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Diet and Nutrition in Critical Care

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Editors

Diet and Nutrition in Critical Care

With 413 Figures and 548 Tables

 Springer Reference

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Preface

Patients in need of critical care require expert holistic attention from physicians, surgeons, microbiologists, hematologists, clinical biochemists, pathologists, nurses, physiotherapists, and other medical specialties. Management of the dietary and nutritional needs of these patients is crucial, and the evidence-based input of specialists in nutrition and dietetics is central to their care. It is well recognized that malnourished patients spend longer in hospital and have more interventions and higher rates of mortality and comorbid conditions than their well-nourished counterparts. Some illnesses will cause frank malnutrition, which will exacerbate the illness and impede recovery. However, the remedy is not just “feeding” or the use of standard (*off-the-shelf*) enteral or parenteral solutions. There is a tremendous amount of scientific information relating to the requirements of the critically ill. Depending on the medical condition, some patients may be refractory to nutritional support for a number of reasons. Specific diseases or trauma may require specific treatments or nutrients that may not be applicable to other conditions. On the other hand, some specific protocols may be equally applicable across a wide range of conditions. Thus, the positive outcomes from one well-planned and scientifically sound study may be applicable to other medical conditions. In its purest form, evidence-based clinical practice demands that these studies should be repeated in each specific disease before widespread application. In some cases, treatments may only be at the preclinical stage.

Finding all the information necessary to treat or meet the nutritional requirements of patients who are severely ill or establish new protocols has hitherto been problematic. This is addressed in *Diet and Nutrition in Critical Care*. This book encapsulates the treatments and procedures to meet the dietary and nutritional needs of the critically ill. Preoperative conditions and their connections to diet and nutrition are also described.

Frequently, the term *critical care* is used interchangeably with *intensive care*, though essentially this book deals with nutrition in those who are seriously ill. The division between the varying severities of illness and the placement of patients within different therapeutic units is bridged by the inclusion of a specific section within each chapter entitled *Applications to Critical or Intensive Care*. Furthermore, slightly different precautions, innovations, success rates, and outcome measures may apply to illnesses where different conditions (e.g., cancer versus sepsis), organs (e.g., liver versus kidney), or population groups (e.g., young versus old) may be affected.

The section *Applications to Other Conditions* addresses this too. Thus, *Diet and Nutrition in Critical Care* provides information that covers all manner of conditions that may arise in the critical care setting with its unique sections.

We are also mindful that great advances in enteral and parenteral nutrition have been made via preclinical studies. For example, some of the pioneering studies on branched-chain amino acids involved measuring protein synthesis in incubated muscles in vitro. Later, studies were carried out on perfused hemicorpus skeletal muscle preparations, which were followed by measurements in intact laboratory animals in vivo. Such transitions ultimately aid the patient or provide detailed insights into the mechanisms whereby treatment regimens exert their effect. Thus, this book contains information or chapters on novel therapeutic treatments at various stages of preclinical development.

Diet and Nutrition in Critical Care addresses the needs of all those concerned with diet and nutrition in the critically ill. The subject matter is covered as per the following main aspects:

General Aspects

Enteral Aspects

Parenteral Aspects

Accordingly, the sections in this title are as follows:

General Aspects: General Conditions in the Severely Ill

General Aspects: Screening, Assessments, Requirements, and Protocols

General Aspects: Nutritional Aspects in Specific Conditions and Scenarios

General Aspects: Nutritional Aspects in the Young

General Aspects: Specific Nutrients and Components

General Aspects: Adverse Aspects, Outcomes, and Considerations

General Aspects: Preclinical Studies

General Aspects: Electronic and Published Resources

Enteral Aspects: General Information, Overviews, and Methods

Enteral Aspects: Specific Nutrients and Formulations

Enteral Aspects: Specific Conditions

Enteral Aspects: Adverse Aspects and Outcomes

Enteral Aspects: Parenteral and Enteral Support

Enteral Aspects: Preclinical Studies

Parenteral Aspects: General Information, Overviews, and Methods

Parenteral Aspects: Specific Nutrients and Formulations

Parenteral Aspects: Specific Conditions

Parenteral Aspects: Adverse Aspects and Outcomes

Parenteral Aspects: Enteral and Parenteral Support

Parenteral Aspects: Preclinical Studies

The Editors recognize the limitations in simplistic divisions, and there is always difficulty in categorizing protocols or treatment regimens. For example, some regimens involve transitions from one feeding protocol to another. Furthermore, while some chapters may be headed with the term “enteral,”

they may also contain information relating to parenteral nutrition and visa versa. Thus, some chapters can be adequately assigned to more than one section.

The chapters have the following features in addition to the main text:

Abstract

Applications to Critical or Intensive Care

Applications to Other Conditions

Guidelines and Protocols

Summary Points

The contributors are authors of international and national standing, leaders in the field, and trendsetters. Emerging fields of science and important discoveries relating to artificial support will also be incorporated in *Diet and Nutrition in Critical Care*. This represents a one-stop shop of material related to general nutrition and enteral and parenteral support and is essential reading for those specializing in intensive and critical care, dietitians, nutritionists, gastroenterologists, pharmacologists, health care professionals, research scientists, biochemists, general practitioners, as well as those interested in diet and nutrition in general.

London
April 2015

Rajkumar Rajendram
Victor R. Preedy
Vinood B. Patel

About the Editors



Rajkumar Rajendram is an intensivist, anesthesiologist, and perioperative physician. Dr. Rajendram graduated in 2001 with a distinction from Guy's, King's and St. Thomas School of Medicine, London. As an undergraduate, he was awarded several prizes, merits, and distinctions in preclinical and clinical subjects. This was followed by training in general medicine and intensive care in Oxford, during which period he attained membership of the Royal College of Physicians (MRCP) in 2004. Dr. Rajendram went on to train in anesthesia and intensive care in the Central School of Anaesthesia, London Deanery,

and became a fellow of the Royal College of Anaesthetists (FRCA) in 2009. He has completed higher training in regional anesthesia, pain medicine, and intensive care. Dr. Rajendram returned to Oxford as a Consultant in General Medicine at the John Radcliffe Hospital, Oxford, before moving to the Royal Free Hospital as a Consultant in Intensive Care, Anaesthesia, and Perioperative Medicine. He coauthored the *Oxford Case Histories in Cardiology*, which was published by the Oxford University Press in 2011. Dr. Rajendram is currently preparing the text for the *Oxford Case Histories in Intensive Care*.

Dr. Rajendram recognizes that nutritional support is a fundamental aspect of critical care. He has therefore devoted significant time and effort into nutritional science research. As a visiting research fellow in the Nutritional Sciences Research Division of King's College London, he has published over 50 textbook chapters, review articles, peer-reviewed papers, and abstracts from his work.

Victor R. Preedy is a senior member of King's College London (Professor of Nutritional Biochemistry) and King's College Hospital (Professor of Clinical Biochemistry; Hon). He is attached to both the Diabetes and Nutritional Sciences Division and the Department of Nutrition and Dietetics. He is also Director of the Genomics Centre and a member of the School of Medicine. Professor Preedy graduated in 1974 with an Honours Degree in Biology and Physiology with Pharmacology. He gained his University of London Ph.D. in 1981. In 1992, he received his Membership of the Royal College of

Pathologists, and in 1993 he gained his second Doctoral degree for his contribution to the science of protein metabolism in health and disease. Professor Preedy was elected as a Fellow of the Institute of Biology in 1995 and to the Royal College of Pathologists in 2000. Since then, he has been elected as a Fellow to the Royal Society for the Promotion of Health (2004) and The Royal Institute of Public Health and Hygiene (2004). In 2009, Professor Preedy became a Fellow of the Royal Society for Public Health and in 2012 a Fellow of the Royal Society of Chemistry. In his career, Professor Preedy worked at the National Heart Hospital (part of Imperial College London) and the MRC Centre at Northwick Park Hospital. He has collaborated with research groups in Finland, Japan, Australia, USA, and Germany. Professor Preedy is a leading expert in biomedical sciences and has a long standing interest in how nutrition and diet affects well-being and health. He has lectured nationally and internationally. Professor Preedy has published over 500 articles, which include peer-reviewed manuscripts based on original research, reviews, abstracts, and numerous books and volumes.



Vinood B. Patel is currently a Senior Lecturer in Clinical Biochemistry at the University of Westminster and honorary fellow at King's College London. He presently directs studies on metabolic pathways involved in liver disease, particularly related to mitochondrial energy regulation and cell death. Research is being undertaken to study the role of nutrients, antioxidants, phytochemicals, iron, alcohol, and fatty acids in the patho-physiology of liver disease. Other areas of interest are: identifying new biomarkers that can be used for diagnosis and prognosis of liver disease,

and understanding mitochondrial oxidative stress in Alzheimers disease and gastrointestinal dysfunction in autism. Dr. Patel graduated from the University of Portsmouth with a degree in Pharmacology and completed his PhD in Protein Metabolism from King's College London in 1997. His post-doctoral work was carried out at Wake Forest University Baptist Medical School studying structural–functional alterations to mitochondrial ribosomes, where he developed novel techniques to characterize their biophysical properties. Dr. Patel is a nationally and internationally recognized liver researcher and was involved in several NIH-funded biomedical grants related to alcoholic liver disease. He has edited biomedical books in the area of nutrition and health prevention, autism, and biomarkers, and has published over 150 articles. In 2014, Dr. Patel was elected as a Fellow to The Royal Society of Chemistry.

Organization of the Book

This title is organized into the following parts:

- Part I General Aspects: General Conditions in the Severely Ill
- Part II General Aspects: Screening, Assessments, Requirements, and Protocols
- Part III General Aspects: Nutritional Aspects in Specific Conditions and Scenarios
- Part IV General Aspects: Nutritional Aspects in the Young
- Part V General Aspects: Specific Nutrients and Components
- Part VI General Aspects: Adverse Aspects, Outcomes, and Considerations
- Part VII General Aspects: Preclinical Studies
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- Part XI Enteral Aspects: Specific Conditions
- Part XII Enteral Aspects: Adverse Aspects and Outcomes
- Part XIII Enteral Aspects: Parenteral and Enteral Support
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- Part XIX Parenteral Aspects: Enteral and Parenteral Support
- Part XX Parenteral Aspects: Preclinical Studies

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