


# Diagnosis and Screening of Overweight and Obese Children in a Resident Continuity Clinic

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## Abstract

**Objective.** To evaluate the association between documenting excess weight and ordering screening tests. **Methods.** We retrospectively reviewed well-child visits for patients 2 to 18 years old at a pediatric resident clinic. We evaluated visits of patients with body mass index  $\geq$  85th percentile for documentation of excess weight in the electronic medical record (EMR) and screening tests ordered. Associations were investigated with  $\chi^2$  tests. **Results.** Of 522 patients, 215 (41%) were overweight (19%) or obese (22%). Among obese and overweight patients, 92/215 (43%) had documentation of excess weight in the EMR. Screening tests were ordered for 39/92 (42%) patients with a diagnosis of excess weight versus 8/123 (6.5%) of those without one ( $P < .001$ ). **Conclusions.** Documentation rates of excess weight by practitioners were low and worse for younger children and those with milder degrees of excess weight. Documenting excess weight in the EMR was highly associated with ordering of screening tests.

## Keywords

electronic medical record, screening recommendations, overweight, obesity, residents

## Introduction

Childhood overweight and obesity are a significant problem in the United States. Almost 32% of US children aged 2 to 19 years have a body mass index (BMI) at the 85th percentile or greater.<sup>1</sup> Childhood obesity is a risk factor for concurrent diabetes mellitus, nonalcoholic fatty liver disease, hyperlipidemia, and cardiovascular disease,<sup>2</sup> and increases risk for adult obesity. Expert committee guidelines from the American Academy of Pediatrics (AAP) published in 2007 outline recommendations for the prevention, assessment, and treatment of child and adolescent overweight and obesity (Table 1).<sup>3</sup>

Appropriate counseling and treatment for overweight and obesity begins with health care provider recognition of elevated BMI and screening for obesity-related comorbidities. Pediatric providers underrecognize overweight and obesity and do not perform evaluations and interventions consistent with expert committee recommendations.<sup>4</sup> A review of nationally representative data from 1997 to 2000 found that providers diagnosed obesity in only 0.93% of well-child visits for children aged 2 to 18 years.<sup>5</sup> More recent data from 2005 to 2007 report that physicians documented a diagnosis of obesity in 18% of youth aged 2 to 18 years who had BMI above

the 95th percentile for age and sex, which is an improvement in documentation but remains far below the actual prevalence of obesity and overweight.<sup>4</sup>

Identification of overweight and obesity is particularly problematic among young children and those with milder degrees of obesity. An evaluation of health supervision visits at an academic pediatric hospital showed providers identify obesity as a problem for only one-half of obese children aged 3 months to 15 years, with the lowest rates of identification among children  $<5$  years of age and those with milder degrees of obesity.<sup>6</sup> In a retrospective chart review of outpatient visits at 2 academic hospitals, children under age 5 years and with BMI percentile of 85% to 94% were least likely to receive diagnosis and intervention for overweight.<sup>7</sup>

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**Table 1.** AAP Recommendations for the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity.

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2007 AAP obesity and overweight definitions

- Under 2 years: Overweight = weight-for-length >95th percentile for age/sex
- Over 2 years:
  - Overweight = BMI 85-94th percentile for age/sex
  - Obese = BMI >95th percentile for age/sex

2007 AAP serum screening recommendations for obese/overweight patients

- Any *overweight* or *obese* patient should have fasting lipids
- If  $\geq 10$  years old: any *obese* patient OR any *overweight* patient with risk factors for type 2 diabetes should have fasting lipids, aspartate aminotransferase/alanine aminotransferase (AST/ALT), and fasting glucose. Type 2 diabetes risk factors include the following:
  - Family history of diabetes
  - High-risk racial/ethnic background (black, Hispanic, or Native American)
  - Polycystic ovarian syndrome
  - Acanthosis nigricans
  - Cardiovascular disease risk factors
- If serum screening laboratory studies are normal, may repeat every 2 years after age 10

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Abbreviations: AAP, American Academy of Pediatrics; BMI, body mass index.

Challenges exist in improving rates of screening for obesity-related comorbidities. Surveys of pediatric providers have found variable adherence to guidelines for screening for obesity-related comorbidities. A study of children seen for well-child care in a diverse group of pediatric practices in Chicago from 2002 to 2003 showed rates of laboratory screening for obesity-related comorbidities among children with BMI  $\geq 85$ th percentile to be low (7% to 13%), but screening rates improved when providers documented overweight in the medical record.<sup>8</sup> Since the release of the AAP 2007 recommendations for pediatric obesity management, a survey of pediatricians' behaviors and beliefs reported variability in the use of laboratory screening and referrals for children with overweight and obesity.<sup>9</sup>

The use of an electronic medical record (EMR) may facilitate weight-related evaluations in pediatrics. The Kaiser Permanente Southern California Pediatric Weight Management Initiative evaluated more than 700 000 patients using computer-assisted decision tools that standardized pediatric weight management. In this setting, diagnosis of overweight or obesity increased significantly from 12% to 61%, and documented counseling rates for exercise and nutrition increased significantly from 1% to 50%.<sup>10</sup> Furthermore, a systematic review in *Pediatrics* evaluated 13 studies that used information technology (including EMR use, telemedicine counseling, telephone support, and text-messaging) to deliver obesity screening

or treatment to children aged 2 to 18.<sup>11</sup> The use of EMRs was associated with improvements in BMI documentation and counseling about nutrition and physical activity; however, these studies did not demonstrate a significant improvement in laboratory screening.<sup>11</sup>

We conducted a study to determine how often pediatric residents correctly diagnose overweight/obesity and order laboratory screening tests based on the AAP 2007 Expert Committee recommendations at pediatric health supervision visits. We hypothesized that residents are more likely to correctly order serum-based screening tests when they correctly diagnose overweight or obesity in the EMR.

## Patients and Methods

### Overview

We conducted a retrospective chart review of patient visits at 1 of the 2 pediatric resident continuity clinic sites affiliated with our large, tertiary care, academic pediatric hospital, the Ann & Robert H. Lurie Children's Hospital of Chicago (formerly Children's Memorial Hospital), the pediatric teaching hospital affiliated with Northwestern University Feinberg School of Medicine. The clinic studied operates 4 mornings and 4 afternoons each week. Each clinic is staffed by up to 9 residents per session (varies due to resident schedules and duty hours). Each resident is assigned to a half-day session each week that does not change during residency training. Residents are supervised by 2 to 3 attending physicians in each session; some are full-time academic generalist pediatric faculty and some are volunteer community-based pediatricians. Each half-day session is supervised by the same attending physicians each week. The study was approved by the institutional review board of Children's Memorial Hospital.

### Study Population

The clinic serves a predominately urban, minority population (49% Hispanic, 33% African American); 90% are insured by Illinois Medicaid. Using our EMR we identified patients aged 2 to 18 years who were seen for a well-child visit from March 1, 2010, through August 31, 2010, and had both a height and weight documented at the visit.

### Measures

All subjects had date of birth, date of visit, reason for their visit, and BMI extracted from the hospital EMR. BMI was calculated and plotted automatically on Centers for Disease Control BMI growth charts by the EMR

**Table 2.** Weight Status by Age<sup>a</sup>.

Patient Category	All Ages		Age 2-9		Age 10 and Older	
	Number	Percentage of Age Group	Number	Percentage of Age Group	Number	Percentage of Age Group
All	522	N/A	346	N/A	176	N/A
BMI $\leq$ 85th percentile	307	58.8	222	64.2	85	48.3
Overweight	99	19.0	64	18.5	35	19.9
Obese	116	22.2	60	17.3	56	31.8
Overweight or obese	215	41.2	124	35.8	91	51.7

Abbreviations: N/A, not applicable; BMI, body mass index.

<sup>a</sup>Chi-square 16.115 (df = 2);  $P < .001$ .

(weight in kilograms divided by height in centimeters squared). Subject BMI was categorized as normal, overweight, or obese. Overweight was defined as BMI  $\geq$  85th and  $<$ 95th percentile; obesity was BMI  $\geq$  95th percentile; and normal was BMI from 5th to  $<$ 85th percentile.

If the patient had a BMI  $\geq$  85th percentile for age and sex, the visit record was evaluated for (a) the appropriate diagnosis of either overweight or obesity in the EMR and (b) proper screening tests ordered in the previous 2 years. Subjects were grouped by age into 2 to 9 years and  $\geq$ 10 years to correspond to the AAP's laboratory screening recommendation age groups. We defined "correct diagnosis" as the notation of terms such as obese, overweight, or elevated BMI in the visit ICD-9 code, in the provider's assessment at the time of the visit, or in the EMR problem list for the patient. Credit was given for "correct diagnosis" if any concern about excess weight was documented, regardless of whether the patient's associated BMI was correctly categorized as overweight or obese. The EMR was then examined for screening laboratory tests for obesity-related comorbidities ordered in accordance with the 2007 AAP panel recommendations within the previous 2 years. We determined that patients had "appropriate" screening laboratory tests if an overweight patient had fasting lipids, if an obese patient aged 2 to 9 had fasting lipids, or if an obese patient aged  $\geq$ 10 years had fasting lipids, aspartate aminotransferase/alanine aminotransferase (AST/ALT), and fasting glucose. Patients who had laboratory studies in addition to the AAP's recommended labs were considered to have had "appropriate" screening. Physician compliance with the guidelines was assessed on the basis of laboratory test ordering and not on whether patients actually went to the laboratory to have the screening tests performed.

### Data Analysis

Data were summarized using descriptive statistics. We used  $\chi^2$  tests to examine associations between diagnosis

of overweight or obesity, recommendations for laboratory screening testing consistent with AAP panel recommendations, and patient age.

### Results

A total of 1075 charts of patients seen for well-child care visits were reviewed. Of these, 522 patients were at least 2 years old and were included in the study. Included subjects had a mean age of 8.06 years (standard deviation 4.47 years); 66% of subjects were aged 2 to 9 years.

Two hundred and fifteen of the 522 subjects (41%) met criteria for either overweight or obesity; 19% were overweight and 22% were obese. Children aged  $\geq$ 10 years were more likely to be obese or overweight than younger children (Table 2). Ninety-nine subjects (19.0%) were overweight; 17/99 (17.2%) carried a correct diagnosis of overweight in the EMR. One hundred sixteen subjects (22.2%) were obese; 74/116 (63.7%) carried a correct diagnosis of obesity in the EMR. Two hundred fifteen subjects were overweight or obese; 91 (42.3%) were correctly diagnosed. Older children were more likely to have a diagnosis of overweight or obesity. Among the 91 children  $\geq$ 10 years, 52 (57.1%) had a correct diagnosis in the EMR, while among the 124 children aged 2 to 9 years, only 39 (31.5%) had a correct diagnosis in the EMR ( $P < .001$ ; Table 3).

Overall, screening tests consistent with 2007 AAP guidelines were ordered for 21.9% of patients with obesity and overweight. Test ordering was significantly more common for those with an overweight or obesity diagnosis in the EMR: AAP guideline-recommended tests were ordered for 39 of 91 (42.3%) patients with a correct diagnosis versus 8 of 124 (6.5%) missing a correct diagnosis ( $P < .001$ ; Table 4). In addition, test ordering was more common when BMI was at or above the 95th percentile; recommended tests were ordered for 31.9% of obese children and 10.0% of overweight children ( $P < .001$ ).

**Table 3.** Correct EMR Diagnosis by Age for Overweight and Obese Subjects<sup>a</sup>.

Patient Category	All Ages		Age 2-9		Age 10 and Older	
	Number	Percentage of Age Group	Number	Percentage of Age Group	Number	Percentage of Age Group
Total overweight or obese	215	N/A	124	N/A	91	N/A
No correct diagnosis in EMR	124	57.7	85	68.5	39	42.9
Correct diagnosis in EMR	91	42.3	39	31.5	52	57.1

Abbreviations: N/A, not applicable; EMR, electronic medical record.

<sup>a</sup>Chi square 14.2 (df = 1);  $P < .001$ .

**Table 4.** Laboratory Screening and EMR Diagnosis for Overweight and Obese Subjects<sup>a</sup>.

	All Subjects		No Correct Diagnosis in EMR		Correct Diagnosis in EMR	
	Number	Percentage of Total	Number	Percentage of Group	Number	Percentage of Group
Total: Overweight or obese	215		124		91	
Screening laboratory tests ordered	47	21.9	8	6.5	38	41.8
No correct laboratory orders	168	78.1	116	93.5	52	57.1

Abbreviation: EMR, electronic medical record.

<sup>a</sup>Chi square 40.72 (df = 1);  $P < .001$ .

## Discussion

Overweight and obesity were common in our urban, predominantly Medicaid-insured clinic population, with a combined prevalence of 41%. Similar to findings in other studies, rates of documentation of overweight and obesity by practitioners were low and worse for younger children and for those with milder degrees of excess weight. In addition, physicians in our clinic frequently failed to order recommended laboratory tests: labs consistent with the 2007 AAP guidelines were ordered for 21.9% of patients with BMI  $\geq$  85th percentile. This rate of testing is actually higher than the 13% reported by O'Brien et al in an academic continuity clinic population<sup>6</sup> and the 7% to 13% reported by Dilley et al in a Chicago-area community-based sample.<sup>8</sup> Our higher screening rates could be related to greater pediatric provider awareness of the 2007 AAP guidelines or a function of increasing public and professional awareness of obesity. It is also possible that the opportunity to discuss a patient with another physician, as occurs when a resident discusses a patient with a clinic attending, increases the likelihood of recognition and evaluation of medical concerns. Our data do not address this possibility.

Office-based tools to support documentation of BMI and nutrition/activity counseling can help improve

adherence to obesity recognition and treatment recommendations.<sup>12</sup> EMRs that include automatic BMI plotting, as ours does, are associated with increased documentation of overweight.<sup>13</sup> While prior studies have not demonstrated that, in itself, the use of an EMR improves rates of serum laboratory screening for overweight and obese patients, these studies did not investigate an interaction between provider recognition of excess weight, the EMR-based prompt, and subsequent ordering of screening tests.<sup>13,14</sup> Our results, despite the fairly low overall rates of laboratory screening, show that recording a correct diagnosis of excess weight in the EMR was highly associated with appropriate ordering of screening tests.

It seems logical that the first step in identifying the need for screening for obesity-related comorbidities is recognizing and documenting the presence of overweight/obesity. However, our study does not identify the way in which the presence of an EMR diagnosis facilitates ordering appropriate laboratory studies. It is unclear whether providers record the diagnosis in the EMR when they order laboratory tests, having already identified a patient as obese or overweight, or whether they use a preexisting documented diagnosis as a prompt to order appropriate screening. Additional investigation of clinician recognition of overweight/obesity and adherence to guidelines for screening for obesity-related complications is needed.

Our study has several limitations. It is a single-site study and represents the practices of residents in training, which may limit its generalizability. Prior studies have found that resident physicians are more likely than attending physicians to document and plot BMI,<sup>15</sup> which may suggest that the trainees in our study were more likely than the average physician to focus on weight-related issues. However, the residents were directly supervised by board-certified attending pediatricians who practice in a variety of settings and who were responsible for the quality of care provided in the clinic. It is possible we misclassified some children with BMIs in the overweight range who should have had screening labs *in addition* to fasting lipids on the basis of diabetes risk factors from their personal or family history—such children would lower the proportion of correctly screened overweight children. These limitations should be considered in interpreting our results but they would be unlikely to significantly alter the implications of our findings.

We anticipate that introduction of an EMR-based automatic prompt to alert providers to a patient's weight status based on patient height and weight will improve serum-based screening and increase the diagnosis and treatment of overweight/obesity-related comorbidities. However, in our study, rates of laboratory screening were low even among patients with an EMR diagnosis of overweight or obesity. Other barriers to physician adherence to the AAP guidelines should be considered. Cabana et al cite 3 barriers for physician adherence to clinical practice guidelines: lack of familiarity, lack of awareness, and lack of agreement with guidelines. Their research shows that lack of adherence can be due to differences in the interpretation of the evidence, believing the benefits are not worth the risk, discomfort, or cost, or believing that guidelines decrease clinician autonomy.<sup>16</sup> Physicians may not agree with the screening recommendations, may not believe adhering to the guidelines will change patient care or improve health outcomes, or may not know how to react appropriately to abnormal laboratory values.

Ideally, a streamlined EMR with automated prompts would help physicians recognize obesity, evaluate abnormal values, reinforce healthy eating behaviors with their patients, and increase awareness of obesity-related dangers. In addition to the potential for direct benefit to individual patients, the Affordable Care Act (ACA) includes provisions for increased reimbursement for “meaningful use” of EMRs, including documenting overweight and obesity and providing counseling to patients. The effectiveness of such provisions in the ACA, EMR-based prompt strategies, and their subsequent impact on patient or family adherence to recommended changes in diet and exercise will require further study.

## Declaration of Conflicting Interests

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