
Pediatric Hypertension

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Editors

Pediatric Hypertension

Fourth Edition

With 94 Figures and 97 Tables

 Springer

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Preface to the Fourth Edition

We are delighted to present this expanded fourth edition of *Pediatric Hypertension*, which is intended to capture and update the ongoing progress in childhood hypertension. There is a growing recognition that adult cardiovascular disease has its origins in childhood, supported by many recent studies. Additionally, the assessment of the short-term sequelae of childhood hypertension is providing new and important data, reviewed herein. Further, there are increasing numbers of studies that are delineating mechanisms of blood pressure elevation in the young. While the obesity epidemic appears to be leveling off (at least in the United States), it remains an important contributor to the higher prevalence of childhood hypertension reported in recent years; numerous epidemiologic studies have become available since publication of the third edition of this text and are detailed here. With publication of this new fourth edition, we hope to bring further focus on the importance of understanding and addressing the role of the obesity epidemic in pediatric hypertension.

As our publisher, Springer, has transitioned this text to its Major Reference Work program, which is available not only in print but also online, which allows for continual updating, we have been able not only to retain the topics covered in previous editions of *Pediatric Hypertension* but also to add new chapters that address additional and important aspects of childhood hypertension. One new chapter addresses the controversy over routine childhood blood pressure screening raised by the 2014 US Preventive Services Task Force Report. Obesity hypertension is now covered in two chapters, one focusing on mechanisms and the other on clinical aspects. Another important mechanism of cardiovascular disease, vascular dysfunction, is covered in a new chapter in the first section of the text. We also now address the important topic of home blood pressure measurement, while continuing to cover casual and ambulatory blood pressure measurement in detail. Expanded chapters on ESRD-related hypertension, substance-induced hypertension, hypertension in oncology patients, and hypertension in young adults should be of substantial interest to clinicians who care for such patients. We have also expanded the section on hypertension research with a new chapter on cohort studies and meta-analyses and their role in studying childhood hypertension. Finally, we have added a short Appendix summarizing the major changes of the 2017 American Academy of Pediatrics clinical practice guideline on childhood hypertension, which was completed as this new edition was in progress.

It is impossible to put together a comprehensive text such as *Pediatric Hypertension* without more than “a little help from our friends.” We are greatly indebted to our returning authors as well as to our new authors, all of whom were asked to contribute to the text because of their acknowledged expertise in childhood hypertension. We also thank Daniela Graf and Rebecca Urban from Springer for helping keep everyone on task. We are certain that you will agree that the tremendous amount of work that has been devoted to this edition of *Pediatric Hypertension* has led to a comprehensive and useful text, which we hope you will consult often in your clinics and research laboratories.

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Preface to the Third Edition

We are excited to offer you this third edition of *Pediatric Hypertension*. Interest in childhood hypertension has increased markedly since the publication of the prior editions of this text, fueled in part by the increase in the prevalence of hypertension in children and adolescents, owing to the obesity epidemic. Investigators have continued to explore many aspects of hypertension in the young, resulting in better understanding of the mechanisms, manifestations and management of this important clinical problem. Cardiovascular disease remains the leading medical cause of death in the world. Only by understanding important risk factors such as hypertension at the earliest stages of disease, during childhood, can substantial progress at eradicating this disease be made.

In this edition, we have retained most of the topics from the prior two editions, but have made some important additions and replacements that we feel will increase the usefulness of the text to clinicians and researchers alike. New clinically oriented chapters on obesity-related hypertension, endocrine hypertension and renovascular hypertension should help guide the evaluation and management of these major causes of hypertension in the young. A new chapter on models of hypertension should help both researchers and clinicians to better understand the investigative approaches that have been employed to study childhood hypertension. There are also new chapters on hypertension in pregnancy and ethnic influences on hypertension in the young, which should be of particular interest to those who care for large numbers of teens and minority patients, respectively.

A text such as this would not have been possible without contributions from many busy people, all of whom are acknowledged experts in the field. We are profoundly grateful to our colleagues who agreed to contribute chapters to this text, especially those who willingly took on new topics only 2–3 years after

writing their chapters for the second edition! It has been a privilege to work with such a talented and generous group of collaborators, and we are sure that you will agree that their efforts have resulted in an enhanced third edition.

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Preface to the Second Edition

Interest in pediatric hypertension dates back nearly half a century, when it was first recognized that a small percentage of children and adolescents had elevated blood pressures – and in those days, the same normal values for adult blood pressure were utilized in children! The many advances since that time have led to a much clearer understanding of how to identify, evaluate, and treat hypertensive children and adolescents. At the same time, many questions remain: What causes hypertension in children without underlying systemic conditions? What are the long-term consequences of high blood pressure in the young? What is the optimal therapy of childhood hypertension? and Does such treatment benefit the affected child or adolescent? Can we identify children at risk of developing hypertension and intervene to prevent its occurrence? Readers conversant with the history of hypertension in the young will recognize that these questions were being asked decades ago and may still be unanswered for many years to come.

The first text focusing on pediatric hypertension was published in 1982. The book you are about to read is a direct descendant of that first effort to summarize what is known about hypertension in the young. We are fortunate to have been given the first opportunity to produce a second edition of such a text, which reflects the increased interest in hypertension in the young that has developed since the publication of the first edition of *Pediatric Hypertension*. Many chapters from the first edition have been revised and updated by their original authors; others have been written by new authors. New chapters on topics of recent interest in pediatric hypertension such as the metabolic syndrome and sleep disorders have been added. We hope that the reader will find this new edition of *Pediatric Hypertension* to be an up-to-date, clinically useful reference as well as a stimulus to further research in the field.

It is also our hope that the advances summarized in this text will ultimately lead to increased efforts toward the prevention of hypertension in the young, which, in turn, should ameliorate the burden of cardiovascular disease in adults. We thank our many colleagues who have taken time from their busy

schedules to contribute to this text – and we are sure that you will agree with us that their combined efforts have resulted in a valuable reference to those interested in hypertension in the young.

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Preface to the First Edition

More than a quarter of a century has elapsed since the first Task Force on Blood Pressure Control in Children was published in 1977. Since that seminal publication, normative data have been obtained for both casual and ambulatory children's blood pressure. Blood pressure measurement in infants, children, and adolescents, once an afterthought, has become routine. *Pediatric Hypertension* discusses the many aspects of pediatric hypertension – a multidisciplinary subspecialty that is comprised of pediatric nephrologists, cardiologists, endocrinologists, pharmacologists, and epidemiologists. Although some areas of our discipline have become well established, others, such as routine use of ambulatory blood pressure recording and well-designed trials in pediatric hypertension, are still emerging. Accordingly, we have included chapters that focus on aspects of blood pressure control and hypertension in the very young that are particularly relevant to those caring for infants, children, and adolescents.

Pediatric Hypertension opens with chapters concerning blood pressure regulation in the very young: the transition from fetal life to infant circulation, the factors that regulate blood pressure in early childhood, and the chronobiology of pediatric blood pressure. We then move on to the assessment of blood pressure in children. The book addresses both casual and ambulatory blood pressure measurement methodologies and norms, as well as the epidemiology of hypertension in children.

Definitions of hypertension in children, predictors of future hypertension, risk factors, and special populations are discussed at length. Comprehensive chapters on both primary and secondary hypertension in children point out differences in presentation of hypertension in the pediatric, in comparison to the adult, population. The contributions of genetics to the understanding of hypertension are presented, as well as those events during gestation and perinatal life that may influence the development of later hypertension. Risk factors that are discussed include the influences of race and ethnicity, diet, obesity, and society. Special populations, including the neonate with hypertension and the child with chronic renal failure or end-stage renal disease, are each discussed in a separate chapter. In those chapters, the pathophysiology insofar as it is known is also considered.

This text concludes with a section that focuses on the evaluation and management of pediatric hypertension. Suggestions for evaluation are presented, and both nonpharmacologic and pharmacologic therapy are discussed

at length. The 1997 Food and Drug Administration Modernization Act, which offers extension of market exclusivity in return for approved clinical trials of medications with pediatric indication, has had a major impact on the conduct of pediatric antihypertensive medication trials. The current status of such pediatric antihypertensive trials is presented. In the appendix, the reader will find the latest tables for the definition of hypertension in children from the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents, to be published in *Pediatrics* in the summer of 2004.

We hope that *Pediatric Hypertension* provides a catalyst for more interest in pediatric hypertension as well as a guide for the interested clinician or clinical researcher already active in this discipline. Very shortly, the results of additional trials concerning new antihypertensive agents in children will be available with the mandate that new antihypertensive medications be evaluated in children. An update by the Task Force on Blood Pressure Control in Children will also be completed in 2004. A number of groups that have a special interest in blood pressure and its control in the very young will continue to contribute to the field, among them, most notably, the International Pediatric Hypertension Association; the National Heart, Lung, and Blood Institute; the American Society of Hypertension; and the American Society of Pediatric Nephrology. These initiatives will lead to a better understanding of the definition, causes, consequences, prevention, and treatment of pediatric hypertension. In addition to advances in molecular and genetics laboratories, new technologies in assessment of human cardiac and vascular anatomy and physiology will help to elucidate the pathophysiology of hypertension and its response to management. In so doing, our hope is that the trend towards reduction in cardiovascular morbidity and mortality will continue for the current generation of children.

Finally, we wish to acknowledge the pioneering work of so many in the field of pediatric hypertension that has given us the foundation and tools to advance our field.

Ronald J. Portman, M.D.

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International Pediatric Hypertension Association

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