

TABLE OF CONTENTS

Book 7

Preface	i
Editorial Board	ii
Book 7 Panel	iii
Disclosure of Potential Conflicts of Interest	ix
Continuing Education and Program Evaluation Instructions	x
Roles of ACCP and BPS	xiii

Gastroenterology I

VIRAL HEPATITIS

Learning Objectives	1
Introduction	1
History	1
Definitions of Acute and Chronic Hepatitis	1
Hepatitis A	1
Virology and Pathogenesis	1
Epidemiology and Risk Factors	2
Clinical Course and Clinical Manifestations	2
Diagnosis and Serological Testing	3
Managing of Hepatitis A	3
Preexposure Prophylaxis	4
Postexposure Prophylaxis	4
Hepatitis A Vaccine	4
Treatment	5
Hepatitis B	5
Virology and Serology	5
Epidemiology	6
Risk Factors	6
Natural History	6

Clinical Course and Clinical Manifestation	6
Diagnosis	7
Managing of Hepatitis B	7
Prevention	7
Hepatitis B Vaccine	7
Postexposure	8
Chronic Hepatitis B	9
Interferon	9
Lamivudine	9
Adefovir Dipivoxil	10
Recommendations for Treating HBeAg-positive CHB	11
Recommendations for Treating HBeAg-negative CHB	11
Investigational Drugs for CHB	12
Entecavir	12
Clevudine	12
Emtricitabine	13
Telbivudine	13
Pegylated Interferons	13
Hepatitis C	13
Virology and Pathogenesis	14
Epidemiology and Risk Factors	14
Natural History	14
Clinical Course and Clinical Manifestation	14
Diagnosis and Serological Testing	15
Managing Hepatitis C	15
Prevention	15
Treating Hepatitis C	16
HIV/HCV Coinfection	18
Treating Recurrent HCV after Liver Transplantation	18
Treating Nonresponders	19
Treatment Duration for Hepatitis C	20
Side Effects Associated with HCV Therapy and Management	20
Flu-like Symptoms	20
Psychological Symptoms	20
Hematological Adverse Effects	20

Anemia	20
Neutropenia	21
Thrombocytopenia	21
Other Adverse Effects	22
Contraindications and Warnings	22
Role of the Pharmacist in Treating Chronic	
Hepatitis C	22
Investigational Drugs for Chronic Hepatitis C	22
Viramidine	22
Merimepodib	22
Thymosin Alpha 1	23
Therapeutic Vaccine	23
Hepatitis D	23
Virology and Pathogenesis	23
Epidemiology	23
Diagnosis, Clinical Course, and Clinical	
Manifestation	23
Managing Hepatitis D	24
Prevention	24
Treating Hepatitis D	24
Hepatitis E	24
Virology and Pathogenesis	24
Epidemiology	24
Diagnosis, Clinical Course, and Clinical	
Manifestation	25
Managing Hepatitis E	25
Conclusion	25
Annotated Bibliography	25
Self-Assessment Questions	27

**GASTROINTESTINAL COMPLICATIONS
IN THE INTENSIVE CARE UNIT**

Learning Objectives	33
Introduction	33
Pathophysiology	33
Gastrointestinal Motility	33
Gastrointestinal Secretion	34
Gastrointestinal Mucosal Perfusion	34
Clinical Considerations for Drug Administration	34
Diagnostic Considerations	35
Radiocontrast Media	35
Oral Radiocontrast Agents	35
Intravenous Radiocontrast Agents	35
Radiocontrast Media	35
Drugs to Avoid	36
Selecting a Radiocontrast Agent	36
Imaging Studies	36
Endoscopy	37
Laparoscopy and Surgical Interventions	37
Clinical Monitoring	37
Gastric pH	37
Gastric Tonometry	37
Alterations in GI Motility	38
Gastrointestinal Hypomotility	38
Causes	38
Pharmacist Involvement	38

Measurements of Intestinal Transit and Motility	38
Gastric Emptying	38
Scintigraphy	38
Acetaminophen Absorption Model	39
Carbon Radioisotopes	39
Manometry	39
Small Intestinal Transit	39
Overview	39
Intolerance to Enteral Feeding	39
Causes	39
Prokinetic Drugs	40
Selection	40
Non-pharmacological Strategies	40
Feeding Tube Placement	40
Ileus	41
Causes	41
Complications	41
Management	41
Acute Intestinal Pseudo-obstruction	41
Management	42
Mechanical Bowel Obstruction	42
Causes	42
Complications	42
Management	42
Constipation	42
Causes	42
Prevention	43
Management	43
Laxative Agents	43
Diarrhea	43
Secretory Diarrhea	43
<i>Clostridium difficile</i> Colitis	43
Causes	43
Laboratory Evaluation	44
Treatment	44
Antibiotic-associated Causes of Diarrhea	44
Probiotic Organisms	44
Exudative, Osmotic, and Altered-transit Diarrhea	44
Management	44
Postoperative Nausea and Vomiting	45
Incidence and Risk Factors	45
Complications	45
Pathophysiology	45
Drug Prophylaxis	45
Rescue Treatment	46
Pharmacist Involvement	46
Stress-related Mucosal Disease	46
Introduction	46
Definition of Clinically Significant Bleeding	46
Pathophysiology	47
Risk Factors for GI Bleeding in ICU Patients	47
Impact of Enteral Nutrition	47
Pharmacological Approach	48
Sucralfate	48
Histamine-2 Receptor Antagonists	48
Proton-pump Inhibitors	48

Tolerance	49
Nosocomial Pneumonia	49
Comparison of Stress Ulcer Prophylaxis Drugs	50
Treatment Recommendations	50
Economic Considerations	51
Upper GI Bleeding	51
Variceal Upper GI Bleeding	51
Pathophysiology	51
Primary Prophylaxis	51
Acute Management	51
Octreotide	52
Antibiotic Drugs	52
Prevention of Variceal Rebleeding	52
Pharmacological Options	52
Nonvariceal Upper GI Bleeding	53
Introduction	53
Risk Factors for GI Rebleeding and Mortality	53
Acute Management	53
Preventing Peptic Ulcer Rebleeding	53
Potential Therapies for GI Rebleeding Prevention	53
Octreotide	53
Histamine-2 Receptor Antagonists	54
Proton-pump Inhibitors	54
Comparison of Antisecretory Drugs for Recurrent Bleeding Prevention	54
Economic Considerations	55
Development of Treatment Guidelines	56
Severe Intra-abdominal Infections	56
Pathophysiology	56
Classification	56
Primary Peritonitis	56
Secondary Peritonitis	56
Tertiary Peritonitis	57
Gastrointestinal Microflora and Microbiology	57
Treatment	57
Non-pharmacological	57
Pharmacological	58
Acute Management	58
Vasopressors	58
Antimicrobial Drug Therapy	58
Irrigation Solutions	58
Controversies	59
Therapy Duration	59
Utility of Intra-abdominal Cultures	59
Summary	59
Annotated Bibliography	59
Self-Assessment Questions	61

Gastroenterology II

INFLAMMATORY BOWEL DISEASE

Learning Objectives	69
Introduction	69
Pathophysiology of IBD	69
Definitions	69
Epidemiology	70

Etiology	70
Genetic Influences	70
Environment Influences	70
Immunologic Influences	70
Clinical Characteristics and Complications	71
Ulcerative Colitis	71
Clinical Manifestations of UC	71
Complications of UC	71
Crohn's Disease	72
Clinical Manifestations of CD	72
Complications of CD	72
Diagnostic Approach and Tools	73
Patient-based Questionnaires	74
Disease Progression	74
Ulcerative Colitis	74
Crohn's Disease	75
Therapeutic Goals and Outcomes	75
Quality Patient Care	75
Pharmacotherapy	75
Treatment of UC	78
Proctitis	78
Left-sided Colitis	78
Pancolitis	79
Fulminant Colitis	79
Surgical Intervention	79
Refractory UC	79
Alternative Therapies for UC	79
Nicotine	79
Infliximab	80
Treatment of CD	80
Crohn's Ileitis	80
Peritonitis	81
Ileocolitis	81
Refractory Disease	81
Fistulae	82
Postoperative Recurrence	82
Adjunctive Therapies for IBD	82
Antidiarrheal Drugs	83
Psychotropic Drugs	83
Fish Oil	83
Probiotics	83
Nutritional Considerations	83
Issues in Special Patient Populations	84
Reproductive Health	84
Pediatric and Adolescent Patients	84
Investigational and Alternative Therapies for IBD	84
Budesonide	85
Anti-integrin Antibodies	85
Thalidomide	85
Additional Anti-TNF Antibody Therapies	85
Growth Hormone	85
Antimycobacterial Therapy	85
Monitoring	86
System Support for Drug Use Process	86
Documentation	86
Patient Education	87

Patient Support	87
Economics	87
Quality Improvement	88
Conclusion	88
Annotated Bibliography	88
Self-Assessment Questions	91

SHORT BOWEL SYNDROME

Learning Objectives	95
Introduction	95
Pathophysiology	95
Duodenum	96
Jejunum	96
Ileum	96
Ileocecal Valve	97
Colon	97
Diagnosis and Management	98
Therapeutic Goals and Outcomes	98
Acute Phase	98
Nutrition	98
Monitoring	100
Adaptation Phase	100
Nutrition	100
Trophic Factors	101
Maintenance Phase	102
Patient Education	102
Early Complications	103
Fluids and Electrolytes	103
Vitamins and Minerals	103
Diarrhea	104
Hypergastrinemia	106
Central Venous Catheter-related Complications	106
Late Complications	106
Hyperoxaluria	106
Cholelithiasis	107
D-Lactic Acidosis	107
Liver Disease	109
Other Complications	109
Surgery	109
Nontransplant Surgery	109
Transplant Surgery	109
Stoma Management	110
Skin Care	110
Complications	111
Psychosocial Concerns	111
Pharmacists' Role	111
Conclusion	112
Annotated Bibliography	112
Self-Assessment Questions	113

NSAID-INDUCED GASTROPATHY

Learning Objectives	117
Introduction	117
Pathogenesis	117
Risk Factors	119
Aspirin as a Risk Factor	120

<i>Helicobacter pylori</i> as a Risk Factor	120
Treating and Preventing NSAID-induced	
Gastropathy	121
General Management Strategies	121
Pharmacological Options	122
Antacids and Sucralfate	122
Misoprostol	122
Antisecretory Drugs	123
Drugs Targeting COX-2	124
Comparing COX-2 Inhibitors and PPIs	126
Recommendations for Pharmacological	
Management	126
Patients With No Risk Factors	126
Patients With Two or More Risk Factors	126
Patients Receiving Aspirin	127
Comparative Non-gastrointestinal Toxicity	
of NSAIDs and COX-2 Inhibitors	127
Renal and Hemodynamic Effects	127
Cardiovascular Effects	128
Pharmacoeconomic Aspects of Treating and	
Preventing NSAID-Induced Gastropathy	130
Conclusion	131
Annotated Bibliography	132
Self-Assessment Questions	135

Nutrition I

NUTRITION MANAGEMENT IN THE INTENSIVE CARE UNIT

Learning Objectives	141
Introduction	141
Malnutrition in the Intensive Care Unit	141
Nutrition Support Goals	141
Physiological Changes	141
Starvation	141
Critical Illness	142
Ebb and Flow Physiology	142
Protein Metabolism	142
Carbohydrate Metabolism	142
Lipid Metabolism	142
Fluid Changes	143
Electrolyte Changes	143
Nutritional Assessment	143
Clinical Assessment	143
Weight History	143
Clinical History and Physical Examination	143
Bowel Function	143
Injury and Illness Type and Severity	143
Laboratory Assessment	144
Serum Proteins	144
Albumin	144
Prealbumin	144
Retinol-binding Protein	144
Transferrin	144
Nutritional Requirements	144
Energy Requirements	144

Predictive Equations	144
Harris-Benedict Equations	144
Ireton-Jones Equations	145
Other Equations	145
Weight-based Estimates	145
Indirect Calorimetry	146
Protein Requirements	146
Weight Determination	146
Nitrogen Balance	146
Fluid Requirements	147
Electrolyte Requirements	147
Vitamin and Trace Element Requirements	147
Nutritional Intervention	147
Timing of Intervention	147
Route of Intervention	148
Physiology	148
Clinical Studies Comparing EN to PN	148
Enteral Nutrition	149
Enteral Access	149
Enteral Administration Techniques	149
Enteral Formula Selection	150
Immune-enhancing Formulations	150
Arginine	150
Glutamine	150
Complications of EN	150
Mechanical Complications	150
Infectious Complications	151
Underfeeding and Therapy Interruptions	151
Feeding Protocols	151
Diarrhea	151
Delayed Gastric Emptying	151
Prokinetic Drugs	152
Postpyloric Tube Placement	152
Parenteral Nutrition	152
Parenteral Access	152
Administering PN	152
Complications of PN	152
Metabolic Complications	152
Overfeeding	152
Overfeeding Protein	152
Overfeeding Carbohydrates and Hyperglycemia	152
Overfeeding Lipid	153
Refeeding Syndrome	153
Monitoring Nutrition Support	153
Monitoring for Effectiveness	153
Monitoring for Complications	153
Specific Disease States	154
Burns	154
Postresuscitation EN (Timing, Complications, and Overall Need for PN)	155
Trauma	155
Acute Lung Injury and Acute Respiratory Distress Syndrome	155
Conclusion	156
Annotated Bibliography	156
Self-Assessment Questions	159

CHRONIC PARENTERAL NUTRITION-ASSOCIATED METABOLIC COMPLICATIONS	
Learning Objectives	163
Introduction	163
Liver Complications	163
Cholestasis	163
Etiology and Predisposing Factors	164
Biochemical Abnormalities	164
Clinical Symptoms	164
Management	164
Non-pharmacological Approaches	164
Pharmacological Approaches	164
Ursodiol	164
Sincalide	165
Oral Antibiotic Drugs	165
Cholestyramine	165
Enzyme Inducers	165
Cholelithiasis	165
Etiology and Predisposing Factors	165
Management	166
Hepatic Steatosis	166
Etiology	166
Dextrose	166
Lipid Emulsions	166
Choline Deficiency	166
Carnitine Deficiency	166
Signs and Symptoms	166
Management	167
Metabolic Bone Disease	167
Etiology	167
Calcium and Phosphorus Deficiencies	167
Calcium and Phosphorus Intake	167
Amino Acids and Hypercalciuria	167
Metabolic Acidosis and Calcium Deficiency	167
Parenteral Nutrition Cycling and Hypercalciuria	167
Aluminum Toxicity	168
Vitamin D	168
Signs and Symptoms	168
Management	168
Trace Mineral Abnormalities	169
Manganese	169
Manganese Toxicity	169
Management	170
Copper	170
Copper Deficiency	170
Management	170
Zinc	170
Zinc Deficiency	170
Management	170
Selenium	170
Selenium Deficiency	171
Management	171
Iron	171
Iron Deficiency	171
Management	171

Electrolyte Abnormalities	171
Sodium	172
Hyponatremia	172
Hypernatremia	172
Potassium	172
Hypokalemia	172
Hyperkalemia	173
Magnesium	173
Hypomagnesemia	173
Hypermagnesemia	173
Phosphorus	173
Hypophosphatemia	173
Hyperphosphatemia	174
Calcium	174
Hypocalcemia	174
Hypercalcemia	174
Chloride and Acetate	174
Conclusion	174
Annotated Bibliography	175
Self-Assessment Questions	177

Indications for Parenteral Nutrition	193
Role of Exogenous Pancreatic Enzyme	
Supplementation in Chronic Pancreatitis	194
Therapeutic Goals and Desired Outcomes in Acute and Chronic Pancreatitis	195
Conclusion	195
Annotated Bibliography	195
Self-Assessment Questions	197

Nutrition II

NUTRITIONAL MANAGEMENT IN ACUTE AND CHRONIC PANCREATITIS

Learning Objectives	183
Introduction to Acute and Chronic Pancreatitis	183
Epidemiology of Acute and Chronic Pancreatitis	183
Classifying and Diagnosing Pancreatitis	183
Etiology and Clinical Manifestations of Pancreatitis	185
Nutritional Pathophysiology in Pancreatitis	185
Nutritional Pathophysiology in Acute Pancreatitis	185
Nutritional Pathophysiology in Chronic Pancreatitis	186
Physiology of Exocrine Pancreatic Function	187
Nutritional Assessment in Acute Pancreatitis	187
Macronutrient Requirements in Severe Acute Pancreatitis	187
Protein	187
Carbohydrate	188
Lipid	188
Role of Nutrition Support Therapy in Severe Acute and Chronic Pancreatitis	189
Role of Nutrition Support in Mild Acute Pancreatitis	189
Role of Nutrition Support in Severe Acute Pancreatitis	189
Role of Nutrition Support in Chronic Pancreatitis	190
Indications for EN	190
Selecting EN Formulas	191
Selecting EN Formulas in Acute Pancreatitis	191
Selecting EN Formulas in Chronic Pancreatitis	191
Optimal EN Feeding Tube Placement	192

OVERWEIGHT AND OBESITY

Learning Objectives	201
Introduction	201
Definitions	201
Epidemiology	201
Adults	201
Children and Adolescents	202
Diagnosis and Patient Assessment	202
Pathophysiology	203
Energy Balance	203
Genetics and Chemical Mediators of Weight Regulation	204
Environmental Factors	204
Relationship of Obesity to Other Disorders	205
Introduction	205
Mortality	205
Cardiovascular Disease	206
Type 2 DM	206
Cancer	206
Other Disorders	206
Treatment Goals	207
Weight Loss	207
Weight Maintenance	207
Quality of Life/Functional Status	207
Non-pharmacological Therapy	207
Diets to Induce Weight Loss	207
Traditional Low-calorie, Low-fat Diets	207
Very Low-calorie Diets	208
Low-carbohydrate Diets	208
Other Diets	209
Commercial Weight Loss Programs	209
Meal Replacement Therapy and Structured Meal Plans	209
Fat Substitutes	209
Sugar Substitutes	209
Physical Activity	210
Behavioral Therapy	210
Pharmacological Therapy	210
Nonprescription Therapy	210
Over-the-counter Drugs	210
Dietary Supplements	211
Prescription Therapy	211
History and Present Usage	211
Orlistat	212
Sibutramine	213
Unlabeled Drugs	215
Investigational Drugs	216

Surgical Therapy	.216
Treatment Plan	.217
Economic Issues	.219
Quality of Life Issues	.219
Pharmacists' Role	.219
Conclusion	.219
Annotated Bibliography	.219
Self-Assessment Questions	.223

**SPECIAL CHALLENGES IN PEDIATRIC
NUTRITION: CLINICAL ISSUES AND
COMPOUNDING CONSIDERATIONS**

Learning Objectives	.227
Introduction	.227
Essential Fatty Acid Deficiency	.227
Patient Populations at Risk	.228
Consequences of EFAD	.228
Signs and Symptoms of EFAD	.228
Treatment Options	.229
Nutritional Issues in CHD	.231
Growth Failure	.231
Causes of Growth Failure	.231
Nutritional Assessment	.232
Energy Requirements	.232
Feeding Options	.232
Enteral Nutrition	.232
Parenteral Nutrition	.233
Special Conditions	.233
The Ketogenic Diet	.233
Mechanism of Action	.234
Other Indications	.234
Contraindications	.234
Initiation and Maintenance of the Diet	.235
Monitoring	.235
Effectiveness of the Diet	.235
Drug Use	.235
Intercurrent Illness	.236
Complications	.236
Discontinuing the Diet	.236
Protective Nutrients and Functional Foods	.237
Probiotics	.237
Rationale for Use	.238
Indications	.238
Product Concerns	.239
Prebiotics	.239
Amino Acids	.239
Glutamine	.239
Glutamine Research	.240
Arginine	.240
Summary	.241
Current Controversies in PN Preparation	.241
Aluminum	.241
Aluminum Toxicity	.241
Diagnosis	.242
Treatment	.242
Food and Drug Administration Mandate	.242

Patient Populations at Risk	.242
Calculating the AI Load in PN	.242
Di-(2-ethylhexyl) Phthalate Toxicity	.242
Adverse Effects Associated with DEHP	.243
Patient Populations at Risk	.243
Methods to Limit DEHP Exposure	.243
Photodegradation	.243
Methods to Minimize Peroxidation	.244
Conclusion	.244
Annotated Bibliography	.244
Self-Assessment Questions	.247