

ASPEN

Parenteral Nutrition Handbook

THIRD EDITION

EDITORS

Phil Ayers, PharmD, BCNSP, FASHP

Elizabeth S. Bobo, CNSC, MS, RDN, LDN

Ryan T. Hurt, MD, PhD

Andrew A. Mays, PharmD, BCNSP, CNSC

Patricia H. Worthington, MSN, RN, CNSC

About ASPEN

The American Society for Parenteral and Enteral Nutrition (ASPEN) is a scientific society whose members are healthcare professionals—physicians, dietitians, nurses, pharmacists, other allied health professionals, and researchers—who envision an environment in which every patient receives safe, efficacious, and high-quality patient care.

ASPEN's mission is to improve patient care by advancing the science and practice of clinical nutrition and metabolism.

NOTE: This publication is designed to provide accurate authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering medical or other professional advice. Trademarked commercial product names are used only for education purposes and do not constitute endorsement by ASPEN.

This publication does not constitute medical or professional advice, and should not be taken as such. Use of the information published herein is subject to the sole professional judgment of the attending health professional, whose judgment is the primary component of quality medical care. The information presented herein is not a substitute for the exercise of such judgment by the health professional.

All rights reserved. No part of this may be used or reproduced in any manner whatsoever without written permission from ASPEN. For information write: American Society for Parenteral and Enteral Nutrition (ASPEN), 8401 Colesville Road, Suite 510, Silver Spring, MD 20910; (301) 587-6315, www.nutritioncare.org, aspennutritioncare.org.

Copyright 2020. American Society for Parenteral and Enteral Nutrition.

Print ISBN 978-1-889622-41-5

eBook ISBN 978-1-889622-42-2

Suggested citation: Ayers P, Bobo ES, Hurt RT, Mays AA, Worthington PH, eds. *ASPEN Parenteral Nutrition Handbook, Third Edition*. Silver Spring, MD: American Society for Parenteral and Enteral Nutrition; 2020.

1 2 3 4 5 6 7 8 9 10

Printed in the United States of America.

Table of Contents

Preface	1
---------------	---

Editors & Contributors	2
------------------------------	---

CHAPTER 1

Nutrition Screening, Assessment, and Plan of Care 3

Introduction	3
--------------------	---

Malnutrition and Inflammation	7
-------------------------------------	---

Adult Malnutrition Characteristics and Assessment	8
---	---

General Considerations in Applying the Malnutrition Characteristics	13
---	----

Global Perspective on Malnutrition	13
--	----

Approach to Pediatric Malnutrition	15
--	----

Nutrition Support Care Plan	19
-----------------------------------	----

CHAPTER 2

Overview of Parenteral Nutrition 25

Introduction	25
--------------------	----

Routes of Infusion	27
--------------------------	----

Indications for PN	29
--------------------------	----

Specific Indications for PN in Pediatric Patients	35
---	----

Appropriate Use of PN	36
-----------------------------	----

Summary	37
---------------	----

CHAPTER 3

Parenteral Nutrition Access Devices 41

Introduction	41
--------------------	----

Physiologic Principles and Vascular Anatomy	44
---	----

Nomenclature: Peripheral vs Central Access	45
--	----

Peripheral Venous Catheters	47
-----------------------------------	----

Central Venous Access Devices	48
-------------------------------------	----

Assessment for Central Vascular Access	52
--	----

Enhancing the Safety of CVAD Insertion and Maintenance	55
--	----

Elements of CVAD Care	58
-----------------------------	----

Education and Engagement	64
--------------------------------	----

Quality Improvement	64
---------------------------	----

Summary	64
---------------	----

CHAPTER 4

**Parenteral Nutrition Formulations and
Managing Component Shortages 73**

Introduction	73
Formulation Components	73
PN Preparation	82
PN Product Shortages	84

CHAPTER 5

How to Prescribe Parenteral Nutrition Therapy 95

Introduction	95
PN Order Format	97
General Considerations for Nutrient Requirements	104
Sample Calculations	109

CHAPTER 6

**Review and Verification of Parenteral Nutrition Orders,
Preparing Parenteral Nutrition Formulations,
and Labeling 117**

Introduction	117
PN Order Review and Verification	117
PN Preparation	118
Stability and Compatibility of PN Formulations	127
Aluminum Contamination	131
Labeling PN Formulations	132

CHAPTER 7

**Parenteral Nutrition Administration
and Monitoring 141**

Introduction	141
Initiating PN	141
Timing of Nutrition Intervention	144
Recognizing Risk for Refeeding Syndrome	145
Frequency of Errors in Administration Phase of PN	146
System-Based Strategies for Enhancing PN Safety	147
Quality Improvement	151
Creating a Culture of Safety	152
Strategies to Prevent Errors When Initiating a PN Infusion	152

Preventing Errors During PN Administration	154
Medication Administration	159
Monitoring	160
Transitional Feeding and Discontinuing PN	164
Documentation	166
Summary	166

CHAPTER 8

Complications of Parenteral Nutrition173

Introduction	173
Macronutrient-Related Complications	173
Micronutrient-Related Complications	177
Refeeding Syndrome	179
Hepatobiliary Complications	180
Strategies to Manage PN-Associated Hepatobiliary Complications	184
Metabolic Bone Disease	187
Summary	193

CHAPTER 9

Competency in Parental Nutrition: Prescribing, Order Writing, and Administration199

Introduction	199
Competencies in PN Prescribing	199
Competencies for PN Order Review and Preparation	210
Competencies for PN Administration	217
Summary	229

CHAPTER 10

Medication-Related Interactions233

Introduction	233
Pharmaceutical Interactions	235
Pharmacokinetic Interactions	241
Pharmacodynamic Interactions	242
Administration-Related Factors	242
Formula-Related Factors	242
Disease-Related Factors	243

Medication Additives with PN	243
------------------------------------	-----

CHAPTER 11

Home Parenteral Nutrition Support 247

Introduction	247
Discharge Planning	250
Role of Nutrition Support Clinicians	256
Nutrition Care Plan	258
Patient Education	265
Clinical Monitoring in the Home	269
Emergency Planning	270
QOL, Outcomes Management, and Resources	271
Summary	273

CHAPTER 12

Multichamber-Bag Parenteral Nutrition Products 279

Introduction	279
Safety and Errors	281
Current Formulations	281
Determining Appropriateness	284
Summary	285

CHAPTER 13

Optimizing Electronic Health Records for Nutrition Care 287

Introduction	287
ASPEN Consensus Recommendations for EHR optimization	293
Summary	302

Appendix	307
----------------	-----

Index	311
-------------	-----