Effect of an obesity best practice alert on physician documentation and referral practices

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Abstract

The Centers for Medicare & Medicaid Services Electronic Health Record Meaningful Use Incentive Program requires physicians to document body mass index (BMI) and a follow-up treatment plan for adult patients with BMI ≥ 25 . To examine the effect of a best practice alert on physician documentation of obesity-related care and referrals to weight management treatment, in a cluster-randomized design, 14 primary care clinics at an academic medical center were randomized to best practice alert intervention ($n = 7$) or comparator ($n = 7$). The alert was triggered when both height and weight were entered and BMI was ≥ 30 . Both intervention and comparator clinics could document meaningful use by selecting a nutrition education hand-out within the alert. Intervention clinics could also select a referral option from the list of clinic and community-based weight management programs embedded in the alert. Main outcomes were proportion of eligible patients with (1) obesity-related documentation and (2) referral. There were 26,471 total primary care encounters with 12,981 unique adult patients with BMI ≥ 30 during the 6-month study period. Documentation doubled (17 to 33%) with implementation of the alert. However, intervention clinics were not significantly more likely to refer patients to weight management than comparator clinics (2.8 vs. 1.3%, $p = 0.07$). Although the alert was associated with increased physician meaningful use compliance, it was not an effective strategy for improving patient access to weight management services. Further research is needed to understand system-level characteristics that influence obesity management in primary care.

Keywords

Obesity, Best practice alert, Primary care, Electronic health record

Over one third of adults in the USA meet criteria for obesity (body mass index [BMI] ≥ 30 kg/m²) [1]. Behavioral weight management treatment produces, on average, a loss of 8–10% of initial weight, which is associated with decreased risk for diabetes and significant improvement in cardiovascular disease risk factors [2, 3]. Given this evidence, the US Preventive Services Task Force (USPSTF) recommends that primary care physicians (PCPs) screen for obesity and

Implications

Practice: Best practice alerts can be used to facilitate documentation of weight counseling and improve physician meaningful use compliance.

Policy: Healthcare organizations and policy makers need to explore feasible and sustainable strategies (e.g., educating physicians about treatment options, improving insurance coverage of services) to expand coordination of care between primary care and clinic or community-based weight management programs.

Research: Future studies are needed to better understand the system-level characteristics (e.g., number of staff available, level of access to weight management treatment programs) that are needed to improve obesity management in primary care.

offers all patients with BMI ≥ 30 intensive behavioral treatment for obesity [4]. The Centers for Medicare & Medicaid Services (CMS) provides physicians with financial incentives for using the electronic health record (EHR) to document quality measures under the EHR Meaningful Use Incentive Program, which was introduced in 2011 to improve quality of care [5]. The meaningful use obesity-related quality metric for patients 18 and older (NQF 0421), which is based on the USPSTF recommendation [4], consists of documenting BMI as well as a follow-up treatment plan for patients with a BMI ≥ 25 .

Clinical decision support systems can be used to facilitate meaningful use [6, 7]. Previous studies suggest that clinical decision support tools (e.g., BMI calculators, alerts at the point of care, and interactive counseling templates) embedded within the EHR increase PCP documentation of obesity diagnosis and weight counseling [8–10]. Despite this evidence, important barriers remain, such as time constraints, discomfort discussing weight issues, and lack of knowledge regarding available treatment options [11–14]. As such, more than two thirds of patients with obesity nationally are not being offered or referred to obesity

treatment by their PCP [15, 16]. Thus, PCPs need access to clinical decision support tools that not only facilitate meaningful use but also help in addressing these barriers to obesity management within clinical practice.

To address these issues, we conducted a pragmatic pilot study to develop and evaluate a best practice alert embedded within the EHR system at an academic medical center. The alert was designed to improve PCP adherence to the meaningful use BMI quality metric and increase referrals to clinic-based and community-based weight management programs. Our primary outcomes were PCP documentation of obesity-related care and the proportion of eligible patients with a referral to weight management treatment.

METHODS

Setting

This study was conducted at Rush University Medical Center, an academic medical center in Chicago, with the Rush University Medical Group (RUMG) primary care clinics. RUMG consists of 14 clinics with ~197 PCPs who complete over 200,000 patient visits annually. Rush uses Epic (EpicCare, Epic Systems Corporation, Verona, WI) as its EHR system. The system calculates and prominently displays a patient's BMI at the top of the medical record when both height and weight are entered. Also, an EHR-based tool is available that can facilitate meaningful use documentation, including a

follow-up treatment plan for obesity, within the progress note (Fig. 1). This tool consists of a drop-down menu to indicate if weight counseling was provided or a referral to a dietitian made, or if counseling was not performed due to medical reasons. Despite the capabilities of Rush's EHR system, only 17% of patients with BMI ≥ 30 had obesity-related documentation in their medical records from January 2015–July 2015 based on the use of the EHR-based tool and referral orders placed through the EHR system to a dietitian.

Study design

The 14 RUMG clinics were randomized at a 1:1 ratio using a computer-generated randomization scheme to one of two conditions: (1) best practice alert for obesity with nutrition education handouts (comparator) or (2) best practice alert for obesity with nutrition education handouts and a list of clinic-based and community-based services for weight management (intervention). This study was approved by the Rush Medical Center Institutional Review Board, which granted a waiver of informed consent to identify and review electronic charts of patients with BMI ≥ 30 .

Best practice alert—As part of a quality improvement initiative, a behavioral psychologist (first author) worked with senior system leadership and the informatics team at Rush to design and implement a best practice alert in the EHR system to feasibly capture and increase PCP documentation to meet meaningful use criteria. This process also included developing a list to facilitate referrals to clinic-based and

Progress Notes (F3 to enlarge)

Bookmark

Arial 11 B I U A Insert SmartText

(MEANINGFUL USE:21041000)

INFLUENZA: {VACCINE STATUS:2100501521}

{Dietary and exercise counseling provided:TXT,63600}

Referral to dietitian made.

BMI counseling not performed because of medical reason

Tobacco cessation counseling provided.

Diagnosis of Persistent Asthma.

Asthma: ACT score: ***

Asthma: Patient is not on asthma medication because: {BECAUSE:21041001}

Current medications reviewed

Sign at Close Encounter

Restore Close Cancel Previous Next

Fig. 1 | Rush University Medical Center electronic health record tool for meaningful use documentation

community-based weight management programs. The alert was reviewed and approved by the Primary Care Working Group, which consists of primary care medical directors, as well as by the Quality Measure Subcommittee at Rush before it was implemented in August 2015. Senior system leadership also sent emails to PCPs describing the best practice alert before implementation. As part of this process, personnel from the Rush Department of Information Services visited each clinic to provide training on use and features of the alert.

The alert was triggered when both height and weight were entered on the vitals screen within the patient's electronic medical record, and a BMI ≥ 30 was calculated. The alert was considered a passive alert because PCPs could ignore it and were not forced to take any action once it was triggered. During the first 6 months of implementation, the alert was designed to be activated when BMI ≥ 30 (instead of ≥ 25) to prevent immediate alert fatigue and to not overwhelm the clinic-based weight management programs. After the alert was triggered, PCPs would see a bright yellow box (see Fig. 2a, b) indicating the patient's BMI and the option to open the alert. Once the best practice alert was opened, PCPs were provided with simple language to help start a conversation using three of the five As (Ask, Advise, and Assist) [17–19]. This feature was included in the alert to address the discomfort PCPs sometimes have when trying to discuss weight with their patients. The language for Assist varied based on the clinic randomization assignment (Fig. 2a, b). The use of the best practice alert (i.e., selecting a handout and/or providing a referral)

counted as meaningful use documentation of a treatment plan for obesity for that encounter. PCPs could also indicate if they provided counseling on their own or if weight loss was contraindicated at the time using the alert.

Best practice alert with handouts only (comparator; $n = 7$ clinics)—Clinics in this study arm could meet the meaningful use BMI quality metric by using the previously available EHR-based tool within the progress note (Fig. 1) or by ordering a referral through the EHR system to a clinic-based weight management service to document obesity treatment. The nutrition handouts were developed by a registered dietitian and focused on the “how” of making health behavior changes. Handout topics included tips on reading food labels, portion control, increasing vegetable intake, emotional eating, and healthy recipes. Providers accessed these handouts through the alert, and they were printed out with the patient's After Visit Summary, which we counted as documentation of a follow-up plan.

Best practice alert with handouts plus referral list (intervention; $n = 7$ clinics)—Intervention clinics also had access to the nutrition handouts through the alert. In addition, to enhance PCP and patient awareness about available treatment options, we embedded in the best practice alert a list of diverse weight management-related programs at Rush University Medical Center and in the community at the time of the study (Fig. 2b). The Rush Department of Nutrition consists of students and registered dietitians who provide individual treatment. The Rush Prevention Center and Department of Behavioral Sciences consist of behavioral

a High Body Mass Index

BMI is in the obese range ≥ 30
 Estimated body mass index is 53.59 kg/m² as calculated from the following:
 Height as of this encounter: 152.4 cm (5')
 Weight as of this encounter: 136.1 kg (300 lb)

Ask "Do you have any concerns about your weight? Is that something you want to work on at this time?"

Advise "Your current weight increases your risk for heart disease, stroke, diabetes, and cancer or the recurrence or worsening of these diseases. The good news is that moderate weight loss has been shown to greatly reduce the risk or improve these diseases."

Assist "If you're interested, we can talk a bit more about your weight and I can provide you with some handouts to help you get started with making some small, healthy changes. So, is this a good time for us to get started?"

Use the SmartSet to add patient instructions

[Open SmartSet](#) [Do Not Open](#) [BMI](#) [Preview](#)

Acknowledge Reason (Reason applied)

☒ Dietary and exercise counseling provided ☐ Patient refuses measurement of height and weight

☐ Weight loss contraindicated at this time

[Accept \(1\)](#)

b SmartSets

BMI Referrals

Request For...

☐ Prevention Center: Individual and Group based behavioral lifestyle treatment for weight and chronic disease management; Mindfulness Based Stress Reduction Program; weight loss medication

☐ Behavioral Health: Department of Behavioral Sciences Eating Behavior and Obesity Program - Cognitive behavioral treatment for weight loss and unhealthy eating behaviors, as well as pre- and post-bariatric surgery psychological support. Referral to facility-DEPT OF BEHAV SCIENCES

☐ Request For Medical Nutrition Therapy

☐ Program Membership: Chicago Park District Fitness and Swim
 Referral to facility-Chicago Park District Fitness and Swim, Website: <https://apm.activecommunities.com/chicagoparkdistrict/membership>

☐ Program Membership: Take Off Pounds Sensibly (TOPS)
 Referral to facility-Take Off Pounds Sensibly, Website: www.tops.org Email: wondering@tops.org Available Programs: In-person group meetings, Online membership

☐ Program Membership: Weight Watchers
 Referral to facility-Weight Watchers, Website: www.weightwatchers.com Available Programs: In-person group meetings, Online Plus Program, Personal Coaching

☐ Behavioral Health in Diabetes Program
 Provides help with adjustment to diabetes or management of mood, stress, weight, and other health concerns. Call Clinic Coordinator at 312-942-6973 to schedule an appointment.

☐ Bariatrics

BMI Patient Instructions

Prints on the patient's After Visit Summary

☐ Healthy Eating and Portion Guidelines

☐ Healthy Snack Ideas

☐ High Protein Breakfast Ideas

☐ Eat More Vegetables

☐ Home Prepared Meal Ideas

☐ Food Label Reading

☐ Emotional Eating Management Strategies

[Associate](#) [Edit Multiple](#) [Providers](#) [Remove](#) [Send](#) [Sign](#)

[Restore](#) [Close](#) [Previous](#) [Next](#)

Fig. 2 | a Best practice alert for comparator arm. **b** Best practice alert for intervention arm. Patient instruction handouts were also available for the comparator arm

health psychologists who provide individual and group-based behavioral weight loss treatment; additional practitioners in the Rush Prevention Center include a registered dietitian and endocrinologist who specialize in weight management. A referral for a bariatric consultation with the Center for Weight Loss and Bariatric Surgery consists of the patient meeting with a bariatric surgeon to learn about surgical options for weight loss. Community-based resources were selected based on the use of evidence-based practice and popularity. Weight Watchers is a well-established community-based program that provides group-based, internet-based, and/or peer coaching [20, 21]. The Chicago Park District provides low-cost or free access to fitness classes, pool, and a walking track at several locations across Chicago. Take Off Pounds Sensibly (TOPS) provides a weight management support group that meets in-person or connects online via the website and blogs [22]. We considered selection of a clinic-based or community-based resource as a referral and documentation of a follow-up treatment plan. PCPs were able to order the referrals directly through the best practice alert, therefore simplifying the referral and documentation process. Contact information for the selected referral service was provided to the patient in the After Visit Summary.

Statistical analysis

This study took place between August 2015 and February 2016. Our two outcomes of interest were proportion of patients with BMI ≥ 30 with (1) documentation of obesity-related care and (2) referral to clinic-based or community-based weight management programs. We extracted data to calculate both outcomes from the EHR. In addition to using the best practice alert for obesity-related documentation, documentation was also counted if it was completed using the EHR-based tool within the patient's progress note (Fig. 1) or a referral was placed to a Rush University Medical Center service within the EHR system. Although patients may have had multiple encounters with their PCP during the 6-month study period, PCPs were not expected to address and document obesity-related care at every visit. For the meaningful use BMI quality metric, CMS requires documentation of a follow-up treatment plan within 6 months of identifying overweight or obesity during a reporting year. CMS does not require that a follow-up treatment plan be documented after each primary care encounter [5]. Because some patients had multiple encounters, we developed a set of rules to create a unique patient dataset for the primary analysis. Primary care encounters that had documentation of a referral (either via the alert or referral order to clinic-based weight management services through the EHR system) were first priority, encounters that involved the use of the alert were second, encounters that involved the use of the EHR-based tool to document within the progress note were third, and encounters with no documentation

were fourth. For each study arm, the number of unique patients with weight-related documentation (or a referral) over six months was computed (numerator) and divided by the total number of unique patients for whom the best practice alert was triggered over that same period (denominator). Using Mplus v7.4, we ran generalized linear mixed models [23] to examine proportions of documentation and referrals by treatment arm while adjusting for the clusters (i.e., 14 clinics), patient sex, race/ethnicity, insurance status, and age (mean centered).

To understand PCPs' opinions about the acceptability of and satisfaction with the best practice alert, a research assistant who was not involved in the development of the alert (KD) conducted semi-structured interviews with PCPs within clinics that were randomized to the intervention arm. All PCPs within the intervention clinics were invited to participate in the interviews. The interviews were audiotaped and transcribed. Transcripts were read, and the first coder (KD) consulted with the second coder (SLF) on the key themes identified to ensure study reliability. In addition, a subset of patients who had visits at the intervention clinics during the study period were contacted by email or phone and asked to complete a brief survey after their primary care encounter. As part of this survey, we asked these patients if their PCP addressed their weight status, provided handouts, and referred them to a weight management program.

RESULTS

Because this was a quality improvement initiative, all 14 clinics participated, with 7 clinics randomized to the comparator arm and 7 randomized to the intervention arm (see Fig. 3). There were a total of 26,471 primary care encounters (including patients with multiple visits) with patients who had a BMI ≥ 30 during the study period. The best practice alert was triggered for 72% of the total encounters (66% among comparator total encounters and 76% among intervention total encounters). Based on this result, we know that height and weight were not entered for more than 25% of the encounters. Among the encounters where the alert was triggered (i.e., 19,164), there were 12,981 (68%) unique patients. Characteristics of the 12,981 unique patients for whom the alert was triggered are provided in Table 1. Two thirds of the patients were female and from a racial/ethnic minority background. The mean age was 53 years old, and almost one third of patients were Medicare recipients. The number of PCPs per clinic ranged from 1 to 122, with the largest clinic being a resident training clinic. Also, nine PCPs saw patients in more than one clinic; however, five of those PCPs saw only one patient at any of the other clinics. We reran the primary analysis removing encounters within the clinic with 122 PCPs in one model and removing encounters with the nine PCPs in another model to examine the impact on results (see findings below).

Fig. 3 | Consort diagram for cluster-randomized pilot pragmatic study depicting the flow of clinics and patients through randomization, intervention, and outcome analysis. *EHR* electronic health record

Of the 12,981 unique patients for whom the alert was triggered, 33% had documentation of obesity treatment (31% using the best practice alert), suggesting that the alert increased documentation compared to the previous 17% documentation rate from January 2015–July 2015. In the unconditional model (i.e., no predictors or covariates), the intraclass correlation was 0.54, which indicates that more than half of the variability in the outcome measure (i.e., documentation) was due to differences between the clinics. We found no significant difference in proportion of unique patients with documentation between the comparator arm (35%) and the intervention arm (32%) when adjusting for the clusters ($p = 0.19$). Once triggered, the alert was used to document weight management

for 33% of the visits in the comparator arm and 29% in the intervention arm ($p = 0.25$). Table 2 presents results from the generalized linear mixed models. White non-Hispanic compared to Hispanic/Latino patients and patients with private insurance compared to Medicare were significantly more likely to have documentation of a follow-up treatment plan for obesity. Similar results were found for use of the best practice alert only (Table 2).

Only 2.2% of unique patients seen during the study period and for whom the alert was triggered had a referral to weight management treatment. Most referrals were made to the Department of Nutrition (1.5%). Clinics in the intervention arm provided a referral to weight management services for 2.8% of unique

Table 1 | Characteristics of unique patients with BMI ≥ 30

	<i>N</i> = 12,981
Age in years, mean (SD)	53.18 (15.58)
% Female	67
% White non-Hispanic	32
% Black non-Hispanic	46
% Hispanic/Latino	7
% Asian	0.8
% Other race/ethnicity	15
% Private insurance	33
% Medicaid	38
% Medicare	26
% Other insurance (e.g., self-pay, Tricare, workers' comp)	4

Of the 26,471 total encounters during the study period, 12,981 were unique patients

Table 2 | Predictors of documentation of a follow-up plan for obesity ($n = 12,981$ patients)

	All documentation Adjusted OR (95% CI)	Use of BPA Adjusted OR (95% CI)
Study arms		
Comparator arm	1.00 [Reference]	1.00 [Reference]
Intervention arm	5.01 (0.84–29.95)	4.85 (0.73–32.30)
Age in years (centered)	1.00 (0.99–1.00)	1.00 (0.99–1.00)
Race/ethnicity		
White non-Hispanic	1.00 [Reference]	1.00 [Reference]
Black non-Hispanic	0.91 (0.68–1.21)	0.89 (0.67–1.19)
Hispanic/Latino	0.86 (0.76–0.98)	0.83 (0.73–0.95)
Asian	0.95 (0.62–1.47)	1.04 (0.66–1.65)
Other	0.91 (0.72–1.15)	0.89 (0.70–1.13)
Sex		
Male	1.00 [Reference]	1.00 [Reference]
Female	0.95 (0.77–1.16)	0.95 (0.76–1.19)
Insurance		
Private	1.00 [Reference]	1.00 [Reference]
Medicaid	0.87 (0.75–1.01)	0.85 (0.76–0.97)
Medicare	0.89 (0.84–0.95)	0.91 (0.86–0.97)
Other insurance (self-pay, Tricare, workers' comp)	0.97 (0.78–1.20)	0.96 (0.77–1.18)

patients, compared with only 1.3% in the comparator arm ($p = 0.07$). Younger age and black non-Hispanic patients were more likely to receive a referral than white non-Hispanics (Table 3). Medicare patients were less likely to receive a referral than patients with private insurance (Table 3).

To account for the wide range in number of PCPs per clinic and possible contamination, we reran the models, first removing all encounters that took place in the clinic with 122 PCPs. In a separate analysis, we removed all encounters with the nine PCPs who saw patients at multiple clinics. With removing the clinic with 122 PCPs, documentation was 35% comparator vs. 39% intervention ($p = 0.16$), best practice alert use

was 33% comparator vs. 36% intervention ($p = 0.13$), and referral was 1.3% comparator vs. 3.4% intervention ($p = 0.16$). Clearly, this clinic, which was randomized to the intervention arm, influenced the results. Perhaps because so many PCPs in this clinic were residents who were not in the practice of documenting weight management, this decreased the proportion of patients with documentation in the intervention arm. In contrast, when we removed the nine PCPs, results were very similar to the original findings. Thirty-five percent in the comparator vs. 32% in the intervention arm had documentation ($p = 0.24$); alert use was 33% in the comparator vs. 29% in the intervention ($p = 0.22$), and referral was 1.3% comparator vs.

Table 3 | Predictors of patient receipt of referral for obesity treatment ($n = 12,981$ patients)

	Adjusted OR (95% CI)
Study arms	
Comparator arm	1.00 [Reference]
Intervention arm	2.23 (0.95–5.22)
Age in years (centered)	0.98 (0.97–0.99)
Race/ethnicity	
White non-Hispanic	1.00 [Reference]
Black non-Hispanic	1.51 (1.10–2.08)
Hispanic/Latino	0.95 (0.77–1.17)
Asian	Sample size too small
Other	1.13 (0.95–1.35)
Sex	
Male	1.00 [Reference]
Female	1.36 (0.97–1.91)
Insurance	
Private	1.00 [Reference]
Medicaid	0.89 (0.68–1.16)
Medicare	0.73 (0.60–0.88)
Other insurance (self-pay, Tricare, workers' comp)	0.92 (0.60–1.41)

3.0% intervention ($p = 0.03$). Findings suggest that although practicing in different clinics (sometimes switching between comparator and intervention arm clinics), documentation practices were generally consistent for these nine PCPs.

PCP acceptability and satisfaction with best practice alert—semi-structured interviews

A research assistant who was not involved in the development of the alert conducted semi-structured interviews with four of the intervention clinics (23 PCPs total). Three overarching categories emerged from these interviews: (1) alert usability and placement, (2) specific use of handouts, and (3) specific use of the referral list (Table 4). Within the alert usability and placement category, overall comments were negative. Many PCPs felt that they needed additional education about how the alert worked, such as how often it would be triggered, what had to be selected in order for documentation to count, and what happened once certain selections were made. Some PCPs also discussed alert fatigue and thought that there were too many clicks within the alert to complete documentation. However, some PCPs stated that the alert's yellow box helped to remind them to address obesity with their patients. They also liked receiving an immediate "reward" because the box turned green after documentation had been completed.

All of the PCPs stated that they found the handouts very useful because they helped to facilitate weight counseling during the encounter. Some of the PCPs asked for the handouts to be made available in Spanish and to reflect nutrition education about foods more typical in the Hispanic/Latino culture. However, PCPs voiced concerns about the referral list, including lack of knowledge about the programs listed, which one was appropriate to select for their patient, and if the services listed would be covered by the patient's insurance.

Patient follow-up on referrals

We administered a brief survey with patients seen in the intervention arm clinics by email or phone after their primary care encounter to determine whether weight was addressed during the encounter and whether they received any weight management resources (i.e., handouts or referrals). Because of the study's budget and personnel limitations, we could not follow-up on all of the 12,900 encounters within the intervention clinics. As such, we set a goal of obtaining 500 completed surveys during the study period. Approximately 8000 emails were sent, and 295 phone calls were attempted. Of the 500 patients who completed the survey, 73% were women, 52% were white, 33% were black, 5% were Hispanic, 40% were on Medicaid, and 25% were Medicare beneficiaries. Sixty percent ($n = 302$) reported that their PCP talked to them about their weight. Of these patients, 37% ($n = 111$) reported receiving a handout on nutrition and 28% ($n = 85$) received a referral for weight management treatment. A total of 84% of those

patients who received a referral followed up (38%) or planned to follow-up (46%) on the referral. Twenty-four patients (75%) who followed up on the referral actually attended an appointment at the referral service.

DISCUSSION

We found no significant difference in the proportion of unique patients with weight-related documentation between the intervention and comparator arms. Furthermore, clinics with access to a list of referral options to weight management services embedded in the best practice alert were not significantly more likely to refer their patients than clinics without access to this list. Across both study arms, the proportion of patient visits with documentation almost doubled during the implementation study period from 17 to 33%. The improvement in documentation of obesity-related care after implementing an EHR-based tool seen in this study is consistent with older studies published between 2007 and 2012 and conducted in larger health systems, which also demonstrated an improvement in BMI screenings, documentation of obesity-related care, and referrals after implementation of an EHR-based tool [8–10]. Although the EHR-based tool improved PCP adherence to meaningful use in terms of documentation, our findings suggest that increasing documentation had little impact on improving PCP referrals to weight management services.

We were not surprised that documentation did not significantly differ between the two arms given that both versions of the best practice alert were considered "active interventions." In response to national health-care reform, senior leadership at Rush Medical Center required that all PCPs have access to a new tool (beyond the previous EHR-based tool) in order to improve meaningful use compliance. Thus, both versions of the alert were designed to facilitate and improve documentation practices for all PCPs despite clinic randomization. The intervention arm alert, however, was also designed to improve referrals to clinic-based and community-based weight management programs by providing a list of referrals. Despite the availability of such a list, only 2% of unique patients had a referral for weight management treatment. This result suggests that PCPs provided weight counseling for the majority of encounters where the alert and/or EHR-based tool was used; however, the quality of this counseling cannot be determined from this study. Another study that also used a clinical decision support tool embedded in the EHR to facilitate referral to community-based programs had a higher percentage of patients with obesity (i.e., 12%) that were referred to intensive counseling probably due to the use of an active rather than passive alert as well as offering intensive counseling for free to patients [24]. Despite this result, however, most EHR users are opposed to active alerts due to alert fatigue, and offering programs for free may not be sustainable in non-integrated healthcare settings and low-resourced community health centers.

Although Hispanic/Latino patients have a higher prevalence of obesity than their white counterparts

Table 4 | Quotes from semi-structured interviews based on three categories

Categories	Quotes
Alert usability and placement	<p>Negatives</p> <ul style="list-style-type: none"> • “I think, yeah, a cheat sheet [to remember how to use the BPA] would be really, really helpful and decreasing the clicks.” • “But if they can only summarize, this would be even better. Less clicks... because we have to do colonoscopy, mammogram, DEXA, we have a lot of clicks.” • “It’s just easy to ignore...” • “... maybe getting properly instructed on how to use Epic to go through this... I think that’s more of the issue.” • “The alert is in a very poor place for a physician during their flow. You’re not going to talk to your patient about obesity before you say “Hi, how are you? What are you here for today?” So the whole place where it is, is wrongly placed. And then it takes several clicks to get to your thing. It would be much better at a time down the visit to see it. But otherwise I like the instructions that you can click on.” <p>Positives</p> <ul style="list-style-type: none"> • “It’s gone, kind of satisfactory, no more yellow box...” • “So it’s not as... jolting to them [patients], I guess, to be given this diagnosis because there’s potentially a plan...”
Specific use of handouts	<p>Positives</p> <ul style="list-style-type: none"> • “It’s nice having those [patient] instructions right there so you can just pick easily...” • “I’m a big turning the screen person – and saying, “Hey which of these things would you like to hear more about?” ... And you can look at that [the handout], bringing the patient into the conversation.” • “At least there’s something that prints out.” • “I think healthy snacks, healthy eating for Hispanic patients also. ‘Cause those of us who practice in Spanish see a lot of that too [culturally based diets]. How many tortillas equal to, ya know, ‘cause they’ll eat tortillas and not bread.” <p>Negatives</p> <ul style="list-style-type: none"> • “But, the other thing that doesn’t help me at all is, I can click any one of these [referrals] and I have no idea if my patient can do any of them because for many of them their insurance isn’t going to cover it.” • “I’ve found this a little confusing, it takes longer to enter it in... I guess I’m unfamiliar with it, so I actually had to read each one individually [referral options]...”
Specific use of referral list	

[1], a conversation about weight or at least documentation of such occurred significantly less often for Hispanic/Latino patients. This finding may be related to an issue of language barriers impeding communication with the PCP and limiting referrals for outside resources. Among the materials and programs offered within the alert, all of the handouts were written in English and none of the weight management programs were offered in Spanish. Despite this, black patients were more likely to receive referral for weight management treatment than white patients. While this finding may reflect the severity of chronic disease among the black patients [15, 16], we did not examine data on disease diagnosis as part of this study. Interestingly, Medicare beneficiaries were less likely to receive weight management counseling and/or referral despite CMS financial incentives provided to PCPs who provide these services. Further research is needed to understand this phenomenon, which has also been observed using national data [15].

While we found that the proportion of primary care patients who had documentation of obesity-related care (33%) improved over the course of this study, the rate remains comparable to the suboptimal national rate of 29% [16]. Our interviews with 23 PCPs from intervention clinics identified a number of usability and placement issues that may have contributed to the poor practice of documenting weight-related treatment. For instance, some PCPs complained that the placement of the alert was not consistent with the workflow of the primary care visit and that alert fatigue as well as insufficient education on the different components of the alert made it easy to ignore the alert. These interviews also revealed additional reasons for the low percentage of referrals, including PCP lack of knowledge about each referral option and concerns about insurance coverage. Although we made a considerable effort to involve PCPs in the development of the best practice alert by getting input from the Rush Primary Care Working Group and the Quality Measure Subcommittee, clearly there was a need for more pre-implementation work including having PCPs test out the alert during real patient encounters to determine usability and consistency with workflow. Despite these barriers, the PCPs found the handouts to be the most useful tool because they helped to facilitate the conversation about weight and could be easily given to the patient with their After Visit Summary.

Sixty percent of the 500 patients who completed the survey reported that their PCP had discussed their weight during their last primary care encounter. Over one third of the patients who received a referral ($n = 85$) followed up on the referral, and three quarters of these attended an appointment with one of the weight management services. This finding is in contrast to research that suggests that patients often have poor follow-up with specialty referrals [25]. A recent study suggest that majority of patients want to discuss weight loss with their PCP [26] and discussing referral options may be associated with an increased likelihood that patients follow-up.

Limitations

This study has several limitations. First, it is unclear if implementing the best practice alert in this current study directly caused the doubling in documentation. The only other quality improvement initiative implemented at Rush during the same time period focused on hypertension management by increasing blood pressure screenings. This initiative may have led to the increase in weight-related documentation because the relationship between obesity and hypertension is well documented. However, the emphasis of the blood pressure initiative was medication management, not lifestyle change. Additionally, individual clinics may have implemented their own strategies to address obesity that we were unaware of, which may explain the great variability in documentation between clinics. However, given the short time period between estimating the 17% documentation rate (January 2015–July 2015) and implementing the best practice alert, we expect that implementation of the alert was associated with the increase in documentation. Second, the study period was only 6 months. If the study covered a longer time period, the PCPs could be expected to gain experience with referrals to obesity treatment programs and learn which programs insurance covered, which would likely have increased the number of referrals in the intervention clinics. In addition, a longer study period would have allowed us to explore the relationship between PCP behavior (i.e., documentation or referrals) and patient clinical outcomes. Third, the cluster size was small (14 clinics), and there was significant variability between clinics, which explained half of the total variance in the outcome. Future studies should examine clinic and PCP characteristics that influence obesity management at the system and patient levels. Fourth, both study conditions could be considered active interventions. Despite this, our study reflects the nature of healthcare reform and the need to be flexible with study designs in order for the healthcare system to implement healthcare policy (e.g., meaningful use) while simultaneously rigorously testing strategies to improve quality of care for patients. Finally, the 500 patients who completed the survey represented a small subset of patients who had visits during the study period. This may have led to a selection bias in that patients who completed the survey were motivated and were already working with their PCP on managing their weight.

Conclusions

EHR-based tools that alert PCPs to patients' weight status and provide tools to start the conversation about weight and behavior change is necessary, but not sufficient in terms of long-term patient outcomes. There is a need for additional tools, better workflow processes, and healthcare policies that encourage multidisciplinary care team communication to improve ongoing coordination of care and increase patient access to services that promote long-term success with health behavior changes and healthy outcomes. This study generated several key findings that

have important practice and research implications. First, when developing clinical decision support tools, there needs to be ample involvement of the user in the pre-implementation phase in order to address issues of usability and workflow. Involvement of PCPs in the development of tools to streamline documentation of meaningful use metrics may increase PCP acceptability and long-term use of these tools. Second, PCPs may need more extensive training on how to start a conversation about weight [27], especially with patients from diverse backgrounds. Third, health education materials need to be culturally adapted and translated, and there is a significant need for culturally adapted weight management programs that are also offered in other languages. With a greater variety of materials and referral options made available to PCPs and patients, perhaps more patients including those from racial/ethnic minority backgrounds will be connected to services in the long term. Finally, PCPs would benefit from education about the type of providers who specialize in obesity treatment (e.g., registered dietitians and behavioral psychologists), cost or type of insurance accepted, and outcomes for patients who have completed treatment. Better communication between these obesity specialists and PCPs may improve care coordination and quality of care for patients with obesity [28].

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Compliance with ethical standards

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Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the Rush University Medical Center IRB and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study did not include animals.

Informed consent: For this type of study, formal consent from patients was waived by the IRB.

The findings reported have not been previously published, and the manuscript is not being simultaneously submitted elsewhere.

Authors had full control of all primary data, and they agree to allow the journal to review their data if requested.

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