

Carole Kenner • Leslie B. Altimier • Marina V. Boykova
EDITORS

SIXTH EDITION

COMPREHENSIVE NEONATAL NURSING CARE





Comprehensive Neonatal Nursing Care



Carole Kenner, PhD, RN, FAAN, FNAP, ANEF, is the Carol Kuser Loser Dean/Professor of the School of Nursing, Health, and Exercise Science at The College of New Jersey. Dr. Kenner received a bachelor's of science in nursing from the University of Cincinnati and her master's and doctorate in nursing from Indiana University. She specialized in neonatal/perinatal nursing for her master's and obtained a minor in higher education for her doctorate. She has authored more than 100 journal articles and 30 textbooks.

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I wish to first express my appreciation, love, and support for my dad, who died in 2017 at the age of 105½. He always got excited when a new edition published.

—Carole

I would like to thank my children, Jen, Julie, and Kevin, for their love, support, and encouragement for me as a mom and as a professional.

—Leslie

For my mom, whose love and support were endless.

—Marina

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—Carole Kenner, Leslie Altimier, and Marina Boykova



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Foreword

Comprehensive Neonatal Nursing Care has been the go-to resource for evidence-based and practical guidance for novice and expert neonatal nurses in classroom and clinical settings since 1993. As we have come to expect and rely upon, the new *sixth edition* includes the latest information on neonatal embryology, physiology, medical and surgical management, psychosocial care, emerging infections, neuroprotection, pain control, care of the late preterm infant, and much more. The textbook is organized with a focus on integrative management of the newborn and family. There is extensive use of research findings in each of the chapters to provide evidence to support practice strategies and clinical decision-making. Complete references are found at the end of each chapter.

In the new *sixth edition*, the chapters have been thoroughly updated and refreshed with the latest research and practice tips, written by authors who are recognized experts in their fields. New features include callouts highlighting parent perspectives, quality and safety practice points, and emergency alerts. There are new chapters on trauma-informed care, neonatal abstinence, and support for families. Uniquely among neonatal textbooks, the *sixth edition* of *Comprehensive Neonatal Nursing Care* includes a focus on the neonatal care ecosystem, with chapters on emerging trends in research and care delivery, genetics and genomics, and

competency-based education and support for neonatal unit managers and directors.

In today's world, neonatal nurses are faced with the constant threat of information overload and ever-present concerns about the accuracy and relevance of what appears in print, online, and in videos, blogs, podcasts, or instant messages. It is therefore reassuring—and indeed essential—to have the well-written, accessible, thoroughly researched and accurate *Comprehensive Neonatal Nursing Care* as our constant and trustworthy companion as we strive to provide high-quality care to all newborns and their families. The editors and authors are to be congratulated for maintaining such a high standard of excellence and practical application. Your dedication enables neonatal nurses everywhere to provide essential care to the more than 30 million sick and premature newborns and their families who depend on nurses to survive and thrive.

Thank you!

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Preface

One of the most complex issues in healthcare is the care of sick or premature infants and those with multiple, severe congenital anomalies. Despite advanced technology and knowledge, preterm delivery continues to be a significant problem in the United States. Maternal risk factors have changed over the past decade. For example, more women with congenital heart anomalies and chronic illnesses, such as diabetes or sickle cell anemia, are giving birth to infants with consequent health problems. The rise of in vitro fertilization has resulted in increased multiple births and prematurity. Many infants in neonatal intensive care units (NICUs) have been exposed to substances or are born to mothers with other risk factors such as delayed childbearing or childhood cancers.

The care of these at-risk infants requires the use of more and more complex technology. Surfactant administration, nitric oxide administration, high-frequency jet ventilators, neurally adjusted ventilatory assist (NAVA; Stein & Firestone, 2014), and new hybrid ventilators providing high-frequency and conventional modes of ventilation are being used in Europe and are likely to be brought to the United States for Food and Drug Administration (FDA) approval. New technologies now can provide continuous, noninvasive monitoring of endotracheal tube position and obstruction (Hütten et al., 2015). Servo-controlled oxygen administration, which leads to greater compliance with targeted oxygen saturation ranges, is being developed (Claure & Bancalari, 2015). Near-infrared spectroscopy (NIRS), amplitude-integrated EEGs (aEEGs), dialysis, organ transplantation, and other extraordinary measures are becoming commonplace. Better integration of technologies (both electronic medical records [EMRs] and medical devices) will be the basis for decision support and predictive analytics. However, in the midst of these high-tech interventions, neuroprotective developmentally supportive care interventions such as olfactory and gustatory support, using visible rather than audible alarms, music therapy, cycling lights, using more physiologically and developmentally appropriate positioning, and skin-to-skin contact are being recognized as evidence-based neuroprotective interventions, due to increasing evidence regarding the importance of maintaining a developmentally supportive NICU environment for improved long-term infant/child and family outcomes. Some consequences of prematurity are caused by early parent-infant separation and a lack of parents' participation in the care of their

infant during traditional neonatal intensive care. The family is an essential partner in decision-making and care for their infant, and family-centered care is being expanded to family-integrated care, a paradigm shift from nurse caring to nurse coaching for parents providing the care.

Providers of neonatal care need up-to-date accurate and comprehensive information as a basis for providing care to newborns. A thorough understanding of normal physiology as well as the pathophysiology of disease processes is necessary for well-designed care practices. Knowledge about associated risk factors, genetics, critical periods of development, principles of nutrition and pharmacology, and current neonatal research findings are all essential in providing optimal care for neonates. A newer concept called de-implementation refers to the science of abandoning and unlearning practices built on the scaffolding of habit. Practices that are novel but yet not fully tested, unproven practices (those that lack supporting evidence), and practices of habit (practices that continue despite contradictory evidence) should go through the process of de-implementation. Care practices need to be based on best evidence-based practices available, rather than on tradition and habits.

A multidisciplinary approach has been replaced by an integrated interprofessional approach to care. All these elements form the foundation for assessment, planning, implementation, and evaluation of the effectiveness of neonatal care. The nurse plays a vital role in the provision of integrated healthcare to newborns. During the past decade, the nurse's role has included added responsibilities, which are recognized at both the staff and advanced practice levels. For the purposes of this book, we define the roles of the neonatal staff nurse, clinical nurse specialist (CNS), and neonatal nurse practitioner (NNP).

NEONATAL STAFF NURSE

The neonatal staff nurse role requires accurate and thorough assessment skills, excellent ability to communicate with other health professionals and patients' families, and a broad understanding of physiology and pathophysiology on which to base management decisions. It requires highly developed technical skills as well as critical decision-making skills. With healthcare delivery changes, the role also requires supervision of ancillary