Why Pediatricians Need to Tackle Childhood Obesity Now

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INTRODUCTION

Pediatricians are on the front lines of the childhood obesity epidemic. Over the past two decades we have seen a metamorphosis in the lifestyle of children and families with a resulting increase in childhood obesity and related morbidity that predisposes to a lifetime of medical problems. Data from 2007 show that 63% of US adults were overweight and 33.8% were obese.[1] We are now into our third decade of increased incidences of overweight and obesity (BMI >95th percentile for age and gender among the pediatric population. Data from NHANES 1971–1974 (National Health and Nutrition Examination Survey) to NHANES 2003–2006 show increases in obesity among all age groups. In preschool-aged children (2–5 years), obesity increased from 5.0% to 12.4%; in school-aged children (6–11 years), obesity increased from 4% to 17%; and in adolescents (12–19 years), obesity increased from 6.1% to 17.6%. Recent data show that this increase may be starting to level off. Overall, in 2003-2006, 11.3% of children and adolescents aged 2 through 19 years were at or above the 97th percentile for BMI, 16.3% were at or above the 95th percentile, and 31.9% were at or above the 85th percentile.[2] Obesity is also a global problem and has been classified as a world wide epidemic by the World Health Organization with 1 in 10 children worldwide classified as obese.[3,4]

THE FOUR PHASES OF OBESITY

The trajectory of obesity has been described as having four phases:[5]

- Phase I – steady increase in childhood obesity;
- Phase II – emergence of serious obesity related co-morbidities;
- Phase III – medical complications lead to life threatening disease—death in middle age;
- Phase IV – acceleration of obesity epidemic by transgenerational transmission.

THE CONSEQUENCES AND COSTS OF OBESITY

Obesity is a chronic disease with morbidity in childhood that extends into adulthood. Obesity-related co-morbidities affect almost every organ system. Diseases such as type 2 diabetes, polycystic ovarian syndrome, non-alcoholic steatohepatitis were formerly thought of as occurring only in adults, but they are now seen in obese children. Dramatic increases have also been seen in the prevalence of upper airway obstructive sleep apnea syndrome, hypertension, and hyperlipidemia. Unique pediatric orthopedic issues such as Blount's disease and slipped capital femoral epiphysis (SCFE) have emerged as real threats to function in the obese child. Because of the complexity of care needed for obesity prevention and treatment, care is best delivered using the model of the medical home which can coordinate care and manage chronic conditions. Treatment of obesity and its co-morbidities crosses all disciplines and specialties and requires the expertise of primary care pediatricians, pediatric subspecialists, nurses, dieticians, exercise physiologists, social workers, mental health professionals, public health, administrators, community based organizations, policy makers.

With another generation of obese children entering adulthood, healthcare costs continue to escalate. The already enormous healthcare expenditures on obesity have doubled over the past decade to an estimated $147 billion in 2008, accounting for 9.1th percentile of total healthcare spending. Much of this cost is for treatment of obesity co-morbidities such as type 2 diabetes and cardiovascular disease.[6] Hospitalization costs related to childhood obesity are also increasing, nearly doubling between 1999 and 2005. Hospital stays for obesity complications such as pneumonia, asthma, diabetes, gall bladder disease and mental health disorders cost $238 million in 2005.[7]

In addition to the direct economic costs of obesity, the loss of a healthy childhood indirectly harms the child, the family, and society. Obesity alters the trajectory of healthy growth and development in the domains of physical and mental health, emotional well being, and psychosocial functioning.

THE CAUSES OF OBESITY

The etiology of obesity is complex and multifactorial, including intrauterine "programming," by which

pregnancies complicated by smoking[8] or diabetes predispose to childhood obesity; environmental factors, such as fast food consumption; inactivity; and increased TV time.

PREVENTION AND TREATMENT OF CHILDHOOD OBESITY

Obesity treatment cannot wait for school age or adolescence but must start in our youngest children, since they are already affected by the increasing rates of childhood obesity. 16.5th percentile of U.S. children 2-5 years old are overweight and 14.9th percentile of toddlers are obese. Disparities between racial/ethnic groups can already be identified even in these young children. In one study, 4-year-old Native American children had the highest prevalence of obesity at 31.2%, Hispanic children at 22% , non-Hispanic black children at 20.8%, non-Hispanic white children at 15%, and Asian children 12.8%.[9]

In 2007 an Expert Committee was convened by the Centers for Disease Control and Prevention (CDC), and the American Medical Association (AMA) to update the 1998 recommendations for prevention and treatment of obesity. The committee represented 15 professional organizations including the American Academy of Pediatrics, American Academy of Family Physicians, and American Dietetic Association. The committee published recommendations based on current evidence and expert opinion.[10] In coming to grips with the supports needed to effectively prevent and treat childhood obesity, the Expert Committee recommended using the Chronic Disease Model, to provide an evidence-based systems model of health care delivery.[11] This model was derived from examining health care delivery systems which routinely produced optimal patient outcomes. The components of this model include self management support, decision support, delivery system design, and clinical information systems, all of which support the partnership between the clinical team and the patient and family.

Important concepts included in the recommendations were the need for practice change to adequately incorporate the "new work" of obesity prevention and treatment into practice, the concept of "universal prevention" meaning that BMI calculation and classification and healthy lifestyle counseling should be part of all well child care. The recommendations also emphasized that parents and families are integral to obesity prevention and treatment and that techniques such as motivational interviewing are important tools for the pediatrician to have at their disposal.

The other major change in approach was to create a step wise approach to obesity prevention and treatment. These five steps are utilized in accordance with the five severity categories of obesity, and are described as Prevention, Prevention Plus, Structured Weight Management, Comprehensive Multidisciplinary Protocol and Tertiary Care. The stages applied to both the severity of the child's obesity and the venue and resources needed to care for them.

Severity categories are based on BMI, which is calculated from height and weight (wt (kg) /ht (m^2) or wt (lbs)/ ht $(in)^2$ x 703 and plotted on BMI growth charts to obtain BMI percentile referenced to age and gender based on population data. The report recommended the classification of BMI percentiles as:

- *Underweight*: <5th percentile
- *Normal weight*: 5th – 84th percentile
- *Overweight*: 85th – 94th percentile
- *Obese*: 95th - 99th percentile
- *Morbid (severe) obesity*: > 99th percentile

Following is an outline of the five major steps in prevention and management of obesity. Details of these strategies are provided further below in relation to two representative patients:

- **Prevention** would be universal for children with "healthy" BMIs—between the 5th and 84th percentiles—and would take place in the primary care office at well examinations.[12] (This recommendation for preventive action in non-obese children is based on the interaction among factors related to the environment, genetics, and behavior, as well as the worsening nutritional and activity environment).
- **Prevention Plus** would be for children with BMI between the 85th and 94th percentile classified as "overweight," and would target any problematic dietary and activity behaviors; review risks; and use patient directed behavioral techniques to encourage lifestyle change. This intervention would occur in primary care practice and include monthly revisits.
- **Structured Weight Management** would include overweight children with health risk factors and "obese" children whose BMI is > 95th percentile. It would provide increased structure, goal setting, and could include referral to a dietician or exercise specialist. This intervention could be a structured program or a series of structured revisits at the primary care level.
- A **Comprehensive Multidisciplinary Intervention** would occur in a multidisciplinary obesity program which could include a pediatrician,

dietician, exercise specialist, social worker and mental health provider. This stage would be for children who did not have success in previous stages, for children with severe obesity and/or obesity related comorbidities, and would occur at a hospital clinic level.

- **Tertiary Care Intervention** would be for children with severe obesity and/or obesity related comorbidities and include a multidisciplinary obesity team as well as pediatric subspecialists. This intervention would offer intense medical and surgical treatment at the hospital level.

Key to implementing the new recommendations is the assessment of the individual child:

- Calculate, chart, and classify BMI for all children 2-18 years, at least yearly;
- Assess obesity related comorbidities;
- Assess dietary patterns;
- Assess activity/inactivity;
- Assess readiness for change;
- Assess ongoing progress.

CLINICAL MANAGEMENT

It is helpful to think of two contrasting patients in your practice,

– a 12 year old girl who comes to your office for a yearly examination. Her mother is worried about her daughter's increasing comments about her weight, and being "fat."

– an 8 year old boy who comes to your office after an absence of 2 years, having gained 30 lbs since you last saw him.

Calculating and assigning BMI class is the first step to assessing the child's risk for unhealthy dietary and physical activity behaviors and unhealthy environments that could contribute to overweight and obesity.

The 12 year old girl has a height of 5'3" (160 cm) and weight of 130 lb (59kg). This gives her a BMI of 23 which places her in the 90th percentile for age and gender and categorizes her as overweight.

In contrast, the 8 year old boy with a weight of 156 lb (71 kg) and height of 4'11" (150 cm) has a BMI of 31.5 which places him > 99th percentile for age and gender, and categorizes him as morbidly obese. Children with BMI > 99th percentile have greater rates of cardiovascular as well as other obesity related comorbidities.

High risk dietary behaviors include frequency of dining out, consumption of sugar-sweetened beverages, increased portion sizes, consumption of fruit juice, low frequency of breakfast, high energy dense snacking, consumption of high-fat foods, and low consumption of fruits and vegetables. Unhealthy physical activity behaviors include decreased/low amount of total physical activity/day and increased amount of sedentary time spent in front of a screen (television, computer and video games).

The final component of the assessment is ascertaining the family and child's motivation to change, which involves assessing the family's level of concern and the importance to the family of making nutrition and activity change. With this information, the provider can counsel and set goals collaboratively with the family, maximizing their opportunities to succeed.

Prevention: All children in the BMI range from 5th – 84th percentile should have prevention counseling at well visits and at any other opportune patient-physicians encounters. The content of this visit may be a review of the "5210" practices:

- 5 - Consume at least 5 servings of fruits and vegetables daily
- 2 - View no more than 2 hours of television per day. Remove televisions from children's bedrooms. No television viewing is recommended for children under 2.
- 1 - Be physically active at least 1 hour per day
- 0 - Limit consumption of sugar-sweetened beverages (e.g., soda and sports drinks))

Many practices use a questionnaire to assess these behaviors and then ask families if they would like to talk about one of the 5210 behaviors at the visit. In young children it is also important to continue to encourage and promote maintenance of breastfeeding, which has a positive effect on prevention of obesity[12] in addition to all its other benefits. It is equally vital to assess self efficacy, readiness to change, and family support; to be positive and support small incremental steps for change; and to remind families that setbacks are normal. Physicians should troubleshoot any anticipated problems that crop up and be supportive of families returning to their original plan after a setback.

Stage 1 - Prevention Plus: The most efficient way to provide this intervention is to assess the workflow and use a team approach. For example, the person in the office who measures the height and weight may be the one to calculate and classify BMI, the office nurse may hand out a questionnaire to parents, the physician may offer counseling and goal setting and the checkout staff may ensure a timely revisit.

Behavior change begins with the provider and family and patient recognizing the need for change, assessing the willingness and capacity to change, and

setting small achievable goals that work toward the desired behavior change. Motivational interviewing is a technique that was recommended by the Expert Committee to help engage the family and patient in dialogue about change.

The healthy eating and physical activity habits recommended for Prevention Plus include the 5210 practices listed above, plus:

- Prepare meals at home rather than eating at restaurants.
- Eat together as a family at the table at least 5-6 times per week.
- Eat a healthy breakfast daily.
- Include the entire family in making healthy lifestyle changes.
- Allow the child to self-regulate his/her meal when parents have provided a healthy meal in appropriate portion size.
- Assist families in shaping recommendations to be consistent with their cultural values.

The goal for this stage is weight maintenance that with continued growth will reduce BMI. If after 3-6 months of monthly revisit, the patient has not improved, proceed to Stage 2.

Your 12 year old patient falls into the Prevention Plus category. In assessing her dietary patterns you note that she has multiple bad habits such as skipping breakfast (no time), eating pretzel and juice for lunch (not hungry for a regular lunch), eating snacks after school, eating dinners out 3x week (too busy to cook), etc. She has inadequate physical activity as well, with no gym this session, no recess, and too much TV and computer time. You find that she and her mother are both concerned about her weight and you continue with a family history focused on obesity and obesity related comorbidities, such as: Type 2 diabetes, polycystic ovarian syndrome, hypertension, lipid disorders, cardiovascular disease, stroke, liver disease, upper airway obstructive sleep apnea syndrome. The mother and maternal grandmother are obese; the grandmother has heart disease.

Your Review of Systems, again in addition to general questions, focuses on obesity related signs and symptoms such as: Headache, vision problems (Pseudotumor cerebri); shortness of breath, exercise intolerance (asthma, deconditioning); snoring, napping, declining school performance, enuresis (upper airway obstructive sleep apnea syndrome); abdominal pain (reflux, non alcoholic fatty liver disease, constipation, gall bladder disease); hip pain, knee pain, limp (slipped capital femoral epiphysis); knee pain, limp (Blount's disease); irregular menses (polycystic ovarian syndrome); primary amenorrhea (polycystic ovarian syndrome, Prader Willi syndrome); polyuria, polydipsia, unexpected weight loss (type 2 diabetes); anxiety, school performance decline, social isolation, sleep disturbance (depression).

Her mother feels she has low self esteem, avoids social situations, is moody, and sometimes angry, all indicating possible depression.

On Physical Examination, in addition to a routine examination, you look for obesity related physical findings such as: skin- striae (Cushings syndrome), acanthosis nigricans (insulin resistance, diabetes), hirsuitism and acne (polycystic ovarian syndrome); irritation/infection in skin folds (obesity, type 2 diabetes); eyes- papilledema, visual impairment, cranial nerve VI impairment (pseudotumor cerebri); throat- tonsillar/adenoidal hypertrophy (upper airway obstructive sleep apnea syndrome); neck- goiter (hypothyroidism); lungs- wheezing (asthma); cardiac (hypertension); abdomen- tenderness (non alcoholic fatty liver disease/non alcoholic steatohepatitis, gall bladder disease); genitourinary- Tanner stage (premature adrenarche, premature puberty, delayed puberty) micropenis (Prader Willi syndrome); extremities-abnormal gait, pain, limp, hip pain, knee pain (slipped capital femoral epiphysis, Blount's disease) small hands and feet (Prader Willi syndrome) polydactyly (Bardet Biedl syndrome).

Your 12 year old patient had a normal review of systems and was a Tanner 2.

Based on her BMI at the 90th percentile and absence of other risk factors, you follow the Expert Committee recommendations and order a fasting glucose, lipid profile, AST, ALT.

You highlight the following dietary patterns that the family may want to begin to change: after school–soda and snack food; dinner–family eats out 3x week; bedtime–cereal. Mother thought she could limit family's eating out to 2x/week and shop for sugarless beverages and healthier snack. Fig. 4

You also discuss her activity patterns: weekends "TV all the time;" extracurricular activity. Mother decides that she will work with her daughter to find another peer group activity; your patient thinks she would enjoy karate and family will limit TV watching on weekends by adding some family activities, such as taking a walk and visiting friends.

You ask mother and she agrees to schedule a revisit in a month to see how the family is doing with their goals.

Stage 2: Structured Weight Management – The primary difference between Prevention Plus and Structured Weight Management is that a specific plan and support for behavior change is provided to the patient and family. This can be done in a primary care office with additional support from a dietitian, counselor, physical therapist, or exercise therapist if needed.

Goals for this stage include the goals as above for Prevention Plus in addition to

- Dietary and physical activity behaviors;

- Development of a plan for utilization of a balanced macronutrient diet emphasizing small amounts of energy-dense foods
- Increased structure for daily meals and snacks
- Supervised active play of at least 60 minutes per day
- Screen time (computer, TV) of 1 hour or less per day
- Increased monitoring (e.g., screen time, physical activity, dietary intake, restaurant logs) by provider, patient and/or family
- This approach may be amenable to group visits with patient/parent component, nutrition and structured activity. The goals for this stage are weight maintenance that decreases BMI as age and height increase. Weight loss should not exceed 1 lb/month in children aged 2-11 years, or an average of 2 lb/wk in older overweight/obese children and adolescents.
- If no improvement in BMI/weight after 3-6 months of monthly visits, patient should be advanced to the next stage of Comprehensive Multidisciplinary care.

Your 8 year old boy with a BMI >95th percentile may start in this category, unless obesity related comorbidities require more intensive treatment.

You assess his dietary patterns and find that he eats: breakfast at home (cereal with 2% milk); breakfast at school– a surprise to mom (honey bun, apple juice); school lunch (extra money for ice cream, sometimes trades food); snack at home (juice and potato chips); dinner (2/7 nights order out), 2nds at home; beverages at home, soda, Gatorade™, juice-5 glasses/day.

His physical activity patterns are also in need of change; they include: physical education 1x/week; recess daily but "stands around;" no after school outdoor time; screen time 4 hours/day; TV in bedroom.

Obesity focused Family History shows that his father has hypertension, obesity and sleep apnea and a he has a maternal grandmother with diabetes.

Review of Systems reveals that he has snoring with pauses, daytime tiredness indicating possible sleep apnea, as well as poor school performance over past year which could indicate sleep apnea, or depression, low self esteem and possible teasing/bullying at school.

Physical examination showed that he had blood pressure 118/78 (systolic pressure >90th percentile), prehypertension; mild acanthosis nigricans; and enlarged tonsils.

Laboratory assessment recommended for a child with BMI >95th percentile is fasting lipid profile, AST, ALT q 2 years, fasting glucose. You also add a sleep study based on his symptoms of snoring with pauses, daytime tiredness, and poor school performance. You ask specifically about possible depression, teasing and bullying.

You discuss possible improvements in his dietary patterns with his mother and she is not happy with his double breakfast; she decides right away to stop his school breakfast. After discussion about acanthosis and the family history of diabetes and obesity, mother thought she could stop buying soda and sugared beverages, even though her son would initially be "unhappy."

You go over his physical activity and find that all physical activity changes seem hard to mother and son. They decide to "look into" the local Boys and Girls Club to see if he could go there after school. You ask them to keep track of his screen time and see them in one month.

You schedule monthly revisits for him and his family to track progress on goals.

If after 3 months he has not made progress you refer him either to a Stage 3 or 4 program for further treatment.

Stage 3: Comprehensive Multidisciplinary Intervention: This treatment usually is delivered in a pediatric weight management program by a multidisciplinary team composed of a behavioral counselor, a registered dietitian, an exercise specialist, and an obesity specialist. Weekly visits are recommended for at least 8-12 weeks and group visits should be considered. Parents must play a key role in the intervention including modifying the home environment and participating in behavior modification techniques.

- Eating and activity goals are the same as in Stage 2.
- Activities within this category should also include a structured behavioral modification program, including food and activity monitoring and development of short-term diet and physical activity goals.
- Goal is weight maintenance or gradual weight loss until BMI is less than 85th percentile. It should not exceed 1 lb/month in children aged 2-5 years, or 2 lbs/wk in older obese children and adolescents.

Stage 4: Tertiary Care Intervention: Patients with morbid obesity and/or significant obesity-related comorbidities may need intensive tertiary care in pediatric weight management centers offering comprehensive services that may include medications, very low-calorie diet, and weight control

surgery. The multidisciplinary team providing care includes a physician experienced in obesity management, a registered dietitian, a behavioral counselor, and an exercise specialist with expertise in childhood obesity and its comorbidities. Standard clinical protocols should be used for patient selection and evaluation, before, during, and after intervention. Bariatric surgery, including gastric bypass or gastric banding have shown to be effective, but are available at only a few centers.

CONCLUSIONS

Obesity treatment can be successful.[14,15,16,17,18] Components of effective treatments have included dietary and physical activity interventions, behavioral therapy, family involvement, and access to multidisciplinary teams.[19] Key to building treatment capacity for pediatric obesity are reimbursement models that support multidisciplinary care, support for training the needed medical personnel, ongoing parenting and family support to sustain treatment effects, and continuing research into treatment effectiveness.

REFERENCES

1. Flegal, KM, Carroll, MD, Ogden CL, Curtin L. Prevalence and Trends in Obesity Among US Adults, 1999-2008. JAMA. 2010; 303(3) 235-241.
2. Ogden CL, Carroll MD, Flegal KM High Body Mass Index for Age Among US Children and Adolescent 2003-2006.JAMA 2008; 299(20) 2401-2405.
3. James PT, Leach R, Kalamara E, Shaveghi M. The Worldwide Obesity Worldwide Obesity Epidemic Obesity Research 2001 9; s228-230.
4. IOTF reports to WHO—Obesity in children and young people; A Crisis in public health. Obesity Reviews May 2004 Vo 5 s1: 1-104
5. Ludwig DS. Childhood obesity—the shape of things to come N Engl J Med. 2007 Dec 6; 357(23):2325-7.
6. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual Medical Spending Attributable to Obesity; Payer-And Service-Specific Estimates. Health Affairs 2009; 28(5):w833-w831
7. Trasande L, Liu Y, Fryer G, Weitzman M. Affects of Childhood Obesity on Hospital Care and Costs 1999-2005 Health Affairs.2009;28 (4): w751-w760
8. Meaney MJ, Seckl JR Glucocorticoid programming Ann NY Ac Sci 2004 1032; 63-84
9. Anderson SE, Whitaker RC. Prevalence of obesity among US preschool children in different racial and ethnic groups. Arch Pediatr Adolesc Med 2009 Apr 163(4) 344-8.
10. Barlow SE. Expert committee recommendations regarding the prevention assessment and treatment of child and adolescent overweight and obesity summary report. Pediatrics. 2007; 120 Suppl 4:S164-192.
11. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patient with chronic illness JAMA 2002; 288; 1775-1779.
12. Davis, AMM, Gance-Cleveland, B, Hassink S, Johnson R, Paradis G, Resnicow K. Recommendations for Prevention Childhood Obesity Pediatrics 2007; 120/; S229-S253, www.pediatrics.org/cgi/content/full/120/Supplement_4/S164
13. Lamb MM, Dabelea D, Yin X, Ogden LG, Klingensmith GJ, Rewers M, Norris JM. Early life predictors of higher body mass index in healthy children. Ann Nutr Metab. 2010; 56(1):16-22.
14. Whitlock EA, O'Connor EP, Williams SB, Beil TL, Lutz KW. Effectiveness of weight management programs in children and adolescents. Evid Rep Technol Assess (Full Rep) 2008 Sep ;(170):1-308
15. Nowicka P, Hoglund P, Pietrobelli A, Lissau I, Flodmark CE. Family Weight School treatment; 1 year results in obese adolescents. Int J Pediatr Obese 2008; 3(3):141-7
16. Jelaltan E, Saelens IS. Empirically supported treatments in pediatric psychology; pediatric obesity. J Pediatr Psychol 1999; 24; 223-248.
17. American Dietetic Association Position of the American Dietetic Associate ion; Individual – family –school-community based interventions for pediatric overweight. J Am Diet Assoc 2006; 106:925-945.
18. Garipagaoglu M, Sahip Y, Darendeliler F, Akdikemen O, Kopuz S, Sut N. Family based group treatment versus individual treatment in the management of childhood obesity; randomized prospective clinical trail Eur J Pediatr 2009 Sep;168(9):1091-9
19. US Preventive Services Task Force Screen for Obesity in Children and Adolescents: US Preventive Services Task Force recommendations Statement. Pediatrics 2010; 125: 361-367

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