The Increasing Burden of Pediatric Hypertension

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See related article, pp XX–XX

In this issue of Hypertension, Tran et al report on the increasing economic and medical burden of hypertension in hospitalized pediatric patients. Using the Healthcare Cost and Utilization Project database of pediatric hospital discharges, the authors have provided the first glimpse of the growing economic impact that hypertension is playing in children. This important study helps dispel some of the remaining myths about pediatric high blood pressure, many of which are rapidly giving way to evidence such as these new data (Table). The biggest myth, of course, is that hypertension is an adult disease with no real relevance to children.

Why be concerned about pediatric hypertension? For one, it is now clear that hypertensive children do grow into hypertensive adults. A 2008 meta-analysis found >50 studies demonstrating the tracking of blood pressure from adolescence into adulthood. The diseases are not, however, synonymous. Children differ greatly from adults in the diagnosis of hypertension. As children grow into adult size across the pediatric age range, their blood pressure normally exhibits a gradual rise. Rather than a “one-size-fits-all” definition as in the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, children’s blood pressure is, therefore, categorized from thresholds based on age, height, and sex. The fourth report from the National High Blood Pressure Education Program’s Working Group on High Blood Pressure in Children and Adolescents defines children whose blood pressure is in the top 5% on repeated measurements as hypertensive. This statistical definition lacks the outcomes-based findings found in adult guidelines and similarly guarantees that a set proportion of children will have hypertension. Although by definition the top 5% are classified as hypertensive, the requirement of repeatedly elevated blood pressure leads to the more common finding of 3% to 4% of sampled populations having sustained hypertension. These numbers, although much lower than the 30% of adults who have hypertension, are not much lower in prevalence than other common childhood illnesses, such as attention deficit hyperactivity disorder or asthma (9% each) and much higher than some disorders that get far more attention, such as autism or epilepsy (1% each).

A second myth is that pediatric blood pressure problems are almost always attributed to secondary causes. Secondary hypertension was thought by far the most common etiology in pediatrics, and although essential hypertension has been recognized in children for decades, the clinical significance of high blood pressure in children is only now being fully elucidated. Even absent of secondary causes, blood pressures in children have been rising. Certainly the rise in children’s blood pressure in recent decades is not new information. It has been 5 years since Din-Dzietham et al reported the increasing pediatric blood pressure trends over the last half century. Using large databases, including the National Household Education Surveys Program, Hispanic Health and Nutrition Examination Survey, and National Health and Nutrition Examination Survey, she found rising blood pressures in children since a nadir in 1988. As a result, both hypertension and prehypertension are increasing. Additional data provided by Muntner et al in 2004 supported these findings. Examining 5582 children in the National Health and Nutrition Examination Survey, blood pressure was higher (1.4 mmHg systolic and 3.3 mmHg diastolic) in 2000 compared with 1988–1994. These significant increases in blood pressure are likely riding the wave of pediatric obesity that is spreading across America.

Rising blood pressures in children may reflect the rise in obesity, particularly among adolescents. Over the last generation, the prevalence of childhood obesity has more than tripled, with >15% of the US pediatric population now obese. Why does this matter in a discussion of hypertension? Obesity remains the primary risk for essential hypertension in children, and excess weight may be a stronger risk factor in youths than in adults. As part of our school-based community blood pressure screening program at University of Texas (Houston), we reported in 2004 that more than one third of obese school children had abnormally elevated blood pressure. Since that time, we have continued to add children’s blood pressures to our growing screening database. We have now screened blood pressure in >21,000 healthy, school-aged children. Consistently, we are finding an increased prevalence both of excess weight and abnormally high blood pressure.

Another myth is that, although hypertension might be found in children, the disease is an independent entity from the more common hypertension seen in adults. It is now clear that not only does blood pressure does track from adolescence into adulthood, but the vascular damage from hypertension starts in childhood. Many studies over the last decade have provided supporting evidence. Although the blood pressure thresholds for pediatric hypertension are based not on outcomes but on population norms, researchers have continually demonstrated that hypertensive children do in fact present with hypertensive end organ damage. Up to 30% of children with newly diagnosed hypertension already have significant end organ damage, namely left ventricular hypertrophy. In addition, many of the other vascular changes seen in hypertensive adults, including intimal

The opinions expressed in this editorial are not necessarily those of the editors or of the American Heart Association.

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mediated thickening and altered pulse wave velocity, are evident on vascular profiling in hypertensive children.

The current study begins to dispel the final myth that pediatric hypertension is only an outpatient finding with little hospital morbidity or cost. The cost of hypertension treatment is staggering. Again, adult data are more readily available, because hypertension is much more common in adult populations. In 2003, Elliott19 estimated the annual cost of hypertension treatment in the United States at more than $50 billion. At the same time, the total cardiovascular disease costs were, by American Heart Association estimates, well over $300 billion. These large costs relate to both the scope and depth of hypertensive illness. In both total numbers affected (70.0 million versus 2.5 million) and proportion (30% of adults versus 4% of children), adults with hypertension dwarf the pediatric population. Despite the vast discrepancy, however, the current report highlights the growing economic impact of pediatric hypertension. The current study by Tran et al1 indicates that, between 1997 and 2006, the hospital costs to treat children with hypertension-related illness were more than $3 billion.

Although no one study can elucidate the complex economics of hypertension in children, the current analysis provides important information to clinicians, hospitalists, and policy makers. Hypertension in children can no longer be regarded as a fringe diagnosis merely to be noted and passed on to our internal medicine colleagues. Instead, the disease has significant burden on pediatric patients in terms of clinical manifestations, medical complexity, and overall cost of treatment. In this analysis, the proportion of children with a diagnosis of hypertension during hospitalization doubled between 1997 and 2006. In addition, the average length of stay and mean hospital charge were also doubled among those with hypertension as a diagnosis. Certainly there are limitations to the methodology of a database analysis, including questionable diagnostics based on International Classification of Diseases, 9th Revision, coding. It is likely that many of the patients billed as hypertensive during a hospitalization do not have chronic sustained hypertension. Improved recognition of abnormally high blood pressure may be a result of improved index of suspicion after the fourth report. Regardless of these shortcomings, the current data are better than any available to focus on vascular profiling in hypertensive children.

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The 1997 US Food and Drug Administration modernization act greatly increased research of antihypertensive agents in children with hypertension. Pediatricians now have an array of pharmacological antihypertensive interventions, with pediatric dosing, safety, and often even labeling. Given the apparent cost of hypertension even in the pediatric age range, not to mention its whopping cost in adults, now is the time to invest in early detection, prevention, and treatment of elevated blood pressure in children. If the current study tells us anything, it is that we cannot afford to wait.

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**Disclosures**

None.

**References**


**Table. The Myths About Pediatric Hypertension**

<table>
<thead>
<tr>
<th>Myth</th>
<th>Truth</th>
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<tbody>
<tr>
<td>1. Hypertension is an adult disease.</td>
<td>A total of 3% to 5% of children have hypertension, much higher than diagnoses such as autism or epilepsy.3–7</td>
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<td>2. Pediatric hypertension is mostly attributed to secondary causes.</td>
<td>With the growing prevalence of obesity, the most common diagnosis is essential hypertension.4,5</td>
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<td>3. Childhood blood pressure is unrelated to adult hypertension.</td>
<td>Multiple studies have demonstrated tracking of hypertension into adulthood.2</td>
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<td>4. Children may be diagnosed with hypertension, but true hypertensive end organ damage does not occur until adulthood.</td>
<td>Up to 30% of children diagnosed with hypertension already have evidence of vascular injury, including left ventricular hypertrophy.9</td>
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<td>5. The overall impact of hypertension on children is small.</td>
<td>See related paper by Tran et al1 for evidence of hypertension’s significant impact on hospital stay and charges.</td>
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