

International Journal of Nursing and Health Care Research

Adair CW. Int J Nurs Res Health Care: IJNHR-161.

DOI: 10.29011/IJNHR-161.100061

Dissertation

The Effect of an Electronic Chart Alert on Providers' Rate of Obesity Diagnosis

Cheryl Wiley Adair*

College of Nursing, Northwestern State University, Shreveport, Louisiana, USA

***Corresponding author:** Cheryl Wiley Adair, Assistant Professor, College of Nursing, 1800 Line Ave Shreveport, LA 71101, USA. Tel: +1-3186773075; Email: adairc@nsula.edu

Citation: Adair CW (2018) The Effect of an Electronic Chart Alert on Providers' Rate of Obesity Diagnosis. Int J Nurs Res Health Care: IJNHR-161. DOI: 10.29011/IJNHR-161.100061

Received Date: 30 November, 2018; **Accepted Date:** 21 December, 2018; **Published Date:** 28 December, 2018

Abstract

Purpose: Obesity affects over one third of adults in the United States, and is directly responsible for approximately 110,000 preventable deaths per year. Obesity increases risk of cardiovascular disease, gastrointestinal esophageal reflux, nonalcoholic fatty liver disease, gallstone formation, and several malignancies. The economic burden of treating obesity and related chronic diseases is an estimated \$147 billion per year, with estimated increases of \$48-66 billion per year. In spite of obesity's economic impact and association with increased rates of morbidity and mortality, primary care providers often fail to diagnose obesity in their obese patients. Electronic chart alerts have demonstrated improved quality of care in some health conditions. The purpose of this quality improvement project was to determine the effect of an electronic chart alert on primary care providers' rate of obesity diagnosis.

Procedure: Beginning March 1, 2016, Body Mass Index (BMI) was displayed in red if the patient's BMI was 30kg/m² or greater. A retrospective chart review was conducted to determine the rate of obesity diagnosis before and after implementation of the electronic chart alert.

Results: A significant increase in obesity diagnosis was found after implementation of the chart alert. Providers were more likely to diagnose obesity after implementation of the chart alert (71%) than before (43%).

Conclusion: The results of this study support the use of an electronic chart alert for increasing the rate of providers' diagnosis of obesity.

Chapter 1: Introduction

Over thirty percent of adults in the United States (US) are obese, yet primary care providers often fail to diagnose obesity or discuss weight management interventions with their patients. Many providers use Electronic Health Records (EHRs) which have the capability to calculate body mass index. An electronic chart alert within the EHR will be implemented in this quality improvement study to determine its effect on providers' rate of obesity diagnosis. This chapter will provide background of obesity, overview of current provider diagnosis of obesity, and the purpose and proposed impact of this study, as well as limitations and assumptions of the study.

Background of the Clinical Problem

Obesity, and its corresponding effect on morbidity and mortality, remains a public health crisis in the United States (US). More than one-third of adults in the US are obese [1]. Obesity increases risk of diabetes mellitus type 2, cardiovascular disease, hypertension, obstructive sleep apnea, arthritis and certain cancers [1]. Besides suffering from physical illnesses, obesity is associated with social stigmatization and discrimination, as well as psychological problems [2].

Obesity prevalence continues to increase, and latest projections indicate if rates continue to rise at the current pace,

adult obesity rates could exceed 60 percent in 13 states, and all states could have rates above 44 percent by 2030 [3]. This increase will be associated with decreased quality of life and disability-free life years, as well as increased use of healthcare services. Obesity increases risk of Cardiovascular Disease (CVD), which is the number one cause of death, killing over 370,000 people annually [4]. Obesity contributes to other non-fatal but debilitating conditions including high blood pressure, hyperglycemia, high cholesterol, increased inflammation, and intra-arterial plaque [5]. Obesity also appears to be a direct cause of cardiomegaly, heart failure, and obstructive sleep apnea [6]. Gastrointestinal esophageal reflux, nonalcoholic fatty liver disease, and gallstone formation are strongly correlated with obesity [5,6]. In addition, several malignancies are associated with obesity, including breast, endometrial, colon, rectal, prostate, renal cell and other cancers [5,6]. These debilitating morbidities decrease quality of life and require expensive health care. Finally, the CDC estimates that 110,000 preventable deaths in the United States are directly related to obesity [3].

Both premature mortality and lost quality of life years represent important economic impacts of obesity. One of the most cited economic impacts of the obesity epidemic is on direct medical spending. The economic burden of treating obesity and related chronic diseases is an estimated \$147 billion per year [7] and estimated to increase by \$48-66 billion per year [8]. Longitudinal studies reveal significantly higher accumulated costs related to inpatient care, outpatient services, and prescription costs for obese and overweight groups than for healthy-weight groups [9-11]. Pronk, et al. [11] compared total medical care charges over an 18-month period across BMI categories, controlling for age, race, sex, and chronic disease status, and found that a one-unit increase in BMI translates to a 1.9% increase in median medical spending. Obesity also negatively affects the economics of the workplace. Obesity is associated with substantially increased rates of absenteeism and decreased productivity [12-14].

Statement of the Problem

The term Primary Care Provider (PCP) most often refers to physicians, nurse practitioners and physician assistants [15]. A PCP provides preventive care services, healthy lifestyle education, diagnosis and treats common medical conditions, and makes referrals to specialists when necessary. Primary care providers are the first and sometimes only source of a patient's health care services. Health care providers often fail to identify obesity in their obese patients [16-19]. Providers often fail to obtain needed biophysical patient data, or may not clinically identify obesity even when obtained data suggest obesity [19,20]. Barriers to obesity screening and diagnosis are multifactorial, and may involve system, health care provider, and patient factors, including lack of infrastructure to meet the needs of obese patients, lack of time

for preventive care, lack of health care provider skills or financial incentives to address obesity, health care provider or patient concerns about weight stigma, and anti-fat bias by health care providers [19,21].

Failure to recognize, diagnose, and add obesity to the patient's problem list may lead to absence of recommended counseling or treatment [17,22]. The American Academy of Family Physicians recommends lifestyle modification and intensive behavioral intervention counseling be offered to adults diagnosed with obesity [23]. Lifestyle modification for obesity (consisting of a combination of diet, physical activity and behavior therapy) is considered the cornerstone of weight management for overweight and obese adults [24]. Lifestyle modification uses behavioral strategies, such as goal setting and record keeping, to assist individuals in reducing caloric intake by approximately 500-1000 kilocalories per day, primarily by reducing portion sizes, snacking and consumption of high-fat and high-sugar foods. Calorie reduction is combined with exercise recommendations such as brisk walking for at least 30 minutes per day most days of the week [24].

Studies on provider counseling have demonstrated that patients who were advised to lose weight were more likely to report attempting to lose weight, and that sedentary patients who received brief physical activity counseling increased self-reported walking times and objective physical activity levels [25]. In addition, research indicates that even a modest weight loss of 5-10% produces beneficial improvement in cardiovascular comorbidities [26]. Despite this evidence, national survey results show that 58% of primary care providers perform no weight-loss counseling and do not recommend or refer obese patients for evidenced-based treatment [22,27].

Various groups have developed tools for clinical guidance in the assessment and treatment of obesity. In 2012, the U.S. Preventive Services Task Force (USPSTF) issued the recommendation that all adults be screened for obesity, and patients with a Body Mass Index (BMI) of 30 kg/m² or greater be offered intensive, behavioral interventions [28]. The National Heart, Lung and Blood Institute (NHLBI) Obesity Education Initiative Expert Panel has developed an algorithm for the identification, evaluation and treatment of overweight and obesity in adults [29]. The American College of Cardiology (ACC) and the American Heart Association (AHA) collaborated with NHLBI on the development of the algorithm, and endorse the algorithm's use for all healthcare providers [6]. Despite the availability of these recommendations for prevention, screening, and treatment of obesity, the healthcare system has been slow to adopt recommended practices [30].

Prior to recommending treatment options, the first step to address obesity is identifying the condition and ensuring documentation within the obese patient's problem list. Research has found that greater routine use of Electronic Health Records

(EHRs) leads to increased likelihood of obesity being recorded in the medical record [16]. In addition, when a diagnosis of obesity appears on the problem list, providers are more likely to address the issue with patients [22].

Clinical Question

In Primary Care Providers (PCPs), what is the effect of the chart alert on rate of obesity diagnosis?

Purpose and Rationale for the Study: Considering the increasing prevalence of obesity in all communities across the US, PCPs have an obligation to address the obesity epidemic in their clinics. There are many opportunities for PCPs to adopt a greater role through each individual patient encounter, within their own communities, and in the public policy arena [29,31,32]. Interventions should be developed to improve documentation, diagnosis, and management of obesity in the primary care setting. The purpose of this quality improvement study was to determine the effect of a chart alert on the rate of providers' diagnosis of obesity in a family clinic in northeast Louisiana, where the majority of the clinic's patient population is of lower socioeconomic status. Limited research has studied the effect of chart prompts for the diagnosis of obesity in the adult population. Few studies have been conducted in the lower socioeconomic population, where treatment referral may be limited.

Significance: Obesity is one of the most critical health concerns in Louisiana. All obesity-related diseases including heart disease, stroke, diabetes mellitus type 2, and cancer are leading causes of death in Louisiana [33]. These conditions also result in decreased quality of life, loss of productivity, and costly medical care. The United Health Foundation's America's Health Rankings ranks Louisiana 48 out of 50 states, with 31.7% of the adult population being obese. In addition, the lower socioeconomic population may be at increased risk for obesity due to inability to acquire and maintain healthy diet and exercise behaviors [34]. Provider acknowledgement and diagnosis of patients' obese status is the first step to improved health outcomes. Documented diagnosis of obesity within the EHR has been shown to increase likelihood of providers addressing obesity with patients [22]. Provider counseling increases accuracy of patient weight perceptions, positively affects patient weight loss behavior, and improves patients' successful weight loss [35].

Because of the negative effect on population health, obesity recognition is extremely important to Advanced Practice Nursing (APN). A needs survey was developed and conducted by the investigator, and administered during the 2015 Louisiana Association for Nurse Practitioners annual conference (Appendix A). Participants included 62 Advanced Practice Registered Nurses (APRNs) in Louisiana. Requested information for the survey included type of practice setting, method of charting, and practices

and feelings related to obesity screening and management. Of those surveyed, 98% felt screening for obesity was important. However, only 82% screen their patients for obesity. Eighty-eight percent felt an electronic alert for BMI greater than or equal to 30 would aid in recognition, diagnosis, and counseling of obesity.

Impact of the Project on System or Population: The findings in this study determined the effect of a chart alert on providers' rate of obesity diagnosis. If the prompt is effective, the project may increase providers' recognition of obesity. In addition to improving diagnosis rates, counseling and treatment for obesity may improve patients' health outcomes. Effective treatment of obese individuals can substantially reduce risk factors for CVD and improve disease management [36]. Extensive data indicates weight loss can reverse or arrest the harmful effects of obesity [37]. Lifestyle intervention studies have shown the effectiveness of weight loss in improving cardiovascular risk factors, including blood pressure, insulin resistance, and type 2 diabetes [38].

In addition to impacting population health, increasing providers' recognition of obesity has potential economic impact. The economic effect of obesity in the United States is estimated to be between six and ten percent of our national health expenditure [10,39]. Private payers bear the majority of estimated costs, although public-sector spending is also substantial. It is estimated that Medicare spending would be 8.5% lower and Medicaid spending 11.8% lower in the absence of obesity [7]. Across all payers, comparison of the obese to healthy-weight individuals shows 2006 medical spending that is 41.5% higher as a result of obesity [7].

Definition of Terms: Obesity is a complex, multi-factorial condition of excess adipose tissue that causes illness for the individual and concern for the public. For the purpose of this study, obesity was defined by a body mass index BMI ≥ 30 kg/m², a ratio of weight to body surface area that is based on height. Obesity diagnosis may be the listing of Obesity within the problem list, or the International Classification of Disease (ICD) code representing the diagnosis of obesity. For the purposes of this study, ICD-9 code 278.00-278.01 and ICD-10 code E66.0-E66.9 were accepted for diagnosis of obesity. The problem list is a list of the patient's chronic or active medical problems. For the purpose of this study, the problem list will be displayed on the first screen of an EHR, for the purpose of organizing and guiding treatment across time and multiple providers. Electronic alerts are notifications within the EHR of potential complications or adverse events. Decision support alerts can help practitioners adhere to certain standards of care, and often aid in alerting to potential drug interactions when medications are ordered. For the purpose of this study, the electronic alert will be a BMI displayed in red font on the first screen of the EHR when the patient's BMI is 30kg/m² or greater.

Limitations/Assumptions of the Study: Limitations of the study include small sample size from a single family practice clinic in North Louisiana. The results may not be generalizable to other clinics- either in sociodemographic characteristics of patients or behavior of providers. A large percentage of the patients in the study are enrolled in Medicaid, and providers may feel that documented obesity diagnosis will not change health behaviors or improve treatment options. One other limitation of the study is only the rate of obesity diagnosis and documentation of plan will be measured. There will be no examination of patient health outcomes.

Summary: Obesity is a public health crisis and increases morbidity and mortality in communities across the US. Obesity prevalence continues to increase and is associated with decreased quality of life and increased use of healthcare services. Obesity increases risk of life-threatening conditions including cardiovascular disease, high blood pressure, hyperglycemia, high cholesterol, and cancers. Although research indicates PCPs have a significant impact on patients' successful weight loss, and documentation of obesity in the patient's EHR problem list is essential for intervention, many PCPs fail to recognize, diagnose, and document obesity in the EHR. The purpose of this quality improvement study was to determine the effect of a chart alert on the rate of providers' diagnosis of obesity in a family clinic in northeast Louisiana. This chapter provided background of obesity, overview of sub-optimal provider diagnosis of obesity, and the purpose and proposed impact of this study, as well as limitations and assumptions of the study. The following chapter will provide a literature review of current research on the subject.

Chapter 2: Literature Review

Although estimated numbers of obese individuals in the United States continues to escalate, a review of literature indicates obesity may be underappreciated by clinicians. Tools within EHRs have the capability to assist providers with evaluation, documentation, and treatment of many health conditions. This chapter will provide a literature review of current research regarding sub-optimal rates of obesity diagnosis among providers, EHR assistance with clinical practice guideline adherence, and gaps in the research literature.

Under-Diagnosis of Obesity

Lemay, et al. [19] examined the extent to which obesity was diagnosed over a six-month period at a federally funded interdisciplinary, collaborative team practice community health center staffed by physicians, nurse practitioners, and residents. Results were examined by family practice provider type to determine who was most likely to diagnose obesity and how the diagnosis was being made. Obesity was found to be an underdiagnosed condition among all provider types. For patients

who had a BMI $\geq 30\text{kg/m}^2$, physicians recorded a diagnosis of obesity for only 46%, nurse practitioners recorded a diagnosis for 33%, and residents recorded a diagnosis for 17%. Fink, et al. [18] examined concordance between presence of obesity defined as BMI $\geq 30\text{kg/m}^2$ and a documented diagnosis of obesity in the patient's EHR at a large health care organization headquartered in Milwaukee, Wisconsin. The fully integrated EHR included more than 4 million patient records from 15 hospitals and 155 clinics. Of the 158,327 patients with an obesity BMI on the EHR, only 54,940 (35%) also had an obesity diagnosis on their EHR problem list.

A study conducted by Melamed, et al. [40] sought to determine concordance between BMI documentation and family physicians documented diagnosis of obesity. The findings revealed family physicians failed to identify most obese and overweight patients. Only 24.4% of obese patients with BMI equal to or greater than 30kg/m^2 received a diagnosis of obesity. The study also examined variables affecting documentation of obesity. The researchers found lack of knowledge needed to treat obesity, time limitations, pessimistic views about weight-loss prospects, and lack of reimbursement within the healthcare system resulted in suboptimal identification of obesity by family physicians.

The practices of providers in 25 primary care clinics in Boston, Massachusetts were studied over four years to determine rates of BMI documentation and diagnosis of obesity in EHR data [41]. The researchers reported approximately one-third of adult primary care patients had no BMI documented in the EHR. Furthermore, very few obese patients had a diagnosis on the problem list. The diagnosis of obesity was only 30.1% among obese patients. The rates of obesity screening and diagnosis in a nationally representative sample through data obtained from the 2005 National Ambulatory Medical Care Surveys conducted by the National Center for Health Statistics (NCHS). The researchers determined nearly 50% of visits lacked complete height and weight data needed to screen for obesity using Body Mass Index (BMI).

Effect of Electronic Health Record Tools

Current literature indicates EHR clinical decision support tools have improved quality of care for some health conditions. Bright, et al. [42] performed a systematic review of 148 randomized, controlled trials evaluating the effect of Clinical Decision Support Systems (CDSSs) on clinical outcomes, health care processes, workload and efficiency, patient satisfaction, cost, and provider use and implementation. The researchers reported CDSSs improved health care process measures related to performing preventive services, ordering clinical studies, and prescribing therapies [42].

Other studies report varying improvements in care quality resulting from EHR alerts. Sequist, et al. [43] evaluated the impact of an integrated patient-specific electronic clinical reminder system on diabetes and Coronary Artery Disease (CAD) care.

The researchers concluded integrated electronic reminder systems resulted in variable improvement in care for diabetes and CAD. Patients in the intervention group were significantly more likely than control patients to receive recommended diabetes care. However, reminders for statin use in the presence of hypercholesterolemia and for overdue annual dilated retinal examinations had no effect. The study revealed patients in the intervention group received recommended coronary artery disease care more often than those in the control group. Conversely, reminders for overdue annual cholesterol monitoring and the use of beta-blocker therapy had no effect [43]. Current literature indicates EHR-based clinical decision support tools offer potential for improving diagnosis and management of pediatric obesity and accelerating clinicians' adoption of obesity evidenced-based recommendations. Ayash, et al. [44] examined the effect of a computerized point-of-care alert with clinical decision support on rates of diagnosis of childhood obesity in a multisite group practice in Massachusetts. The researchers reported the point-of-care alert was effective in improving rates of obesity diagnosis, relative to a separate group practice that did not adopt an alert [44].

In a similar study, Savinon, et al. [45] sought to determine if customization of the EHR using evidence-based practice guidelines would improve the rate of screening and diagnosis of obesity in children. In their study, clinical practice guidelines were integrated into the EHR. Once the child was identified as overweight or obese using integrated screening tools, the providers were prompted during the encounter with an electronic alert to document the appropriate diagnosis. The researchers found the number of children diagnosed with overweight or obesity increased with customized EMR. Although pediatric practices have been slow to adopt use of EHRs [44], EHRs are commonly used for the adult population. Many commercial EHRs have BMI calculators within the software. Bordowitz, et al. [16] evaluated whether automatic BMI calculations within the EHR vital signs section improved clinicians' documentation and treatment of overweight and obese patients. The study was conducted during the conversion from paper to electronic charts within two family practice clinics in Brooklyn, New York. Through retrospective review of paper and electronic charts, the researchers found documentation of obesity increased from 31% to 71% after implementation of the EHR with automatic BMI calculation. However, documentation of overweight patients (BMI 25-29.9 kg/m²) only increased from 4% to 9% [16].

Analysis of Gaps in the Literature

Few studies have examined whether EHR-based tools can help clinicians address adult obesity. Even fewer studies report the differences in provider rates of obesity diagnosis with elevated BMI before and after implementation of EHR alert. Baer, et al. [46] performed a systematic review to examine how EHRs were

used to improve assessment and management of overweight and obesity. Although 1188 studies were identified through a literature search, only eleven studies met inclusion criteria of involving a new feature or a change in an existing feature within an EHR related to the identification, evaluation, or management of overweight and obesity. Within these eleven studies, only four were conducted in the adult population. Two of these studies reported rate of providers' diagnosis of obesity with elevated BMI, but did not provide a control group or historical comparison.

Application of Theoretical Framework to Project

The theoretical frameworks guiding this project are The Theory of Reasoned Action and The Technology Acceptance Model. These models are valuable in establishing a relationship to PCPs' behavior as it relates to obesity documentation. The Theory of Reasoned Action is a persuasion model of psychology, aimed towards explaining the relationship between attitudes and behaviors within human action [47] (Figure 1). Specifically, the theory seeks to understand an individual's voluntary behavior where intention to perform a certain behavior precedes the actual behavior. Two factors determine behavioral intention: personal attitudes and subjective norms. Personal attitudes are derived from the individual's opinion about the outcome of the behavior and subjective norms are influenced by our perceptions of the beliefs of those around us, including parents, friends, colleagues, and partners [47]. In applying the Theory of Reasoned Action to this project, the provider will document the diagnosis of obesity on the condition that they and their colleagues perceive the outcome of diagnosis as positive.

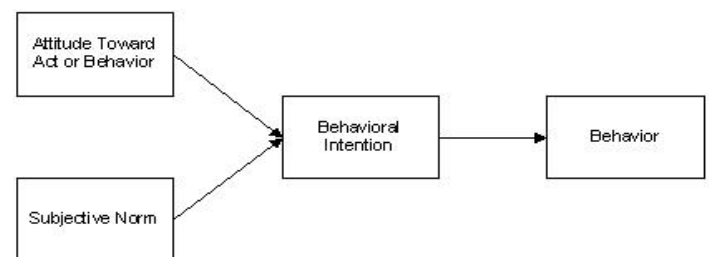


Figure 1: The Theory of Reasoned Action

The Technology Acceptance Model (TAM) seeks to determine factors influencing users' behavioral intentions toward using new technology [48] (Figure 2). Specifically, the TAM theorizes that an individual's intention to utilize a new information system may be influenced by perceptions of system usefulness and ease of use. The TAM speculates that a user's intended behavior predicts actual system use [48]. Application of the TAM to this project provides a framework to examine the effect of perception of ease of use and usefulness of the electronic alert on rate of obesity diagnosis.

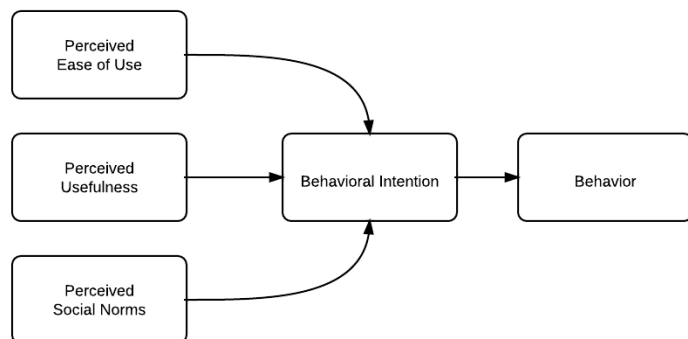


Figure 2: The Technology Acceptance Model

Summary

This literature review reported research related to under-recognition, evaluation and documentation of obesity. Several variables were identified as possible causes to under-documentation, including incomplete data, lack of provider knowledge, time limitations, pessimistic views about weight-loss prospects, and lack of reimbursement within the healthcare system. Additional studies investigated the impact of EHRs on improved quality of care. Gaps in the literature were reported, stressing the repeated recommendation that future studies should focus on interventions to improve documentation of BMI and diagnosis and management of overweight and obesity in the adult primary care setting. Finally, the Theory of Reasoned Action and The Technology Acceptance Model were explained and applied to the project.

Chapter 3: Methodology

The purpose of this quality improvement project was to evaluate in primary care providers, the effect of a chart alert on rate of obesity diagnosis. This chapter presents a description of the project design, the study setting, sample selection, ethical considerations, method of data collection and analysis, and the projected resources that will be required to develop, implement, analyze, and evaluate this project. A SWOT analysis will describe strengths, weaknesses, opportunities, and threats related to the project.

Project Design

The project design for this study was a non-experimental quality improvement. The researcher used a retrospective chart review analysis to determine the rate of obesity diagnosis before and after the implementation of the electronic chart alert.

Setting and Participants

The subjects in this cross sectional study with chart review were primary care providers at a family practice clinic in northwest Louisiana. Providers included one physician, one physician's assistant and two nurse practitioners. The patient population of

this clinic was diverse in race, ethnicity, and socioeconomic status. Many of the patients encountered in this clinical setting were complex due to their comorbidities, including coronary artery disease, hypertension, diabetes, and osteoarthritis. As discussed in preceding sections of this paper, these comorbidities are associated with obesity. Thus, the study setting was deemed appropriate due to the patient characteristics and its relevance to the purpose of this project. Patients who were younger than 21 years of age or pregnant were excluded.

EHR and BMI Alert

Routine use of the EHR began within this clinic in 2012. At the point of triage, the patients' height and weight were entered along with other vital signs. The patients' BMI was automatically calculated by the EHR. Prior to implementation of the chart alert, meetings were held with nursing staff to ensure proper height measurement and consistent data entry. For this study, the triage nurse obtained patient weight and height upon patient arrival to the clinic at each visit. Beginning March 1, 2016, the BMI was displayed in red if the BMI was 30kg/m² or greater.

Ethical Considerations

This quality improvement project was classified exempt from review (Appendix B). Minimal risk to participants was associated with this retrospective chart review. Only the researcher had access to EHR for data retrieval, and no face-to-face contact was required. No identifying data for individual provider or patient was collected or linked in any way to BMI or problem list (Appendix C, D). The data was not presented in any way that could compromise confidentiality in the future (Appendix D).

Data Collection

The first two hundred charts from January 2016 and the first two hundred charts from March 2016 were reviewed retrospectively. Data was collected from visits occurring on Mondays, Wednesdays, Thursdays, and Fridays. Visits from Tuesdays were omitted because the researcher sees patients on Tuesdays. Body mass index and problem list were collected from each EHR chart. Data was entered on a standardized paper collection form. Data collected from the EHR during the study period included provider type, BMI, and provider-generated problem list. Patients with BMI 30kg/m² or greater were classified as obese, and the problem list was examined for the presence of obesity diagnosis. For those charts with documented diagnosis of obesity, the plan of care was incidentally evaluated for presence of intervention related to diagnosis. No notation of intervention was recorded, but could include lifestyle modification using behavioral strategies, goal setting and record keeping, education for reduced caloric intake, or exercise recommendations. Exclusion criteria were patients younger than 21 years of age or patients who were pregnant.

Data Analysis

The outcome of interest was the presence of a diagnosis for obesity within the patient's problem list in patients with BMI 30kg/m^2 or greater. The intervention was the presence of a BMI alert within the EHR that appeared in red font for patients with BMI equal to or greater than 30. All data analysis was performed using IBM's Statistical Package for the Social Sciences (SPSS) software.

SWOT Assessment

The purpose of SWOT analysis was to evaluate and analyze the strengths, weaknesses, opportunities, and threats of the phenomena of interest. Internal and external factors were reviewed in order to provide a comprehensive view of the entire situation. This analysis provided useful information for identification of favorable and unfavorable factors related to achievement of the objective.

A principal strength of this practice change was the direction of clinical practice guidelines stating each patient should receive assessment for overweight and obesity. Having supportive staff eased facilitation of an EHR alert for the identification of obesity. Absence of provider buy-in could have been a weakness of the practice change. In clinics not as amiable to additional technology, providers may see the obesity alert as extra work. Because the practice change project was conducted in a relatively small clinic with supportive staff, results may not be generalizable to other clinics. Additionally, providers are attuned to reimbursement restrictions. Reimbursement for obesity may be limited or non-existent. Therefore, providers may be reluctant to add a code for obesity to a well visit.

Opportunities afforded by the project range from more comprehensive medical records to improved patient outcomes. Documenting obesity for patients with BMI of thirty or greater will lead to more complete medical records, and assist providers within the clinic to formulate individualized treatment plans. Documented diagnosis of obesity will provide opportunity for discussion about healthy lifestyle, diet, exercise, and obesity's detriment to health. Supporting research can also lead to policy changes for provision of adequate reimbursement for obesity counseling and interventions. Weaknesses of the proposed project include variable reimbursement for obesity treatment that could be a deterrent for providers. Resistance to change is also a valid concern when implementing additional technology, as providers may see the EHR alert as extra work that slows the office visit.

Summary

This chapter described the quality improvement project's

design and participants, as well as data collection and analysis procedures. The SWOT analysis was then reported, providing strengths, weaknesses, opportunities, and threats related to the project. The following chapter will provide a thorough description of the project results.

Chapter 4: Results

This quality improvement project evaluated the effect of an electronic chart alert on primary care providers' rate of obesity diagnosis. This chapter will provide study results including ratio of obesity diagnosis across all provider types before and after the electronic chart alert. Explanation of statistical analysis will be discussed.

Outcome Analysis of the Intervention's Impact

(Table 1) displays sample by provider group, prior to intervention. Sample by provider group after intervention are summarized in (Table 2). A chi-square test of independence was performed comparing the proportion of provider diagnosis of obesity before and after implementation of the chart alert (Table 3). A significant relation was found ($X^2(1) = 13.973$, $p < .001$).

Prior to implementation of the chart alert, 87 of the 200 visits had documentation of BMI $\geq 30\text{kg/m}^2$. In these 87 visits, providers documented a diagnosis of obesity in 37 (43%). After implementation of the chart alert, 80 of the 200 visits included in the sample had documentation of BMI $\geq 30\text{kg/m}^2$. The clinical question guiding this study was: In primary care providers, what is the effect if the chart alert on rate of obesity diagnosis? A significant increase in obesity diagnosis was found after implementation of the chart alert ($X^2(1) = 13.973$, $df = 1$, $p < .001$). Providers were more likely to diagnose obesity after implementation of the chart alert (71%) than before (43%).

The extent to which obesity was diagnosed by provider type (physician, nurse practitioner, or physician's assistant) was also examined. Significant increase in obesity diagnosis occurred in all providers after implementation of the chart alert. Physicians documented a diagnosis of obesity in the problem list for 55% of patients with BMI $\geq 30\text{kg/m}^2$ prior to implementation of the chart alert compared to 83% after implementation ($X^2(1) = 5.125$, $df = 1$, $p < .05$). Prior to the chart alert, nurse practitioners recorded a diagnosis of obesity for 52% of obese patients, compared to 77% after implementation ($X^2(1) = 3.493$, $df = 1$, $p > .05$). Twenty-eight percent of obese patients seen by the physician's assistant received a diagnosis of obesity prior to implementation of the chart alert compared to 54% after implementation ($X^2(1) = 4.402$, $df = 1$, $p < .05$).

Characteristic	N= 200 visits	Number of patients with BMI \geq 30	Number of patients with BMI \geq 30 with documented diagnosis of obesity	Percentage of patients with BMI \geq 30 with documented diagnosis of obesity
All PCPs	200 visits	87	37	43%
Physician	52 visits	22	12	55%
Nurse Practitioner	78 visits	29	15	52%
Physician's Assistant	70 visits	36	10	28%

Table 1: Characteristics of providers' diagnoses of obesity in patients seen in January 2016, prior to implementation of chart alert

Characteristic	N= 200 visits	Number of patients with BMI \geq 30	Number of patients with BMI \geq 30 with documented diagnosis of obesity	Percentage of patients with BMI \geq 30 with documented diagnosis of obesity
All PCPs	200 visits	80	57	71%
Physician	73 visits	30	25	83%
Nurse Practitioner	62 visits	22	17	77%
Physician's Assistant	65 visits	28	15	54%

Table 2: Characteristics of providers' diagnoses of obesity in patients seen in March 2016, after implementation of chart alert.

Provider	Sample Size	Statistic	Value	df	P-Value
All PCPs	167	Chi-Square	13.973	1	P< .001
Physician	52	Chi-Square	5.125	1	P<.05
Nurse Practitioners	51	Chi-Square	3.493	1	P>.05
Physician's Assistant	64	Chi-Square	4.402	1	P<.05

Table 3: Chi-square analysis of relation between the chart alert and all primary care provider diagnosis of obesity.

For those visits with documented diagnosis of obesity, the plan of care was evaluated for presence of intervention related to diagnosis. (Table 4) displays sample by provider group, prior to intervention. Sample by provider group after intervention are summarized in (Table 5). A chi-square test of independence was performed comparing the proportion of visits where plan of care included intervention for obesity diagnosis before and after implementation of the chart alert. No significant relationship was found ($X^2(1) = .023$, $df = 1$, $p > 0.5$). Providers included a plan of care in 58% of those visits with documented diagnosis of obesity.

Characteristic	Number of patients with documented diagnosis of obesity	Number of charts with intervention for obesity in plan of care	Percentage of charts with intervention for obesity in plan of care
All PCPs	37	22	60%
Physician	12	7	58%
Nurse Practitioner	15	10	67%
Physician's Assistant	10	5	50%

Table 4: Plan of care included interventions related to obesity diagnosis prior to implementation of chart alert.

Characteristic	Number of patients with documented diagnosis of obesity	Number of charts with intervention for obesity in plan of care	Percentage of charts with intervention for obesity in plan of
All PCPs	57	33	58%
Physician	25	15	60%
Nurse Practitioner	17	10	59%
Physician's Assistant	15	8	53%

Table 5: Plan of care included interventions related to obesity diagnosis after implementation of chart alert.

Summary

Obesity is a major epidemic in the United States. Despite the overwhelming evidence of association with life-threatening conditions associated with obesity, primary care providers do not routinely follow recommended guidelines for obesity diagnosis and management. This chapter provided study results and statistical data. The following chapter will discuss the project's results, theoretical framework, impact on practice, strengths and limitations, and plans for dissemination.

Chapter 5: Summary and Discussion of Results

The purpose of this quality improvement study was to determine the effect of a chart alert on the rate of providers' diagnosis of obesity. The study took place over a two-month period as planned. Data was gathered retrospectively from the first 200 charts in January 2016 and from the first 200 charts in March 2016. Implementation of the chart alert occurred March 1, 2016. For charts with obesity diagnosis, plan of care was evaluated for presence of proposed interventions. This study included four primary care providers who care for adults in a family practice clinic in Louisiana. This chapter will discuss the project's theoretical framework and relationship to results of the study, project results as they relate to the objectives of the study, impact on clinical practice, plans for dissemination, and implications for the future.

Project Results Related to Theoretical Framework

The theoretical frameworks guiding this project were The Theory of Reasoned Action and The Technology Acceptance Model. These models proved valuable in relationship to PCPs' behavior as it relates to obesity documentation. The Theory of Reasoned Action is a persuasion model of psychology, aimed towards explaining the relationship between attitudes and behaviors within human action [47], and the TAM seeks to determine factors influencing users' behavioral intentions toward using new technology [48]. Results from the project support the finding that the electronic chart alert was perceived as useful and easy to use, and providers feel diagnosing and documenting obesity will have positive outcomes.

Project Results Related to Objectives

The objective of this study was to determine if an electronic chart alert improved PCPs' rate of documented obesity diagnosis in a family practice clinic in Louisiana. At baseline, PCPs identified 43% of obese patients and managed 56% of those identified. After implementation of the electronic chart alert, PCPs identified 71% of obese patients with diagnosis of obesity, and provided 58% with documented interventions. The fundamental purposes of EHRs are to impact the way organizations incorporate technology into the workflow, improve patient care, and increase primary care efficiency [49]. Electronic alerts have been shown to improve

providers' adoption of clinical practice guidelines. In this study, use of an EHR alert resulted in increased obesity diagnosis - an important first step in obesity management.

As a quality improvement project, the ultimate goal was to improve patient outcomes. The findings in this study were consistent with previous studies demonstrating EHR-based alerts are effective tools, encouraging adoption of evidence-based recommendations. Electronic alerts have been shown to improve providers' prescribing patterns, asthma care, and immunization rates [44,50]. The results of this project demonstrate greater opportunities for early and accurate obesity diagnosis and facilitation of patient education, involvement, and improved health outcomes.

Impact of Results on Practice

This study generates new knowledge regarding effective methods for identification and diagnosis of obesity and management for obese patients. Obesity is an increasing epidemic in our nation, and leads to multiple adverse medical complications. Effective diagnosis and treatment guidelines are available to help patients lose weight and to decrease risk of associated comorbidities. The foremost value of this project is the simplicity of the intervention. Electronic alerts are commonly used in clinical practice, and the BMI alert was not difficult to implement.

Diagnosis is the first step toward appropriate management and counseling for obesity. Identification of obesity by providers has been associated with the provision of other important diagnostic and treatment practices. Primary care providers are well prepared and ideally placed to educate patients regarding health complications related to excess weight, as well as to inform them of the significant health benefits of a 5 to 10% reduction in initial weight [26]. Primary care providers may also assess patients' interest for weight reduction and, with motivated patients, develop a weight loss plan [24]. The mutually-agreed-upon plan could include brief quarterly counseling visits, which have proven effective in producing meaningful weight loss in about 20% of patients [24]. There is a growing consensus that EHRs may provide a powerful platform for improving clinical care and patient outcomes, but that adoption of EHRs alone may be insufficient. Providers need to implement tools that augment the benefits of EHR use. The findings of this study are promising, indicating some barriers to obesity diagnosis may be overcome through the use of an alert for obesity within the EHR.

Strengths and Limitations

This project had several limitations. The use of a small study group in a single facility may affect generalizability to other primary care practices. Additionally, it is possible that factors other than the chart alert influenced the results of this project. A limitation of the project related to framework application was the inability of the theoretical frameworks to consider the influence

of external variables and barriers to technology acceptance and obesity diagnosis. Although the TAM concepts explain a large degree of variance in technology acceptance, there are many other variables that affect providers' diagnosing obesity such as knowledge deficit, time limitations, pre-formed attitudes about weight-loss prospects, and lack of reimbursement.

Future Implications for Practice

This project supports the use of electronic chart alerts and offers potential for accelerating the adoption of adult obesity evidence based recommendations. Early and accurate diagnosis of obesity can improve health outcomes in the primary care setting. Appropriate diagnosis is the first step for improved obesity assessment and management, and the development and testing of progressive electronic support tools in primary care settings may aid care providers in obesity diagnosis and management.

In 2012, the US Preventive Services Task Force updated its recommendation that clinicians screen all adults for obesity and offer intensive multicomponent behavioral interventions to overweight and obese patients. Two important modifications included: a) a clear recommendation for high-intensity counseling and b) the suggestion that practitioners either provide such treatment themselves or refer patients to appropriate interventions [28]. Unfortunately, barriers still exist to obesity diagnosis and management. Future implications for practice should address barriers to clinical practice guideline adherence.

Some studies have shown that primary care providers do not have sufficient relevant knowledge and skills to effectively manage overweight and obesity [51,52]. Lack of obesity training is strongly associated with lower rates of discussing diet and exercise with obese patients [53]. Increasing the amount of obesity training and education primary care providers receive is one means of overcoming this barrier. Increasing dietetic content during training, using practice-based tool kits, and receiving continuing education to improve skills in nutrition, exercise, and motivational interviewing are methods found to be associated with higher rates of obesity diagnosis and treatment [54].

Another documented barrier to obesity clinical practice guideline adherence is lack of reimbursement for weight management services [55]. Greater reimbursement of obesity management is more probable now, considering the overall trend of the US health care system to promote preventive care. In 2012, the Centers for Medicare and Medicaid Services made a significant coverage change providing reimbursement to providers delivering intensive behavioral interventions for obesity. Private insurers may soon follow with similar changes in reimbursement. Shifting to a model rewarding well care and away from traditional fee-for-service models supports preventive care and counseling required for successful obesity management [55]. Leaders in health care policy

promoting advocacy in health care must strive to influence agencies payers who may be considering how to encourage providers to better address the important issue of obesity management.

Summary

The purpose of this quality improvement study was to determine the effect of a chart alert on the rate of providers' diagnosis of obesity. This chapter discussed the project's theoretical framework and relationship to results of the study, project results as they relate to the objectives of the study, impact on clinical practice, plans for dissemination, and implications for the future. Primary care providers have a vital role in obesity management. In this study, the electronic chart alert for BMI was found effective in improving rates of primary care providers' diagnosis of obesity.

References

1. Centers for Disease Control and Prevention (2014) Adult obesity facts.
2. U.S. Department of Health and Human Services (2010) The Surgeon General's Vision for a Healthy and Fit Nation. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General.
3. Trust for America's Health (2012) F as in fat: How obesity threatens America's future 2012.
4. Centers for Disease Control and Prevention (2015) Heart disease facts.
5. Guh D, Zhang W, Bansback N, Amarsi Z, Birmingham L, et al. (2009) The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. *BioMed Central Health* 9: 88.
6. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, et al. (2014) 2013 AHA/ACC/TOS Guideline for the Management of Overweight and Obesity in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Journal of American College of Cardiology* 63: 2985-3023.
7. Hammond R, Levine R (2010) The economic impact of obesity in the United States. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy* 17: 285- 295.
8. Wang Y, McPherson K, March T, Gortmaker S, Brown M (2011) Health and economic burden of the project obesity trends in the USA and the UK. *Lancet* 378: 815-825.
9. Thompson D, Brown J, Nichols G, Elmer P, Oster G (2001) Body mass index and future healthcare costs: A retrospective cohort study. *Obesity Research and Clinical Practice* 9: 210-218.
10. Wolf A (2002) Economic outcomes of the obese patient. *Obesity Research and Clinical Practice* 10: 58-62.
11. Pronk N, Goodman M, O' Connor P, Martinson B (1999) Relationship between modifiable health risks and short-term charges. *Journal of the American Medical Association* 282: 2235-2239.
12. Schulte P, Wagner G, Ostry A, Blanciforti L, Cutlip R, et al. (2007) Work, obesity, and occupational safety and health. *American Journal of Public Health* 97: 428-436.

13. Finkelstein E, Trogdon J, Cohen J, Dietz W (2009) Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affairs* 28: 822-831.
14. Ostbye T, Dement J, Krause K (2007) Obesity and workers' compensation: Results from the Duke Health and Safety Surveillance System. *Archives of Internal Medicine* 167: 766-773.
15. National Institutes of Health (2016) Choosing a primary care provider.
16. Bordowitz R, Morland K, Reich D (2007) The use of an electronic medical record to improve documentation and treatment of obesity. *Family Medicine* 39: 274-279.
17. Cleator J, Richman E, Leong K, Mawdsley L, White S, et al. (2002) Obesity: Under-diagnosed and under-treated in hospital outpatient departments. *International Journal of Obesity and Related Metabolic Disorders* 26: 581-584.
18. Fink J, Morris G, Singh M, Nelson D, Walker R, et al. (2014) Discordant documentation of obesity body mass index and obesity diagnosis in electronic medical records *Journal of Patient-Centered Research and Reviews* 1: 164-170.
19. Lemay C, Cashman S, Savageau J, Fletcher K, Kinney R, et al. (2003) Underdiagnosis of obesity at a community health center. *Journal of the American Board of Family Practitioners* 16: 14- 21.
20. Lyznicki J, Young D, Riggs J, Davis R (2001) Obesity: Assessment and management in primary care. *American Family Physician* 63: 2185-2197.
21. Tharpa R, Friderici J, Kleppel R, Fitzgerald J, Rothberg M (2014) Do physicians underrecognize obesity? *Southern Medical Association* 107: 356-360.
22. Banerjee E, Gambler A, Fogleman C (2013) Adding obesity to the problem list increases the rate of providers addressing obesity. *Family Medicine* 45: 629-633.
23. Poston W, Foreyt J (2000) Successful management of the obese patient. *American Family Physician* 61: 3615-3622.
24. Wadden T, Volger S, Tsai A, Sarwer D, Berkowitz R, et al. (2013) Managing obesity in primary care practice: An overview perspective from the POWER-UP study. *International Journal of Obesity* 37: 3-11.
25. Calfas K, Long B, Sallis J, Wooten W, Pratt M, et al. (1996) A controlled trial of physician counselling to promote the adoption of physical activity. *Preventive Medicine* 25: 225-233.
26. Vetter M, Wadden T, Chittams J, Diewild L, Panigrahi E, et al. (2013) Effect of lifestyle intervention on cardiometabolic risk factors: Results of the POWER-UP trial. *International Journal of Obesity* 37: S19-S24.
27. Kraschnewski J, Sciamanna C, Pollak K, Stuckey H, Sherwood N (2012) The epidemiology of weight counseling for adults in the United States: A case of positive deviance. *International Journal of Obesity* 37: 751-753.
28. United States Preventive Services Task Force (2012) Obesity in adults: Screening and management.
29. National Heart Lung and Blood Institute (2000) Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report. *Obesity Research and Clinical Practice* 6: 1S-209S.
30. Sesselberg TS, Klein JD, O'Connor KG, Johnson MS (2010) Screening and counselling for childhood obesity: Results from a national survey. *Journal of the American Board of Family Medicine* 23: 334-342.
31. Brzezinski S (2008) Morbid obesity: Issues and challenges in home health. *Home Healthcare Nurse* 26: 290-297.
32. Roberts D (2010) Addressing overweight and obesity as health problems. *Medsurg Nursing: Official Journal of the Academy of Medical-Surgical Nurses* 19: 9.
33. Louisiana Department of Health and Hospitals (2015) Obesity prevention and management commission report. Report prepared in response to Act 580 of the 2014 regular session.
34. Wang Y, Beydoun M (2007) The obesity epidemic in the United States-Gender, age, socioeconomic, racial/ethnic, and geographic characteristics: A systematic review and meta-regression analysis. *Epidemiologic Reviews* 29: 6-28.
35. Post R, Mainous A, Gregorie S, Knoll M, Diaz V, et al. (2011) The influence of physician acknowledgement of patients' weight status on patient perceptions of overweight and obesity in the United States. *Archives of Internal Medicine* 171: 316-321.
36. Poirier P, Giles T, Bray G, Hong Y, Stern J, et al. (2006) Obesity and cardiovascular disease: Pathophysiology, evaluation, and effect of weight loss: An update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. *Circulation* 113: 898-918.
37. Klein S, Burke L, Bray G, Blair S, Allison D, et al. (2004) Clinical implications of obesity with specific focus on cardiovascular disease: A statement for professionals from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism *Circulation* 110: 2952-2968.
38. Stevens V, Obarzanek E, Cook N, Lee I, Appel L, et al. (2001) Long-term weight loss and changes in blood pressure: Results of the Trials of Hypertension Prevention, phase II. *Annals of Internal Medicine* 134: 1-11.
39. Wolf A (1998) What is the economic case for treating obesity? *Obesity Research* 6: 2S-7S.
40. Melamed O, Nakar S, Vinker S (2009) Suboptimal identification of obesity by family physicians. *American Journal of Managed Care* 15: 619-624.
41. Baer J, Karson A, Soukup J, Williams D, Bates D (2013) Documentation and diagnosis of overweight and obesity in electronic health records of adult primary care patients. *Journal of the American Medical Association of Internal Medicine* 173: 1648-1652.
42. Bright T, Wong A, Dhurjati R, Bristow E, Bastian L, et al. (2012) Effect of clinical decision support systems. *Annals of Internal Medicine* 157: 29-43.
43. Sequist T, Gandhi T, Karson A, Fiskio J, Bugbee D, et al. (2005) A randomized trial of electronic clinical reminders to improve quality of care for diabetes and coronary artery disease. *Journal of the American Medical Informatics Association* 12: 431-437.
44. Ayash C, Simon S, Marshall R, Kasper J, Chomitz V, et al. (2013) Evaluating the impact of point-of-care decision support tools in improving diagnosis of obese children in primary care. *Obesity* 21: 576-582.

45. Savinon C, Smith Taylor J, Canty-Mitchell J, Blood-Siegfried J (2011) Childhood obesity: Can electronic medical records customized with clinical practice guidelines improve screening and diagnosis? *Journal of the American Academy of Nurse Practitioners* 24: 463-471.
46. Baer H, Cho I, Walmer R, Bain P, Bates D (2013) Using electronic health records to address overweight and obesity: A systematic review. *American Journal of Preventive Medicine* 45: 494-500.
47. Fishbein M (2008) A reasoned action approach to health promotion. *Medical Decision Making: An International Journal of the Society for Medical Decision Making* 28: 834-844.
48. Davis F (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly* 13: 319-340.
49. Beasley J, Holden R, Sullivan F (2011) Electronic health records: research into design and implementation. *The British Journal of General Practice* 61: 604-605.
50. Rattay K, Ramakrishnan M, Atkinson A, Gilson M, Drayton V (2009) Use of an electronic medical record system to support primary care recommendations to prevent, identify, and manage childhood obesity. *Pediatrics* 123: S100-S107.
51. Murray S, Narayan V, Mitchell M, Witte H (1993) Study of dietetic knowledge among members of the primary health care team. *British Journal of General Practice* 43: 229-231.
52. Price J, Desmond S, Krol R, Snyder F, O'Connell J (1999) Family practice physicians' beliefs, attitudes, and practices regarding obesity. *American Journal of Preventive Medicine* 3: 339-345.
53. Forman-Hoffman V, Little A, Wahls T (2006) Barriers to obesity management: A pilot study of primary care clinicians. *BioMed Central Family Practice* 7.
54. Perrin E, Flower K, Garrett J, Ammerman A (2005) Preventing and treating obesity: Pediatricians' self-efficacy, barriers, resources, and advocacy. *Ambulatory Pediatrics* 5: 150-156.
55. Lewis K, Gudzone K (2016) Overcoming challenges to obesity counselling: Suggestions for the primary care provider. *Journal of Clinical Outcomes Management* 21: 123-133.