Factors Associated with Attendance after Referral to a Pediatric Weight Management Program

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Objective To evaluate factors affecting attendance or nonattendance at an initial interprofessional pediatric weight management visit after referral. We hypothesized that increased severity of obesity, farther distance from the program, lower education level of the primary caregiver, public insurance or no insurance, and lower socioeconomic status would all decrease likelihood of attending initial visit after referral.

Study design We examined referral and visit data over 4 years and 5 months. We used geocoding and multivariable logistic regression to analyze links between attendance and demographic factors, baseline body mass index, insurance type, and distance from patients' homes to the program site.

Results Over the study period, 41.2% of the 4783 children referred to the pediatric weight management clinic attended at least 1 visit. A total of 4086 children were included in the full analyses. Factors associated with attendance were female sex, higher body mass index severity class, private health insurance, residence in areas with higher median income, and residence in areas with a higher prevalence of high school completion.

Conclusions The current project expands our understanding of factors linked to children's attendance at an initial pediatric weight management visit. Despite limitations including missing data, results have important implications for pediatric weight management clinics, referring providers, and policymakers to target populations with low attendance and optimize use of these evidence-based programs. *(J Pediatr 2016;172:35-9)*.

Pediatric weight management programs have shown promise as part of a comprehensive strategy to address the key public health concern of pediatric obesity. Statements by the Academy of Nutrition and Dietetics, the US Preventive Services Task Force, and the American Academy of Pediatrics recommend an interprofessional, holistic approach for treating children with obesity through nutritional counseling, promotion of physical activity, behavioral counseling, and family involvement.[1-4] Such pediatric weight management programs target both weight reduction and improvement of other health outcomes.

Despite the promise of these programs in treating children with obesity and its comorbidities, many families face barriers to engagement and participation in care.[5-8] Factors impacting treatment continuation likely overlap with those impacting initiation, but there also may well be differences in these complex processes. The paucity of research to date on pediatric weight management treatment initiation leaves much uncertainty about the factors that actually influence whether a family will follow through with a first visit after an initial referral by another provider.

This project examined factors related to treatment initiation and engagement through comparisons of the characteristics of patients and families who attended an initial pediatric weight management visit after being referred and those who did not follow through on a referral. Our aim was to identify factors differentiating patients who follow through with referral to pediatric weight management clinics from those who do not.

Methods

The current study was approved and granted a waiver of consent by the University of Louisville Institutional Review Board (11.0176). Participants in the current analyses were all patients referred to an interprofessional, tertiary care pediatric weight management clinic from April 2009-October 2013. The clinic was a Stage 3 "comprehensive multidisciplinary intervention" as defined in the standards of the American Academy of Pediatrics Expert Committee[2] with services including medical evaluation and oversight; dietary counseling with a registered dietitian; supervised and prescribed exercise with an exercise physiologist; individual, family, and group therapy with a psychologist; family support; and specialist referrals as needed. Individual visits were offered monthly, with some patients coming every 2 weeks and others coming less frequently. The group program was run

BMI	Body mass index
SES	Socioeconomic status

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by a psychologist, dietician, and exercise physiologist and offered to all patients on an ongoing weekly basis without charge to the families. The majority of patients were referred by their primary care provider, with a minority referred by pediatric medical subspecialists.

Baseline demographic data including date of birth, sex, insurance status, and residential address as well as the patient's height, weight, and body mass index (BMI) were obtained from the referral form completed by staff at the referring physicians' offices and faxed to the pediatric weight management clinic. There were several iterations of the referral form provided by the pediatric weight management clinic over the course of the project, and referring providers sometimes used their own forms. The varied forms did not provide dependable information on the race, ethnicity, or language spoken by referred children and their families, so these demographic variables from the referral forms were not included in the analyses. For patients who attended one or more visits at the pediatric weight management clinic within 6 months of referral, date of visit and BMI were extracted from the medical chart. Referral forms for these patients had been moved to storage with their paper charts and were unobtainable for this study, but their BMIs at initial visit had been recorded in an accessible database. Records missing a valid sex, BMI, date of birth, or address were excluded from the analyses. A valid BMI was defined as a BMI recorded by either the referring provider or the pediatric weight management clinic within 6 months of the referral date.

BMI thresholds for overweight and obesity were defined per the growth charts from the Centers for Disease Control and Prevention.[9] Patients with higher baseline BMI values were further categorized into obesity classes using percentages of the 95th percentile, as recommended by the American Heart Association.[10] These values are similar to the smoothed 99th percentile data, but several studies suggest that percentage above the 95th percentile provides a better tool for classification.[11,12] Severe obesity was subdivided into class II and class III. Class II obesity was defined as a BMI either greater than 120% of the 95th percentile or in the range of 35-39.9, and class III obesity was defined as a BMI of greater than 140% of the 95th percentile or equal to or greater than 40, whichever was lower.[13] These percentages of the 95th percentile correspond approximately to BMI values of 35 and 40, used to define class II and class III obesity in adults.

Neighborhood level demographic data were gathered based on residential location using US Census Bureau 2012 American Community Survey and 2010 decennial census data. Variables examined include median household income, percent residents with a high school education, and percent Hispanic residents. Metrics of median household income and percent with at least high school level education were collected at the census tract level. Racial makeup was collected at the census block group level.

Statistical Analyses

Residential addresses were corrected for flaws including spelling errors, invalid characters, and invalid formats. Valid addresses were subsequently geocoded using the Geographic Information System ArcMap 10.x software (Environmental Systems Research Institute, Inc, Redlands, California). Geographic Information System was used to compile income, education, and racial makeup of referred patients' residential neighborhood environment. Neighborhood environment data were then linked to subject records based on geographic location of geocoded addresses.

Additional analyses were conducted using SPSS v 22 (SPSS Inc, Chicago, Illinois). Referred patients were stratified into 2 groups: those who did not attend the pediatric weight management program and those who attended the pediatric weight management program for at least 1 visit. χ^2 tests were used to test for differences in categorical variables (sex, BMI class, and insurance status) between the 2 groups, and independent-samples t tests were used to test for differences in continuous variables (age, percentage above the 95th percentile, distance to clinic, median income, percent high school education, and percent Hispanic). To test which variables independently predicted attendance of the pediatric weight management program, multivariable logistic regression modeling techniques were employed. Hosmer-Lemenshow tests and Bayes Information Criteria were used to indicate the most parsimonious model.

Results

A total of 4783 patients were referred to the pediatric weight management clinic from April 2009-October 2013. Of these, 1970 (41.2%) attended at least 1 clinic visit, and 2813 were referred but never attended. A total of 697 were excluded from all other analyses because a valid BMI, date of birth, sex, insurance category, or residential address was not available. Almost all of the patients excluded because of missing data never attended a clinic visit. Thus, 1963 (48.0%) children included in our analysis attended at least 1 clinic visit, and 2123 were referred but never attended. Among patients included in the full analyses, the majority were female (58.9%), had more severe obesity (76.4% with obesity class II or III), and were older (64.2% were ≥11 years old).

Demographic characteristics of children who attended at least 1 clinic visit and those who did not are presented in **Table I**. Females, children with class III obesity, and those with private insurance were significantly more likely to attend at least 1 visit. Children who attended at least 1 visit also lived in census tracts with higher median incomes and higher prevalence of high school completion. Absolute distance from the child's residence to the clinic was not significantly associated with clinic attendance, nor was living in a census block with a high percentage of Hispanic ethnicity.

Residential location of 3766 patients was geographically located via residential address. An additional 313 subjects whose listed addresses were not able to be precisely matched were located via zip code or municipality. Valid location data were not available for 7 subjects. Geographic patterns of percent clinic attendance (**Figure**) strongly mirrored those of both income and education. There were significant