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*Chapter 14*

**A COMPREHENSIVE APPROACH TO OBESITY,  
HYPERTENSION, AND MENTAL  
HEALTH EVALUATION**

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**ABSTRACT**

The global epidemic of childhood and adolescent obesity in developing and developed countries has become a major public health concern. Given the relationship between obesity and hypertension as documented in several landmark studies, it is no surprise that, as the prevalence of obesity has increased in the pediatric population, rates of hypertension have also increased substantially. Hypertension is one of the most important risk factors for cardiovascular diseases and stroke; therefore, evaluation and initiation of appropriate treatment are extremely important in the pediatric population. Evaluation for secondary causes of hypertension, including renovascular, renoparenchymal, and endocrine disease, is the approach most commonly utilized in health care settings with the goal to detect abnormalities that already have or might, if left unrecognized, affect the physical health of the child in the future. Children and adolescents are commonly evaluated for organic disease even in situations where secondary hypertension is unlikely and overweight or obesity is most likely the primary factor contributing to hypertension. Psychological and psychosocial factors, which may play an important role in the etiology of obesity and related blood pressure elevation, are often addressed inadequately or completely ignored, potentially reducing long-term therapy success and increasing the incidence of avoidable complications. It is proposed that a comprehensive evaluation by a behavioral health provider will improve outcomes

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and potentially reduce long-term morbidity and hypertension-related end organ disease. A framework for mental health evaluation is provided.

## INTRODUCTION

Obesity has become one of the most common diseases and disease-associated conditions in the United States (US) and other countries. It should be noted that overweight and obesity are usually defined as a body mass index (BMI) equal to or greater than the 95th percentile, compared to pediatric population reference data when plotted on the appropriate age and gender chart; children and adolescents with a BMI between the 85th and 95th percentile are considered to be at risk for obesity according to the Center for Disease Control (CDC); unless otherwise noted, overweight and obesity will be defined as such throughout the remainder of this article.

In the year 2000, it was estimated that obesity would soon surpass tobacco smoking as the leading cause of preventable death in the United States [1] and it has also been suggested that today's young people may, on average, live less healthy and ultimately shorter lives than their parents due to overweight and obesity; in fact, this epidemic may reverse the modern era's steady increase in life expectancy [2,3]. Further, it has been estimated that as this century progresses, more people will die from the complications of overnutrition than of starvation [4]. Between 1980 and 2002, obesity prevalence doubled in adults age 20 years or older, and overweight prevalence tripled in children and adolescents ages 6 to 19 years [5-7]. Comparing results obtained from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) to results from the NHANES survey in 1999-2000, 17.1% vs. 13.9%, respectively, of US children and adolescents were overweight (defined in this analysis as 95th percentile of the sex-specific BMI). For female children and adolescents, the percentage overweight increased from 13.8% in 1999-2000 to 16.0% in 2003-2004; for male children and adolescents, the increase went from 14.0% to 18.2% during the same time period [6].

Obesity is reaching epidemic proportions and is seen at progressively younger ages. Several critical and vulnerable developmental periods, including infancy, early school age (adiposity rebound), and adolescence, have been discussed to play a role in the pathogenesis of obesity [8,9]. It is important to address obesity at the earliest age possible, because most obese preadolescent children and at least 70% of obese adolescents will remain obese into adulthood [10], significantly increasing the chances of obesity-related disease in adulthood, if those diseases have not had childhood onset. More than 10% of school age children are overweight or obese worldwide with the Americas reporting rates as high as 32% [10]. According to the 2005 Youth Risk Behavior Survey, a national probability sample of 9th – 12th graders which assesses risk behaviors and risk factors (data from CDC in 2006), approximately 16% of students nationally were at risk for overweight, and 13% were already obese. In contrast, Kentucky students, the state in which we practice, showed 17% of students at risk for overweight, comparable to the national sample, but almost 16% were already obese, significantly higher than national statistics.

Nutrition and exercise, important variables in overweight and obesity, were also assessed and found lacking in Kentucky youth. In terms of nutritional value of food and beverages consumed, Kentucky youth, in contrast to the national sample, drank significantly less fruit juice, ate significantly fewer fruits, green salads, carrots, and significantly more potatoes.

Also, Kentucky youth were significantly less likely to eat five or more servings per day of any fruits and vegetables (data from CDC in 2006). The findings regarding exercise were equally alarming. According to CDC data from 2006, Kentucky youth, in contrast to the national sample, exercised significantly less (e.g., aerobic exercise, non aerobic exercise, moderate physical activity, attendance at physical education classes).

Other alarming findings from a study by Omar and Rager [11] regarding Kentucky youth and obesity are that these youth misperceive the degree to which they are overweight. In looking at 6th and 9th grade samples whose BMI was assessed objectively, and who were asked about their weight, 23% of 9th grade females and 1% of 6th grade females perceived themselves to be overweight while 50% and 31%, respectively, met objective measures for overweight or obesity, i.e., BMI. Males had similar misperceptions with 45% of 9th grade and 34% of 6th grade males actually at risk for overweight or obese, while only 9% and 1.5%, respectively, perceived themselves to be so.

One of the most important issues noted in the recent past is that maintaining a positive energy balance, even if only to a minimal degree, will, in the long term, lead to weight gain and obesity. If endogenous causes of childhood obesity are eliminated, then lack of physical exercise, sedentary behavior, and poor dietary choices are the most common risk factors for weight gain, potentially leading (or contributing) to hypertension and/or other obesity-related disease states. Pinhas-Hamiel [12] noted that "life-style-related diseases are no longer the exclusive domain of adult medicine." The yearly rate of deaths related to complications of obesity is rising, and young adults are in the highest risk group to develop obesity.

### **Hypertension in Children and Adolescents**

As with overweight and obesity, prevalence of hypertension has also risen in children and adolescents [13] and is predictive of hypertension in adulthood [14]. The 4th Task Force Report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents [15] defines hypertension as three independent blood pressure readings above the 95th percentile adjusted for height and age reference values of the child. The report introduced the 99th percentile of blood pressure readings as a marker of more severe (stage II) hypertension with the aim to simplify management and treatment decisions for the health care provider. Since elevated blood pressure can cause systemic symptoms but may also be a secondary finding in acute illness, a high index of suspicion should be kept and elevated blood pressure readings should be followed by repeated measurements once the child has completely recovered.

Hypertension is a known risk factor for cardio- and cerebrovascular disease and criteria for the evaluation of secondary causes have been established and refined, most recently in 2004 in the 4th Task Force Report [15]. Guidelines for the basic evaluation of secondary causes or early signs of end-organ damage in obese and non-obese children with hypertension are outlined in table 1. Most providers caring for children with hypertension feel that marked blood pressure elevation in younger children is an ominous finding and are very aggressive in ruling out secondary organic causes, especially in the absence of overweight. The relation between increased body weight and higher blood pressure readings was demonstrated in the past 16 and overweight children with documented blood pressure elevations might benefit

from a comprehensive approach to weight control after secondary causes of hypertension have been ruled out.

### **The Relationship between Obesity and Hypertension in Children and Adolescents**

Several well designed studies have documented the association between hypertension and obesity as well as other cardiovascular risk factors [17-19]. Overweight children have higher blood pressures compared to normal weight controls and as many as 30% of children with a BMI greater than the 95th percentile have hypertension [19,20]. In 2002, Sorof et al. reported a threefold higher prevalence of systolic hypertension on the first screening in obese versus non obese children in a cohort of 2460 individuals between 12 and 16 years of age [19].

In most obese individuals seen in physicians' offices for evaluation of hypertension, excessive weight gain reflects a long-term problem rather than a short-term change. Poorly controlled diet and lack of exercise are oftentimes easily identified as factors responsible for weight gain due to a positive energy balance. Lack of recognition of obesity as a problem by families and providers and low counseling rates continue to be ongoing problems [21]. Medical complications, including type II diabetes, hypercholesterolemia, and obstructive sleep apnea, to name a few, are well known and described as complications of obesity.

Morrison et al [22,23] have shown that overweight girls and boys have a much higher prevalence of several cardiovascular risk factors compared with the average expected frequency suggesting that health problems related to obesity are common and will significantly impact future healthcare-related costs. Weight management is recommended in both stages of hypertension, but in clinical practice, the rate of successful weight loss is quite low. With continued blood pressure readings above the 95th percentile, the 4th Task Force Report on diagnosis, evaluation, and treatment of high blood pressure in children and adolescents [15] recommends the initiation of pharmacologic therapy. Even though this certainly reduces the risk of blood pressure related long-term complications if blood pressure control is achieved, it does not affect overweight and obesity and may actually decrease incentive to lose weight, especially if mild symptoms like blood pressure related headaches are controlled.

A timely and thorough evaluation for secondary causes of hypertension and initiation of non-pharmacologic or pharmacologic therapy are recommended by most health care providers involved in the care of those children with consistently elevated blood pressure [24,25]. This is especially important for children who already have evidence of early end organ damage or are at high risk. The 4th Task Force Report recommends a baseline evaluation of secondary causes of hypertension in almost all overweight or obese children as well as all non obese children and teenagers with blood pressures above the 95th percentile adjusted for the appropriate height and age percentile curve [15].

### **The Role of Mental and Behavioral Health**

The 4th Task Force Report recognizes the strong association between high blood pressure and overweight and obesity as well as the significant increase in the prevalence of overweight

children [15] and it provides very detailed recommendations for the evaluation of organic disease related to hypertension. However, it presents no clear guidelines regarding the assessment of mental and behavioral health issues in the hypertensive, obese child, even though the report clearly regards weight loss as “the primary therapy for obesity-related hypertension” [15]. The association of mental health, obesity, and hypertension in adults is well known, and even though data in the pediatric population are quite limited [26-28], it appears to be somewhat intuitive that a similar relationship would be present in children and adolescents who struggle with overweight and obesity, although the data are somewhat contradictory.

Several studies have documented a clear correlation between depression and obesity in adolescents [26-28]. Goodman et al [29] have shown in a nationally representative, longitudinal study of over 9,000 adolescents that depressed mood in non obese individuals is associated with the development of obesity at one year and worsening obesity in baseline obese participants, suggesting that depression may precede obesity. Other studies using community samples of obese versus non obese adolescents have found no differences in depressive symptoms between the two groups [30]. Swallen et al [31] found a statistically significant relationship between BMI and general physical health in adolescents from age 12 to 20 years, but only young adolescents (12-14 years) evidenced a deleterious impact on emotional health as reported by depression and/or low self esteem. Several studies, including a recent one by Daniels [26] failed to confirm a relationship between obesity and symptoms of depression in adolescents. Recent studies have also focused on BMI as a potential link between depression and the risk for hypertension. Kabir et al [28] have shown in a study of more than 1000 mostly adult participants, that BMI can be an intermediate variable linking depression and hypertension, since individuals with the same depression score and no obesity had a lower likelihood to be hypertensive compared to obese individuals. Thus, the relationship between depressive symptoms and overweight and obesity in children and adolescents is not completely clear, although depression appears to play a role in the mental health of a certain subpopulation of obese adolescents.

Studies on self-esteem in obese children and adolescents also report inconsistent results. Some studies have shown moderately lower self-esteem in obese children and adolescents than their non obese peers [32,33], while others have shown no difference between population-based groups of obese children and their non obese peers [34,35]. Studies also show that obese females are at greater risk for self-esteem problems because body image is so important to self-image [32]. In clinical populations, there is a clear relationship between obesity and self-esteem in children and adolescents, with more obese children having lower self-esteem [35]. One hypothesis is that clinically referred children represent a subgroup of obese children associated with especially low self-esteem [36].

Eating disorders have been found to be associated with obesity [37]. Britz et al [38] reported that the rate of eating disorders was six times higher in an obese patient group than a population-based control group. The disorders included bulimia nervosa, eating disorders not otherwise specified, and anorexia nervosa. Sixty percent of females and 35.5% of males reported binge eating episodes.

**Table 1. Guidelines for the evaluation of hypertension in children and adolescents**

1.	All children with persistent BP equal to or greater than the 95 <sup>th</sup> percentile <ol style="list-style-type: none"> <li>Renal function and electrolytes</li> <li>Urinalysis and urine culture</li> <li>Complete blood count</li> <li>Fasting lipid profile</li> <li>Thyroid function studies</li> <li>Retinal exam</li> <li>Echocardiogram</li> <li>Renal Doppler ultrasound</li> </ol>
2.	Overweight patients with BP at 90-94 <sup>th</sup> percentile, family history of CVD, children with chronic renal disease <ol style="list-style-type: none"> <li>Fasting lipid panel and serum glucose</li> </ol>
3.	History of loud snoring/ breath holding <ol style="list-style-type: none"> <li>Polysomnography</li> </ol>
4.	Young children with stage 1 HTN and any child or adolescent with stage 2 HTN <ol style="list-style-type: none"> <li>Plasma renin activity and aldosterone level</li> <li>Renovascular imaging (renal scan, MRA, arteriography)</li> <li>Plasma and urine steroid levels</li> <li>Plasma and urine catecholamines</li> </ol>
5.	Suspected white-coat HTN or more information needed on BP pattern <ol style="list-style-type: none"> <li>24 hr ambulatory BP measurement</li> </ol>
6.	Children with comorbid risk factors and BP readings between 90 <sup>th</sup> and 94 <sup>th</sup> percentile <ol style="list-style-type: none"> <li>Echocardiogram</li> <li>Retinal exam</li> <li></li> </ol>
Other tests might be necessary but need to be discussed on an individualized basis.	
7.	<u>All children with persistent blood pressures equal to or greater than the 95<sup>th</sup> percentile</u> <ol style="list-style-type: none"> <li>Renal function and electrolytes</li> <li>Urinalysis and urine culture</li> <li>Complete blood count</li> <li>Fasting lipid profile</li> <li>Thyroid function studies</li> <li>Retinal exam</li> <li>Echocardiogram</li> <li>Renal Doppler ultrasound</li> </ol>
8.	<u>Overweight patients with BP at 90-94<sup>th</sup> percentile, family history of cardiovascular disease, children with chronic renal disease</u> <ol style="list-style-type: none"> <li>Fasting lipid panel and serum glucose</li> </ol>
9.	<u>History of loud snoring/ breath holding</u> <ol style="list-style-type: none"> <li>Polysomnography</li> </ol>
10.	<u>Young children with stage 1 HTN and any child or adolescent with stage 2 HTN</u> <ol style="list-style-type: none"> <li>Plasma renin activity and aldosterone level</li> <li>Renovascular imaging (renal scan, MRA, arteriography)</li> <li>Plasma and urine steroid levels</li> <li>Plasma and urine catecholamines</li> </ol>
11.	<u>Suspected white-coat HTN or more information needed on BP pattern</u> <ol style="list-style-type: none"> <li>24 hr ambulatory BP measurement</li> </ol>
12.	<u>Children with comorbid risk factors and BP readings between 90<sup>th</sup> and 94<sup>th</sup> percentile</u> <ol style="list-style-type: none"> <li>Echocardiogram</li> <li>Retinal exam</li> <li></li> </ol>
Other tests might be necessary but need to be discussed on an individualized basis.	

Stigmatization of obese children and adolescents is also significant and has long been a part of western culture [39]. Studies have shown that children young as three years of age begin to have negative attitudes toward overweight and obesity. When given different methods for assessing stigmatizing attitudes, these children ascribe negative characteristics to overweight targets, including mean, ugly, stupid, and sloppy, compared to non overweight



targets [40]. These trends tend to worsen as children get older [41]. Such stereotypes are born out in real-life when studies show that US women who were obese adolescents become adults with lower educational attainment, lower paying jobs, higher rates of poverty, and less likelihood of marriage in comparison to thinner women [42,43]. Obese youth have greater difficulty in gaining admission to college, although there is no indication that they are less apt to be able to complete the course work [39].

### **Evaluation of Mental Health**

Obese children and adolescents should be thoroughly evaluated to identify any psychological conditions that may affect the course of treatment [36], especially when there are other complicating medical factors. However, routine evaluation of mental and behavioral health is not in the recommended work-up for hypertension in obese adolescents, leaving an important gap in the evaluation. The 4th Task Force Report [15] mentions weight loss and optimizing blood pressure control by behavior modification but does not provide specific guidelines on how to achieve this goal. This could be part of the reason why health care providers are unsure about how and when to evaluate mental and behavioral health in this patient population. Additionally, most pediatric health care providers are not trained to assess mental health issues and may have limited experience in daily practice in addressing mental health related problems. Other factors, including limited visit time and lack of established office strategies [24] may also contribute to the lack of detection of the psychological and psychosocial factors leading to obesity or originating from it. Additionally, pediatricians may directly or indirectly express "fatism," which may contaminate the relationship with their young patients, and is particularly true with younger, obese patients where parent-bashing or blaming is common [36].

Jonides et al [44] reported on the results of a questionnaire to pediatricians asking about the routine evaluation of various psychological and emotional factors including self-esteem, eating disorders, concern about weight, family dynamics and history of abuse and they showed that by far not every provider asks and elaborates on all of those important factors. Friedman [45] suggested that pediatricians are in an ideal position to detect psychological issues in young people, and they should be better trained to probe for and recognize signs of major mental illnesses. Weitzman and Leventhal [46] concluded that the pediatric practice setting is an optimal environment for behavioral health screening if the currently available tools are used effectively. However, training is lacking in these areas.

Given that most providers specializing in childhood and adolescent hypertension are not trained in mental and behavioral health evaluations, a pediatric trained psychologist familiar with evaluation and treatment options of various mental and behavioral health conditions in children and adolescents could add significant value to the team caring for this particular patient subset. It is postulated that the evaluation and treatment of underlying psychological and behavioral problems by a health care provider trained in adolescent mental health will aid in the reduction of hypertension and obesity related mortality in children and adolescents.

## **Recommendations for Evaluation of Mental Health**

There is no consensus recommendation for the evaluation of mental health in overweight adolescents with and without hypertension, and there are no studies comparing different methods for psychiatric assessment of affected children [36]. An expert committee recommendation on obesity evaluation and treatment by Barlow and Dietz [47] suggested that asking the right questions in “objective, non accusatory language” will help establish a basis of trust between family and provider, which is key to long-term, successful management. Additionally, the use of well-validated instruments for evaluation is important.

In our Pediatric Hypertension Clinic, every child with a BMI greater than the 85th percentile and documented blood pressure readings above the 90th percentile is offered an evaluation by a pediatric psychologist at the time of the initial visit. The psychologist is involved at the time of the first follow-up visit for (borderline) hypertension, after all laboratory data are collected and secondary causes of hypertension have been assessed by the Pediatric Specialist.

At the initial visit with the pediatric psychologist, a thorough psychiatric, psychological and family history regarding the patient is taken. As rapport is established, questions are asked regarding the patient’s weight and whether there are concerns about weight, weight gain or loss, eating issues, and psychosocial issues associated with being overweight (e.g., does the patient have friends, is he/she teased at school, depressive or other symptoms associated with overweight).

A number of paper and pencil instruments are completed by the child and parents in order to assess psychological distress in the child or adolescent. As noted earlier, a high rate of depression and other psychological issues have been found more consistently among obese children than among children of normal weight [28]. In order to assess level of depression in children in the clinic setting, the Children’s Depression Inventory (CDI), a 27-item, symptom-oriented scale for children ages 6 -17 years is utilized [48]. The CDI is a highly reliable and valid measure [49] and has been used effectively in several studies with obese children [50,51]. Since the CDI is a self-report measure, it is supplemented by a parent-completed Child Behavior Checklist [52] in order to obtain corroborating or conflicting data from parents. Issues regarding eating are measured through completion of a version of the Eating Attitude Test [53,54]. This is a 6-point, forced choice, self-report inventory that measures dieting behaviors, food preoccupation, anorexia, bulimia, and concerns about being overweight. Versions for teenagers and younger children (chEAT), have demonstrated concurrent and predictive validity as well as reliability [54]. Finally, for overall symptom assessment, younger children (9-12 years) will complete the Millon Pre-adolescent Clinical Inventory (M-PACI), and adolescents (13-19 years) will complete the Millon Adolescent Clinical Inventory (MACI). Both instruments are designed to quickly and accurately identify psychological problems and looks at both emerging personality patterns and acute psychological symptoms.

## **Effects of Stable Mental Health on Outcome**

Addressing mental health by correct and timely diagnosis and intervention can be of significant importance in improving the outcome of obesity related hypertension in children

and adolescents. In adolescents dealing with hypertension, one certainly wonders if undiagnosed and non treated mental health problems, including anxiety and depression in an asymptomatic individual, can lead to medical non-compliance and worsen hypertension and related end organ disease. Also, the correct diagnosis and therapy of mental health problems, if associated with obesity and hypertension, can improve weight management and decrease the need for pharmacologic therapy to decrease risk of weight and blood pressure related complications.

Data on outcome of evaluation and treatment of behavioral health in obese hypertensive children and adolescents are limited and purely based on non controlled observation. Our strategy has helped to identify children with behavioral health issues that would likely have gone unrecognized if not for the assessment and counseling by a pediatric psychologist. Several children have achieved better weight control and improvement of blood pressure readings after a behavior health specialist was involved. Clinical trials are currently underway and we hope to present broader, controlled data in the near future.

### FUTURE DIRECTIONS

Obesity and related hypertension have become major problems in the developed and developing world in recent years. Preventing obesity would likely significantly reduce the incidence of hypertension and related long-term organ injury including diabetes mellitus and cardiovascular as well as cerebrovascular disease.

Adolescents are a high risk group for developing obesity and hypertension, which is, in part, due to the vulnerable developmental stage. The knowledge that most overweight and obese teenagers will be unsuccessful in their attempts – if they are even considered – to lose weight and move on to become overweight and obese adult has shifted the focus clearly toward primary prevention of obesity. Primary prevention is certainly the best strategy but as of today, obesity and its potential complications are more prevalent than ever and need to be addressed more aggressively and comprehensively. To improve obesity related morbidity and mortality in this age group, providers involved in their care need to develop a better understanding and increased focus on mental health in addition to physical health. One strategy is a comprehensive team approach including a mental health specialist who not only addresses those issues in the patient and family but also teaches the provider better strategies for initial screening. The experience in our practice has been very positive but more long-term data to support our approach are certainly necessary.

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