## ASPEN Fluids, Electrolytes, and Acid-Base Disorders Handbook

**SECOND EDITION** 

## EDITORS

Jeffrey J. Bruno, PharmD, BCPS, BCNSP, BCCCP, FCCM Nicki L. Canada, MS, RD, LD, CNSC Todd W. Canada, PharmD, BCNSP, BCCCP, FASPEN Anne M. Tucker, PharmD, BCNSP Joseph V. Ybarra, PharmD, BCNSP



## About ASPEN

The American Society for Parenteral and Enteral Nutrition (ASPEN) is a scientific society whose members are health care professionals; physicians, dietitians, nurses, pharmacists, other allied health professionals, and researchers; that envisions 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, aspen@nutritioncare.org.

Copyright 2020. American Society for Parenteral and Enteral Nutrition.

Print ISBN 978-1-889622-43-9 eBook ISBN 978-1-889622-44-6

**Suggested citation**: Bruno J, Canada N, Canada T, Tucker AM, Ybarra JV, eds. ASPEN Fluids, Electrolytes, and Acid-Base Disorders Handbook, Second 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.

## Contents

	Forewordvii
	Preface ix
	Editors xi
1	Regulation of Water and Electrolyte Balance $\ldots \ldots 1$
	Composition of Body Fluids 1
	Fluid Compartments
	Movement of Water and Solutes
	Serum Osmolality 4
	Regulation of ECF5
	Fluid Balance and Provision

l	2
[	
	~
ĺ	
l	
	~
l	0
l	3

2	Fluid Disorders
	Fluid Balance
	Fluid Disorders22
	Hypovolemia23
	Hypervolemia31
	Edematous States
3	Electrolyte Disorders
	Sodium
	Potassium76
	Magnesium101
	Calcium122
	Phosphorus142
4	Acid-Base Homeostasis and Disorders171
	Acid-Base Disorders175
	Respiratory Acid-Base Disorders
	Respiratory Alkalosis186
	Metabolic Acid-Base Disorders
	Metabolic Alkalosis197

v

5	Common Clinically Applicable Situations209
	Renal Failure209
	Hepatic Failure
	Gastrointestinal Disorders234
	Hyperglycemic Emergencies241
	Refeeding Syndrome
	Adrenal Insufficiency
6	Pediatric Considerations for Fluids, Electrolytes,
	and Acid-Base Disorders275
	Fluids Status and Requirements275
	Fluid Disorders276
	Electrolyte Balance
	Electrolyte Function and Requirements
	Electrolyte Disorders
	Acid-Base Homeostasis: Chloride and
	Bicarbonate
	Acid-Base Disorders
	Additional Considerations
	Index