care Core Measure Set, as well as other National Quality Forum-endorsed perinatal measures.
 - Define and disseminate evidence-based practices in perinatal care; implement standardized sets of evidence-based practices that, when performed collectively and reliably, have been shown to improve outcomes.
 - Promulgate effective health center initiatives, as well as coalitions and multidisciplinary statewide collaboratives that maximize the impact of perinatal quality improvement initiatives.
 - Promote timely feedback, increased public reporting and transparency of outcome measures in all perinatal quality improvement initiatives.

- Promote research to provide evidence for clinical practices, compare alternative practices and identify strategies to facilitate implementation of evidence-based practices.
- **Creating equity and decreasing disparities in perinatal care and outcomes.**
 - Promote equity and care across the spectrum of perinatal care that is culturally sensitive and developmentally and linguistically appropriate.
 - Improve access to quality health care services, regardless of patient's ability to pay.
- **Empowering women and families with information to enable the development of full partnerships between health care providers and patients and shared decision-making in perinatal care.**
 - Educate, empower and support families to become more active in their care and in perinatal quality improvement efforts.
- **Standardizing the regionalization of perinatal services.**
 - Develop standard definitions and guidelines across the country for levels of maternal and infant care that are consistently utilized, to help optimize the effective regionalization of maternal and newborn care.
- **Strengthening the national vital statistics system.**
 - Create a highly reliable and valid collection of maternal and newborn vital statistics; maintain and promote electronic health records to enable measurement and improvements in perinatal care.
 - Use electronic health records and an electronic infrastructure to enhance communication across integrated delivery systems or independent hospitals.

Each chapter in this book features specific recommendations across the continuum of perinatal care that applies to various stakeholders. While we have grouped the recommendations below according to different

constituents in the health care system, we urge all stakeholders to implement as many as possible. Ultimately, it will take a team of engaged stakeholders committed to improving the outcomes of pregnancy to successfully catalyze and implement systems change.

Health Care Professionals and Hospitals

1. Use best practices and evidence-based guidelines in safety and screening along the entire perinatal continuum, from preconception through postpartum care, making sure care is culturally sensitive, developmentally and linguistically appropriate, as well as patient- and family-centered.
2. Begin perinatal care before conception occurs and conduct regular screening — including at least two ultrasound examinations for every pregnant woman: one in the first and one in the second trimester — to confirm gestational dating, identify birth defects and genetic disorders, and reduce the risk of adverse pregnancy outcomes.
3. Provide women with appropriate antepartum interventions (e.g., antenatal steroids, prophylaxis with progesterone to prevent recurrent preterm birth), and intrapartum interventions, including utilization of evidence-based protocols for oxytocin, magnesium sulfate, shoulder dystocia, postpartum hemorrhage and elimination of non-medically indicated deliveries prior to 39 weeks of gestation.
4. Engage in constructive, culturally sensitive educational interactions with patients to empower them with information to assist in their participation in their own care and decision-making.
5. Embrace evidence-based safety initiatives in newborn intensive care units, including reducing nosocomial infections, improving communication/hand-offs and implementing practice simulations.
6. Include in postpartum care evidence-based risk reduction, such as smoking cessation programs, a renewed focus on the importance of breastfeeding and

routine screening for postpartum depression and post-traumatic stress disorder.

Public Health

1. Create a robust national vital statistics system, which includes data quality assessments, to ensure that reliable and accurate information is collected at the local, state and federal levels; ensure that all states implement the 2003 revised birth certificate; ensure that data are released in a timely manner.
2. Encourage transparency of provider and hospital performance measures; develop electronic health records and systems that allow for linkages with clinical systems to create a comprehensive system that captures data throughout the continuum of perinatal care, from preconception through postpartum care.
3. Embrace the interdependence of promoting equity and quality improvement to achieve the best health care and health outcomes.
4. Develop nationally consistent guidelines for regionalization of perinatal care and encourage states and hospitals to comply with these standards.
5. Create comprehensive services for prenatal, intrapartum and postpartum patients in need of counseling and treatment for behavioral disorders and mental illness.
6. Create comprehensive services for infants with developmental disabilities and birth defects and their families.

Research Scientists

1. Evaluate best practices in perinatal care to facilitate the creation of evidence-based guidelines.
2. Develop a transdisciplinary research agenda involving basic science, as well as epidemiological, clinical, behavioral and social sciences to study the causes of and contributors to adverse birth outcomes, including genetics, stress, and racial and ethnic disparities.
3. Fund and evaluate multisite demonstration projects that employ evidence-based interventions.

4. Support Comparative Effectiveness Research to properly define quality outcomes and processes and to help payers incentivize providers for quality care.

Policy-makers and Payers

1. Payers — private insurers and Medicaid — should play a more significant role in quality improvement in maternal and infant health.
2. Providers should be held accountable for providing care that reflects evidence-based guidelines and clinical standards.
3. Use electronic health records and technology to link clinical care, surveillance and outcomes research.
4. Implement, incentivize and evaluate perinatal quality improvement measures developed by organizations such as The Joint Commission and the National Quality Forum
5. Identify and analyze innovative and successful approaches to improve perinatal care through the adoption of quality standards; catalogue and address barriers to better performance, and mobilize broadly based local, regional and national coalitions.

Patients and Families

1. Encourage providers to embrace patient- and family-centered care, including: group prenatal care, family-centered birth and postpartum care, family support in the NICU and palliative care.
2. Urge providers to recognize and embrace the critical role of patients and families as partners in decision-making.
3. Empower patients and families to partner with health care providers by educating them to know their family history and to ask questions in an effort to predict, manage and reduce risks for potential adverse birth outcomes.
4. Encourage the health care system, as well as national organizations, to include families in perinatal quality improvement initiatives.

Summary of TIOP I and TIOP II and TIOP III

	TIOP I	TIOP II	TIOP III
Year Published	1976	1993	2010
Focus	<ul style="list-style-type: none"> A regional perinatal care system 	<ul style="list-style-type: none"> Care before and during pregnancy Care during birth and beyond Data documentation and evaluation Financing 	<ul style="list-style-type: none"> Enhancing perinatal health through quality, safety and performance initiatives
Primary Recommendations	<ul style="list-style-type: none"> Levels of care <ul style="list-style-type: none"> Level I — Uncomplicated maternity and newborn Level II — Uncomplicated and majority of complicated Level III — Uncomplicated and all serious complications Preparatory and continuing education in regional system Coordination and communication in regional system Major task — financing, education, initiating action 	<ul style="list-style-type: none"> Health promotion and education Reproductive awareness Structure and accountability Preconception and interconception care Ambulatory prenatal care Inpatient patient care Infant care Improving the availability of perinatal providers Data, documentation and evaluation Financing perinatal care 	<ul style="list-style-type: none"> Assuring the uptake of robust perinatal quality improvement and safety initiatives Creating equity and decreasing disparities in perinatal care and outcomes Empowering women and families with information to enable the development of full partnerships between health care providers and patients and shared decision-making in perinatal care Standardizing the regionalization of perinatal services Strengthening the national vital statistics system

National Office
1275 Mamaroneck Avenue
White Plains, NY 10605
(914) 428-7100
marchofdimes.com

© 2010 March of Dimes Foundation
34-2528-10 12/10

