Using Electronic Health Records to Address Overweight and Obesity
A Systematic Review

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Context: Overweight and obesity are problems of tremendous public health importance, but clinicians often fail to discuss weight management with their patients. Electronic health records (EHRs) have improved quality of care for some conditions and could be an effective mechanism for helping clinicians address overweight and obesity. This review sought to summarize current evidence on the use of EHRs for assessment and management of overweight and obesity.

Evidence acquisition: The authors searched PubMed/MEDLINE, Cochrane Central Register of Controlled Trials, Embase, Web of Science, CINAHL, INSPEC, IEEE Explore, and the ACM Digital Library from their inception through August 15, 2012; analyses were conducted between September 2012 and March 2013. Eligible studies had to involve a new feature or a change in an existing feature within an EHR related to the identification, evaluation, or management of overweight and obesity. Included in the review were RCTs and nonrandomized controlled trials, pre-post studies with a historical control group, and descriptive studies. One reviewer screened all of the titles and abstracts. Citations that were potentially eligible were independently reviewed by two reviewers. Disagreements were resolved by consensus.

Evidence synthesis: Of the 1188 unique citations identified, 11 met the inclusion criteria. Seven of these studies were conducted in children and adolescents, and four were conducted in adults. Most of the studies were pre-post studies with a historical control group, and only three were RCTs. Most of the interventions included calculation, display, or plotting of BMI or BMI percentiles; fewer included other features. The majority of studies examined clinician performance outcomes; only two studies examined patient outcomes.

Conclusions: Few studies have examined whether EHR-based tools can help clinicians address overweight and obesity, and further studies are needed to examine the effects of EHR features on weight-related outcomes in patients.


Context

Overweight and obesity are problems of tremendous clinical and public health importance. Almost 69% of U.S. adults are overweight or obese (BMI≥25), and the prevalence continues to increase in some groups.1 Overweight and obesity are also common in the pediatric population, with almost 32% of children and adolescents being overweight or obese (≥85th gender-specific BMI-for-age percentile).2 Even small amounts of weight loss in overweight or obese individuals can lead to substantial health benefits.3–6 Clinical practice guidelines are available on the identification, evaluation, and management of overweight and obesity in adults7–10 and children and adolescents.11,12 Despite these guidelines, however, clinicians often fail to diagnose overweight and obesity or to discuss weight management with their patients.13–21

Many clinicians use electronic health records (EHRs), and adoption of EHRs has been increasing since the
Health Information Technology for Economic and Clinical Health (HITECH) Act was introduced in 2009. The HITECH Act provides incentives for clinicians and hospitals to implement EHRs and to become “meaningful users” of certified health information technology. The decision to include the incentives was based on evidence suggesting that EHRs can lead to substantial improvements in the quality of health care. Previous studies have shown that electronic reminders and clinician decision support within EHRs have improved compliance with medical practice guidelines for conditions such as hypertension, diabetes, and coronary artery disease.

Electronic health records also could be an effective mechanism for assisting clinicians with assessment and management of overweight and obesity. For example, in 2010, calculation and display of BMI became one of the new features of EHRs to assist with the management of overweight and obesity. For example, in 2010, calculation and display of BMI became one of the new features of EHRs to assist with the management of overweight and obesity.

Evidence Acquisition

The primary research questions that this review sought to address were: (1) What studies have been done to examine how EHRs can be used to improve assessment and management of overweight and obesity? and (2) What do these studies show about the effectiveness of EHRs for improving assessment and management of overweight and obesity?

This review included published articles and abstracts that involved an intervention using an EHR, which was defined as a new feature or a change in an existing feature within an EHR pertaining to assessment or management of overweight and obesity. Studies that only used EHRs as a source of data were excluded, as were studies involving a personal health record, web-based program, or other computerized tool not connected to an EHR. Both RCTs and nonrandomized controlled trials were included, as were pre–post studies with a historical control group, and descriptive studies that reported quantitative results.

The literature search was developed and conducted by an experienced reference librarian. The search included controlled vocabulary terms when available and related text and keyword searches in a manner that combined terms related to EHRs with vocabulary terms when available and related text and keyword searches in a manner that combined terms related to EHRs with those related to overweight, obesity, or weight management (Appendix A, available online at www.ajpmonline.org). The authors searched PubMed/MEDLINE (NCBI); Cochrane Central Register of Controlled Trials (Wiley); Embase (Elsevier, 1974–); Web of Science (ISI Web of Knowledge, 1900–); CINAHL (EBSCO Host, 1981); INSPEC (EBSCO Host, 1898–); IEEE Explore (IEEE, 1988–); and the ACM Digital Library (ACM, 1947–) without beginning date limits through August 15, 2012. Additional citations also were identified by reviewing the reference lists of related papers and review articles.

One reviewer screened all of the titles and abstracts to identify any citations that were potentially eligible, and then two other reviewers independently reviewed the full text of these citations to determine which ones met the inclusion criteria. Studies that were not eligible were grouped into categories based on the reason for exclusion. Both reviewers completed a detailed electronic data extraction form for each study, following the PRISMA guidelines for reporting of systematic reviews and meta-analyses.

To assess the risk of bias in studies that were included, a measure of study methodologic quality was used that was based on the 10-point scoring system developed for two previous systematic reviews on the effects of computerized clinical decision support systems. The measure included points for method of allocation to study group, unit of allocation, presence of baseline differences between the groups that were potentially linked to study outcomes, objectivity of the outcomes, and completeness of data for the appropriate unit of analysis. After both reviewers completed the full text review, one reviewer cross-checked all of the information; disagreements were resolved by consensus.

Important features of the included studies were summarized using frequencies and percentages for categoric variables and medians and interquartile ranges (IQRs) for ordinal variables. Because the study designs and outcomes were heterogeneous, a meta-analysis was not conducted. However, the reviewers noted which studies showed significant improvements in at least one of the clinician performance or patient outcomes examined, using \( p < 0.05 \) as the criterion for significance. All analyses were carried out between September 2012 and March 2013 using SAS, version 9.3.

Evidence Synthesis

A total of 1188 unique citations were identified from the literature search. Based on the initial screening of the titles and abstracts, 64 citations were selected as potentially eligible. After review of the full text, 53 were excluded, and 11 met the inclusion criteria for this systematic review (Figure 1).

Four of the 11 studies were conducted among adults (Appendix B, available online at www.ajpmonline.org). In two of these, the intervention was limited to automatic calculation or display of BMI in the EHR. Bordowitz et al. conducted a pre–post study of 302 patients who were seen in two family medicine clinics between 2002 and 2004. The intervention was a new EHR with automatic calculation of BMI. They found significant increases in documentation of diagnosis (from 31% to 71%, \( p < 0.05 \)) and treatment (from 35% to 59%, \( p < 0.05 \)) for obese patients, but not for overweight patients, after the introduction of the new EHR.

Schriever and colleagues conducted an RCT of 846 obese patients. The intervention consisted of a staff member obtaining height and weight from patients,
calculating BMI manually, and entering it into the record; a computerized BMI prompt was then displayed. That study also showed significant improvements in documentation of diagnosis and management of obesity for the intervention compared to the control group; 16.6% of patients in the intervention group had a diagnosis, compared to 10.7% in the control group ($p=0.016$), and 14.0% of patients in the intervention group were referred for diet treatment compared to 7.3% in the control group ($p=0.002$).

The other two studies in adults included additional features within the EHR besides calculation or display of BMI. Krist et al. conducted a descriptive study including 5679 patients seen at nine primary care practices. The intervention consisted of a prompt for BMI $\geq 25$, an electronic form with checkboxes for the 5A's (assess, advise, agree, assist, arrange), and electronic links for clinicians to refer patients for counseling. They found that clinician advice was documented for 7% of overweight and 17% of obese patients, and 3% of overweight patients and 12% of obese patients were referred for counseling; however, there was no control group.

In the second of the two studies, Tang and colleagues conducted an RCT of 400 overweight patients (BMI: 27–29.9) seen at a general internal medicine clinic. The intervention consisted of a new electronic tool set in the EHR, including an alert for overweight, a counseling template, and an order set to facilitate entry of overweight as a diagnosis, import template information into the note, and enable ordering of patient-specific handouts. They observed significant improvements in documentation of overweight as a diagnosis and documentation of counseling for overweight for patients in the intervention group compared to the control group. A total of 21% of patients in the intervention group had a diagnosis, compared to 6.5% in the control group ($p=0.02$), and 26.5% of patients in the intervention group had documentation of counseling, compared to 14.5% in the control group ($p=0.02$). Patients in the intervention group who received counseling using the EHR tools also were contacted by phone after their visit for a follow-up interview. Of patients who completed the interview, 93% reported that they set a weight management plan and took steps toward their plan, 56% reported losing weight, 90% reported increased motivation, and 84% reported new changes in their diet and physical activity after their visit.

There were seven studies among children and adolescents that met the inclusion criteria (Appendix C, available online at www.ajpmonline.org). In two of these, the EHR intervention consisted only of automatic calculation of BMI and plotting of age- and gender-specific BMI percentiles on growth charts. Shaikh et al. conducted a pre–post study in one pediatric primary care clinic in California, which included 550 children and adolescents aged 2–18 years who had well child visits in 2006–2007. They found no significant changes in documentation of BMI and BMI percentile or documentation of weight status (underweight, normal, overweight, or obese), although there was an increase in assessment and counseling for some risk factors and behaviors; for example, documentation of assessment of high-calorie food intake increased from 8% to 14% ($p=0.048$), and documentation of counseling increased from 3% to 24% ($p<0.0001$).

Keehbauch and colleagues utilized a hybrid design, with a pre–post comparison for the EHR upgrade but a nonrandomized control group for physician education about counseling for overweight and obesity. This study was conducted at two community-based family medicine residency clinics in the southern U.S. and included 2340 children and adolescents aged 2–18 years who had visits between 2004 and 2007. The percentage of overweight and obese children with a documented diagnosis increased at both sites, but there was a greater increase at the site that also included physician education (10.5%, $p<0.01$) compared to the site that only had the EHR upgrade (8.5%, $p<0.05$). Counseling for diet and exercise also increased at both sites.
Of the remaining five studies in children and adolescents, four were pre–post studies in which the intervention included features other than calculation and plotting of BMI and BMI percentiles. The first of these studies was conducted by Benson et al. among 60,711 children and adolescents who had a well child visit at MetroHealth, a large academic medical system in northeastern Ohio, between 1999 and 2007. The intervention was an abnormal BMI “flag” in the EHR; the patient’s BMI was displayed in red if the percentile was ≥85th or ≤10th. Although there were increases in documentation of diagnosis of overweight and obesity over the course of the study period, there was no significant change in the trend after the introduction of the abnormal BMI flag.

Gance-Cleveland and colleagues conducted a study in a school-based primary care health center and included 201 children and adolescents who had well child visits in 2006 or 2008. The intervention was a kiosk and decision support system that included calculation of BMI and BMI percentiles, display of growth charts, and a cardiovascular risk summary and tailored recommendations. The study showed significant increases in documentation of BMI (64% to 86%, p < 0.001); BMI percentile (31% to 76%, p < 0.001); blood pressure (83% to 97%, p < 0.001); and blood pressure percentile (1% to 35%, p < 0.001).

A third study was conducted by Coleman et al. within Kaiser Permanente Southern California and included all children and adolescents aged 2–17 years who had outpatient visits between 2007 and 2010; there were an average of 739,816 children and adolescents per year of the study. The intervention consisted of many EHR enhancements, such as calculation of BMI and BMI percentiles, display of growth charts, an alert for BMI > 85th percentile for age and gender, recommendations about counseling and screening, a tool for referring patients to a health education program, and information for patients about diet and physical activity. The study showed significant increases in documentation of height and weight (from 66% to 94%, p < 0.0001); documentation of diagnosis of overweight and obesity (from 12% to 61%, p < 0.0001); and documentation of exercise and nutrition counseling (from 1% to 50%, p < 0.0001).

The fourth study, conducted by Savinon and colleagues, included 74 children and adolescents aged 7–18 years who were presenting for a well child or routine physical examination at a community health center between September and December of 2009. The intervention consisted of customization of the EHR to include a template with information about screening for obesity and related comorbidities, links for ordering lab tests, an obesity visit–specific encounter note, a flowsheet for tracking obesity, prompts for providers to indicate diagnosis and to encourage counseling, and links to patient handouts. Although the study reported increases in documentation of diagnosis of overweight and obesity (from 3% to 12%) as well as in counseling and referral of patients, the significance levels were not reported.

Only one RCT among children and adolescents has been published. In this study by Taveras et al., ten pediatric practices were randomized to an intervention group or to usual care; practices in the intervention group received primary care restructuring as well as EHR enhancements, such as electronic templates for documentation and tracking, printable materials, and comprehensive billing codes for obesity. The study examined changes in BMI and obesity-related behaviors over 1 year. Compared with the usual care group, patients in the intervention group had a smaller but nonsignificant change in BMI (−0.21, p=0.15). There were greater decreases in TV viewing among patients in the intervention group compared to the usual care group (−0.36 hours/day, p=0.01) and nonsignificant decreases in some of the other obesity-related behaviors.

Appendix D (available online at www.ajpmonline.org) summarizes key characteristics of all 11 studies that were included. The number of studies increased with time, with four studies published in 2012. Nearly two thirds of the studies were conducted in children and adolescents. The majority of the studies were pre–post studies, and only three were RCTs. Most of the interventions involved calculation, plotting, or display of BMI or BMI percentile, whereas fewer consisted of additional features such as flags or alerts for high BMI, management recommendations, or assistance with referral of patients to other programs or resources.

Almost all studies focused exclusively on clinician performance outcomes, such as documentation of BMI or diagnosis of overweight and obesity, and most showed significant improvements in at least one of these outcomes. Only two studies examined any patient outcomes, such as changes in BMI or weight-related behaviors, and only one of these showed significant improvement. The median methodologic quality score across all 11 studies was 7 (IQR=6–9).

Discussion

Overweight and obesity are common conditions associated with numerous adverse health outcomes. Many studies have shown that clinicians underidentify overweight and obese patients and fail to counsel them about weight management. EHR interventions could be an effective mechanism for helping clinicians address overweight and obesity with their patients; they have the potential to reach many individuals and are relatively low cost compared to more intensive strategies. However, the authors found only 11 published studies that examined
the effect of EHRs on identification, evaluation, or management of overweight and obesity.

Several gaps in these studies were identified. First, most EHR interventions have focused on increasing identification of overweight and obesity, and few to date have included features to assist providers with management of overweight and obesity, such as patient-specific recommendations and tools for referring patients to other resources. A systematic review of the effects of clinical decision-support systems found that provision of recommendations, rather than just assessments, was an important independent predictor of improved clinical practice. In the future, it will be critical for EHR-based interventions for overweight and obesity to incorporate these types of features, in order to maximize their impact.

Almost all the studies included in this review focused only on clinician performance outcomes, such as documentation of diagnosis of overweight and obesity and documentation of counseling or treatment, and did not examine any patient outcomes, such as changes in BMI, weight, or weight-related behaviors. This is consistent with studies that have examined the impact of EHRs and clinical decision support on quality of care for other conditions. For example, a systematic review of the use of EHRs for the clinical treatment of tobacco dependence reported that most EHR interventions were associated with increased documentation of smoking status, but none of the included studies directly assessed patient quit rates. Studies that have examined the impact of EHRs on patient outcomes related to control of diabetes and hypertension are fairly sparse and have had mixed results. Although the evidence from the current review suggests that EHR interventions are effective at increasing diagnosis and treatment for overweight and obesity, it remains unclear whether this will lead to meaningful changes in patient behaviors or weight loss. Future studies that focus on EHR interventions for overweight and obesity should measure changes in intermediate patient outcomes, such as motivation and behaviors, as well as changes in BMI or weight.

Limitations
A limitation of this review is that it only included published articles and abstracts and did not evaluate publication bias. However, given that the results from the studies that were included were mixed, it is unlikely that there was substantial publication bias or selective reporting of results within studies. Another limitation is that the authors included only studies that examined an intervention or change within an EHR pertaining to assessment or management of overweight and obesity. This scope was chosen because the goal was to determine what types of EHR-based interventions have been implemented specifically for overweight and obesity and how effective they have been. However, there are many other ways in which EHRs may be used more broadly for supporting or facilitating delivery of obesity care, as part of the larger care system.

Rao and colleagues have outlined a number of ways in which EHRs may be useful for transforming chronic disease management and care transitions. Some of these are supporting providers in tracking, coordinating, and managing tasks for high-risk individuals; helping ensure patient safety through electronic prescribing and drug interaction alerts; and improving communication and self-management through features such as secure messaging, data and information exchange, and patient portals. EHRs also could be used as a way to enroll and monitor patients who are participating in clinical trials of treatments for overweight and obesity. Future studies should address the role of these and other EHR functionalities in improving the quality of obesity care.

Conclusion
Few studies have examined whether EHRs can be used to improve assessment and management of overweight and obesity. The studies that have been done suggest that EHR interventions can increase diagnosis and treatment of overweight and obesity, but it is unclear whether this will lead to better patient outcomes. Further studies are needed to evaluate the effects of more sophisticated EHR features that assist clinicians with management, rather than just assessment, of overweight and obesity. In addition, these studies must measure effects on patient weight-related outcomes, as well as clinician performance outcomes.

HJB was supported by a Mentored Research Scientist Career Development Award from the Agency for Healthcare Research and Quality (K01HS019789). IC was supported by the Korea Research Foundation Grant funding by the Korean Government (Ministry of Education & Human Resources Development, KRF-2010-0005952).

The funding organizations had no role in the design and conduct of the study; in the collection, analysis, and interpretation of the data; or in the preparation, review, or approval of the paper.

No financial disclosures were reported by the authors of this paper.

References


Appendix

Supplementary data

Supplementary data associated with this article can be found, in the online version at, http://dx.doi.org/10.1016/j.amepre.2013.05.015.