Contents

Section 1: Basics of Clinical Nutrition

1. **Nutritional Assessment and Techniques Used in Nutritional Assessment** **3**
   Daniella Bear
   - Nutrition Screening *3*
   - Nutrition Assessment *4*
   - Calculation of Energy and Protein Targets *6*

2. **Pathophysiology of Malnutrition, Starvation, Metabolic Derangements in Diseased (Simple Starvation, Stress Starvation Malnutrition and the Response to Injury)** **9**
   Mirey Karavetian
   - Relationship between Malnutrition and Inflammation *9*
   - Effect of Starvation on Metabolic and Nutritional Status *10*
   - Refeeding Syndrome *12*

3. **Need of Artificial Nutrition Support (Common Indications of Nutritional Support According to Healthcare Setting and Disease)** **14**
   Mirey Karavetian
   - Contraindication to Feeding *14*
   - Choosing the Correct Route of Feeding According to Disease State *14*
   - Complementary Feeding *16*
   - Ethical Considerations *17*

Section 2A: Modes of Nutritional Support: Enteral Nutrition Support

4. **Indications, Contraindications and Routes for Enteral Tube Feeding and Methods of Delivering Enteral Nutrition (Transnasal Access, Endoscopic Access: PEG, PEG-J and D-PEJ, Surgical Access: Gastrostomy, Needle Catheter Jejunostomy)** **21**
   Subhash Todi
   - Indications *21*
   - Contraindications *23*
   - Routes *23*

5. Choice of Feeding Solutions and Diets for Enteral Nutrition: Scientific Formulae and Home Made Enteral Nutrition **26**

Harita Shyam

- Enteral Formula and Appropriateness of Usage *26*
- Standard Formulae *27*
- Diabetes Mellitus/Glucose Intolerance Formulae *27*
- Renal Formulae *27*
- Hepatic Formulae *28*
- The Case of Blenderized Tube Feeds When to Use Them *28*

6. Complications of Enteral Nutrition (Gastrointestinal Complications, Mechanical Complications, Metabolic Complications) **31**

Neetu Jain

- Gastrointestinal Complications *31*
- Mechanical Complications *32*
- Metabolic Complications *34*

Section 2B: Modes of Nutritional Support: Parenteral Nutrition

7. Indications and Contraindications of Parenteral Nutrition **39**

John F Stover

- Starting Parenteral Nutrition *39*
- Administering Parenteral Nutrition *41*
- Manufactured Versus Compounded *43*

8. Methods of Delivering Parenteral Nutrition (Peripheral Parenteral Nutrition, Central Parenteral Nutrition) **44**

Subhal Dixit, Khalid Khatib

- Peripheral PN *44*
- Complications *44*
- Central PN *44*

9. Different Systems for Parenteral Nutrition (Multiple Bottle System, All-in-One System) **47**

Subhal Dixit, Sadanand Kulkarni, Sunil Honkals, Khalid Khatib

- Systems for Parenteral Nutrition *47*
- Single Bottle System *47*
- Multi Chamber Bags (All-in-One bags) *48*
- Advantages of Lipids in 3CBs *49*

10. Planning of Parenteral Nutrition **51**

Rajesh Pande, Rajesh Kumar Phulara, Anjana Misri Raina, Maitree Pandey

- Indications *51*
- Assessment *52*
- Route of Administration *54*
- Composition of PN Mixture *54*

- Dose *54*
- Requirements of Individual Components *56*
- Complications of Parenteral Nutrition *58*

11. Parenteral Nutrition Formulae **63**

Pravin Amin

- All-in-one Systems *63*
- Lipid Emulsions in Parenteral Nutrition Solutions *65*

12. Complications of Parenteral Nutrition **67**

Pravin Amin

- Vascular Access Related Complications *67*
- Infectious Complications *68*
- Metabolic Complications *68*
- Refeeding Syndrome *70*
- Metabolic Bone Disease *71*

Section 3: Monitoring of Nutritional Support, Enteral and Parenteral

13. Monitoring of Nutritional Support, Enteral and Parentral: Clinical and Laboratory **77**

Anshu Joshi

- Monitoring of Nutrition Intervention *77*

Section 4: Nutritional Support in Different Clinical Situations

14. Perioperative Nutritional Support **85**

Ravinder Reddy, Kamala Devi Anagani

- Metabolic Response *85*
- Rationale for Perioperative Nutrition *86*

15. Nutritional Support in Wound Healing **91**

Ravinder Reddy, Dilip Shiva Naga Sai Barji, Atiqur Rehman Shaik

- Types of Wounds *91*
- Phases of Healing *91*
- Nutrients in Wound Healing *93*

16. Nutritional Support in Critically Ill Medical Patients **97**

Sanjith Saseedharan

- Assessment of Nutritional Status *97*
- Calculation of Nutritional Requirements *98*
- Initiation of Feeding *99*
- Complications of Feeding *100*
- Monitoring of Nutrition *101*
- Nutrition in Special Medical Situations *101*

17. Nutritional Support in Sepsis **105**

Shirish Prayag, Subhal Dixit, Khalid Khatib

- Screening for Malnutrition Risk *105*
- Estimation of Nutritional Requirements *106*
- Route of Nutritional Support Delivery *107*
- Role of Gastric Residual Volumes, Postpyloric Feeding and Prokinetics *108*
- Role of Vitamins/Micronutrients *109*

18. Nutritional Support in Trauma **111**

Sushma Patil, Kapil Zirpe

- Evidence for: Why Nutrition Needed? *111*
- Overview of Nutritional Support in Trauma *111*
- Other Points to be Considered *112*
- Calculation of Energy Requirement *113*
- Prescription for Nutrition Therapy *113*
- Nutrition Status Assessment *113*
- Timing: Early Versus Delayed *114*
- Position of Patient *114*
- Route of Nutrition Support: EN Versus PN *114*
- Dosing of Enteral Nutrition *114*
- Standard Formulae Versus Immune-enhancing Formulae *114*
- Nasogastric Feeding Versus Non-nasogastric Feeding *115*
- Trace Elements *115*
- Blood Glucose Control *115*
- Assessing Nutritional Adequacy of Patients *115*
- Troubleshooting *116*
- Nutrition Therapy in Patients Undergoing Damages Control Laparotomy *116*
- Assessment of swallowing *116*

19. Nutritional Support in Burns **118**

Sunitha Varghese

- Background *118*
- Pathophysiology of Burns *118*
- Nutritional Assessment *119*
- Estimation of Energy Requirement *120*
- Protein Requirements *121*
- Carbohydrate Requirements and Glycemic Control *121*
- Fat Requirements *122*
- Micronutrient Requirements *122*
- Metabolic Modulation *123*
- Timing of Nutritional Support *123*
- Routes of Nutrition: Parenteral Versus Enteral *124*
- Overfeeding *124*
- Monitoring of Nutritional Support *125*

20. Nutritional Support in IBD (Inflammatory Bowel Disease) 126
Parimal Lawate
- Causes of Malnutrition in IBD *126*
- Consequences of Malnutrition in IBD *126*
- Assessment of Malnutrition in IBD *127*
- Nutritional and Dietary Interventions in IBD *128*
- Routes of Nutrition *128*

21. Nutritional Support in Liver Disease and Liver Transplant 132
Ajeet Singh, Shrinivas Shrikantan, Ashish Srivastava
- Etiology and Pathophysiology *132*
- Metabolic Changes in Liver Disease *132*
- Nutritional Status Assessment *135*
- Nutrition Recommendation/Treatment *136*
- Nutritional Therapy in Liver Transplant Patients *138*

22. Nutritional Support in Renal Disease 144
Arun Tirlapur, Shweta Patel
- Nutritional Assessment in Patients with Kidney Disease *144*
- Nutrition in Chronic Kidney Disease-predialysis Patient *146*
- Nutrition in Chronic Hemodialysis Patients *150*
- Nutritional Interventions in Patients on Hemodialysis *151*
- Nutrition in Peritoneal Dialysis Patients *152*
- Nutritional Support in Kidney Transplant Recipients *153*
- Nutritional Support in AKI in Critically Ill Patietnts *154*

23. Nutritional Support in Pulmonary and Cardiac Disease 157
Sandesh Kumar KJ, Sweta Patel, Deepak Govil
- Cardiac Disease *157*
- Pulmonary Disease *157*

24. Nutritional Support in Acute and Chronic Pancreatitis 162
Shilpa Rao
- Assess Nutrition *162*
- Planning and Execution *163*
- Interim Review *164*
- Treatment Additionally Required *165*

25. Nutritional Support in Gastrointestinal Fistulas 167
Rajeev Joshi, Arka Banerjee, Anand Dugad
- Classification *167*
- Pathophysiology *168*
- Principles of Management *168*
- Nutritional Management *169*
- Surgical Management *171*

26. Nutritional Support in Extensive Gut Resection **173**
Mukund Joshi, Khalid Khatib, Subhal Dixit
- Requirement of Nutrients *173*
- Nutritional Therapy *174*
- Treatment of Diarrhea *175*
- Individualized Approach to Nutritional Therapy *175*

27. Nutritional Support in Bariatric Surgery **177**
Aparna Govil, Mariam Lakdawala, Miloni Sancheti
- Preoperative Evaluation and Preparation Before Bariatric Surgery *177*
- Physiological Changes Brought About by Common Bariatric Procedures and their Effect on Nutrient Absorption *179*
- Postoperative Diet and Lifestyle Modification *181*
- Postoperative Nutritional Supplementation and Treatment of Deficiencies *181*
- Nutritional Deficiencies and their Management *183*
- Common Nutritional Concerns Faced by the Patients Post Bariatric Surgery *183*

28. Nutritional Support in Elderly **188**
Khalid Khatib, Subhal Dixit
- Estimation of Nutritional Requirements *188*
- Assessment of Nutritional Status *189*
- Management of Malnutrition in the Elderly *189*

29. Nutritional Support in Cancer Patients (Surgical Patients, Cancer Cachexia) **193**
Mohandas KM
- Cancer Related Malnutrition *193*
- Cancer Cachexia *194*
- Early Screening and Diagnosis *195*
- Initiating Nutrition Support *196*
- Nutritional Support During Cancer Surgery *197*

30. Nutritional Support in AIDS **199**
Khalid Khatib, Subhal Dixit
- Nutritional Prescription of PLHIV *199*
- Principles and Methods of Nutrition Delivery *200*

31. Nutritional Support in Pregnancy **202**
Sunil Pandya, Praveen Kumar, Latha Sashi
- Physiological Changes in Pregnancy *202*
- Metabolic and Adaptive Changes *203*
- How to Calculate Nutritional Assessments? *206*
- Carbohydrates *207*
- Proteins *208*
- Lipids *208*
- How to Monitor Nutritional Response? *209*
- Disease Specific Nutrition *209*

32. Nutritional Support in Neurological Disorders **213**
Kapil Zirpe, Anshu Joshi
- Nutrition in Stroke *213*
- Nutrition in Traumatic Brain Injury (TBI) *214*
- Nutrition in Motor Neuron Diseases *216*

33. Nutritional Support in Diabetic Patients **218**
GC Khilnani, Avneet Kumar, Pawan Tiwari
- Oral Nutritional Support *219*
- Enteral Nutrition *219*
- Parenteral Nutrition *220*
- Pharmacologic Management of Hyperglycemia in Critically ill Patients Receiving Nutritional Support *221*

34. Home Artificial Nutrition (Enteral and Parenteral) **223**
Yash Javeri, Amit Singh
- Prerequisite to Start Home Artificial Nutrition *223*
- Home Enteral Nutrition *223*
- Home Parenteral Nutrition *228*
- Nutritional Support Team *232*

35. Nutrition Support in Nonsurgical Oncology **233**
Amit Bhat, Anantbhushan Ranade
- Nutritional Assessment *233*
- Use of Enteral Nutrition *234*
- Use of Parenteral Nutrition *235*
- Home Artificial Nutrition and Palliative Care *235*
- Special Substrates *236*
- Salient Summary Points *236*

Section 5: Organization of Nutritional Care

36. Policy, Standards and Protocols **241**
Sadanand Kulkarni
- Policy, Standards and Protocols *241*
- The Hospital Nutrition Steering Committee *241*
- Nutrition Screening *242*

37. Education and Training **245**
Sadanand Kulkarni
- Other Healthcare Professionals *246*
- What Can be Done for Other Healthcare Professionals? *246*

38. Nutritional Support Teams **248**
Sadanand Kulkarni
- Establishment of a Nutrition Support Team *248*

Section 6: Special Substrates

39. Antioxidants in Critical Care Nutrition: Enteral and Parenteral **255**
GC Khillnani, Hariharan Iyer, Pawan Tiwari
- Antioxidants *255*
- Current Evidence and Recommendations *260*
- Conclusion and Future Perspectives *260*

40. Polyunsaturated Fatty Acids and Omega 3 Fatty Acids **262**
Sonia Cabral
- PUFAs *262*
- N-3 Fatty Acids *264*
- PUFAs and N-3 Fatty Acids in Clinical Practice *265*
- Surgery *265*

41. Immunonutrition: Glutamine and Arginine **268**
Ravinder Reddy, Niyoti Reddy
- Glutamine *268*
- Arginine *270*

Section 7: Trace Elements, Vitamins and Micronutrients in Parenteral and Enteral Nutrition

42. When to Start Parenteral Micronutrients? **275**
Wouter Vankrunkelsven, Michael P Casaer
- Why? *275*
- Who? *276*
- How? *277*

Section 8: Technology and Software in Nutrition

43. Role of Technology and Softwares in the Management of Critically Ill Patient **283**
Sanjeet Saseedharan, Rashmi Phalnikar
- Critical Care Nutrition in Indian Intensive Care Units *283*
- Application of Technology in Improving Nutrition Care *284*
- Future of Nutritional Care *288*

Index *291*