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Overcoming Obesity: Provider Reminders and Education in Pediatrics

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OVERCOMING OBESITY: PROVIDER REMINDERS AND EDUCATION IN PEDIATRICS

by

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DEDICATION

This project is dedicated to my Lord and Savior, Jesus Christ, for without Him none of this would have been attainable. He is so good. He gifted me with the family and friends that I needed to complete this project. He provided the energy and the mental fortitude to persevere. He supplied the preceptors, the professors, and the classmates that I needed to succeed. He created the wonderful coffee bean that fueled late nights and early mornings. For this, He deserves all the glory, all the praise, and all the honor and stands alone above all else.

"Whatever you do, work at it with all your heart, as working for the Lord . . .
It is the Lord Christ you are serving."
Colossians 3:23-24

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ABSTRACT

The prevalence of pediatric overweight and obesity is rising globally (Di Cesare et al., 2019) and results in lifelong chronic health problems and an estimated annual healthcare cost of $14.1 billion (Trasande & Chatterjee, 2009). The purpose of this evidence-based practice project was to address overweight and obesity in patients between the ages of five and 12 years through the provision of provider reminders, education, and guidelines. Primary outcomes included frequency of diagnosis, frequency of patient referrals, return to see times, and frequency of patient nutrition and activity education while secondary outcomes included patient weight, body mass index (BMI), and *z*BMI. A review of literature was conducted, and a multimodal, non-pharmacologic approach was determined to be most effective. Over a 12-week period, pediatric patients who met specified BMI percentile criteria were flagged by nurses who supplied provider reminders. A provider education session was also conducted. Statistical analysis was performed utilizing a two-group comparison design. Pre-intervention data (n = 111) was collected on frequency of diagnosis, frequency of patient referrals, and frequency of patient nutrition and activity education and was compared to intervention data (n = 391) using a chi-square test for independence to determine if the intervention made a statistically significant impact. A statistically significant increase in number of diagnosis was found (X^2 (1) = 8.636, p = .003) while the results for the frequency of nutrition and activity counseling (X^2 (1) = 1.587, p = .208), return to see times (t (500) = 1.263, p = .207), and frequency of referrals (X^2 (1) = 2.296, p = .317) were not significant. To examine secondary outcomes, a paired t-test comparing the weight, BMI, and *z*BMI of repeat patients (n = 27) was performed. While patient weight increased significantly (t = -3.620, df = 26, p = .001), this was expected as height also increased. No significant difference in BMI (t = -.792, df = 26, p = .436) or *z*BMI (t = .166, df = 26, p = .869) was found. Future longitudinal research should aim to examine if an increase in diagnosis contributes to decreased patient weight, BMI, and *z*BMI.

CHAPTER 1

INTRODUCTION

Background

The prevalence of children who are overweight is on the rise among all age groups across the globe and is leading to increased levels of obesity (United Nations, 2019). Childhood obesity prevalence rates are predicted to continue to rise through 2023 calling for swift intervention (Sun et al., 2020). According to the Centers for Disease Control and Prevention (CDC, 2018), overweight and obesity is determined through calculation of body mass index (BMI) based on patient weight in kilograms divided by patient height in meters. In childhood overweight and obesity, this calculation cannot correctly identify overweight and obesity in pediatrics due to their continued growth and the differing body compositions between male and female children (CDC, 2018). Because of this variability, childhood overweight and obesity is determined by BMI percentile categorized according to age and gender. This is also referred to as a BMI *z*-score, or *z*BMI, as it is based on one to two standard deviations from the mean BMI. In the United States, CDC growth charts are most frequently used to determine BMI percentile in pediatric patients. According to the CDC (2018), “overweight is defined as a BMI at or above the 85th percentile and below the 95th percentile for children and teens of the same age and sex” while “obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex.”

The pathophysiology of childhood overweight and obesity is poorly understood and multidimensional (Sahoo et al., 2015). In 2013, the American Medical Association declared that obesity is a disease based on its complex pathophysiology and intervention requirements (American Medical Association, 2013). Generally, increased calories and fat intake are considered the culprits. However, culture, environment, lifestyle, and physical activity levels can also be considered influential in the development of elevated BMI. Furthermore, endocrine

disorders can contribute to the disease. Yet, while all these factors are associated with the development of overweight and obesity in children, none have been determined to be causal (Sahoo et al., 2015).

The consequences associated with overweight and obesity in pediatric patients are even more numerous. Childhood obesity increases the likelihood for hypertension, hyperlipidemia, asthma, obstructive sleep apnea, musculoskeletal problems, fatty liver disease, gastro-esophageal reflux, and type 2 diabetes mellitus and is also associated with psychosocial consequences such as decreased self-esteem, bullying, anxiety, and depression (CDC, 2020). Childhood obesity has also been linked to decreased quality of life and poor performance in school (Sahoo et al., 2015). Finally, children who do not overcome overweight and obesity struggle to decrease their weight as adults increasing the severity and number of acquired co-morbid conditions as well as risk for cardiovascular disease and numerous cancers (CDC, 2020).

These associated diseases not only affect patients' quality of life but also the economics of the national healthcare system. Children with obesity have significantly higher outpatient, emergency room, and prescription medication bills that, when applied nationwide, result in an estimated cost of $14.1 billion annually (Trasande & Chatterjee, 2009). Over the course of a lifetime, increased individual healthcare costs for an obese child fall between $12,000 and $19,000, and these estimates do not include the cost of lost productivity or missed days of work (Finkelstein et al., 2014). These devastating effects of overweight and obesity have guided the World Health Organization (WHO, 2020) to claim that "childhood obesity is one of the most serious global public health challenges of the 21st century" and has spurred the organization to set global standards and recommendations for national governments.

Data from the Literature Supporting Need for the Project

Despite the increased healthcare burden posed by overweight and obesity and the elevated risk of chronic health issues and cancers, the prevalence of elevated BMI among

children continues to rise. International, national, state, and regional data reflect that current interventions are hardly slowing rates of pediatric overweight and obesity (Di Cesare et al., 2019).

International Data

Beginning globally, from 1975 to 2016, there was an eight-fold increase in pediatric obesity rates for those between five and 19 years of age (Di Cesare et al., 2019). In 2004, the WHO (2019) adopted a strategy to encourage the world population to increase time spent participating in physical activities and the consumption of more nutrient-rich foods in an attempt to decrease obesity rates. When that was not as successful as previously hoped, in 2012, the WHO implemented a strategy aimed at decreasing the rate of global obesity as well as the the proportion of children who were overweight, and in 2014, began a campaign to stop the spread of non-communicable diseases including obesity. However, from 1990 through 2016, the number of children aged zero to five who were overweight or obese increased from 32 million to 41 million with the majority of these children heralding from developed countries (WHO, 2019). In 2016, among children between the ages of five and nine, 20.6% were found to struggle with overweight alone which equated to 131 million children worldwide (United Nations, 2019). Global statistics from 1985 to 2015 also revealed that elevated BMI was responsible for over four million deaths and an estimated 28.6 million years lived with disability (The GBD Obesity Collaborators, 2017).

When compared to developing nations, developed countries experienced a disproportionately greater rate of increase in overweight and obesity (WHO, 2019). From 1980 to 2015, rates of childhood obesity increased more quickly than in adults, and rates doubled in 73 countries (The GBD Obesity Collaborators, 2017). In Spain, at least one-half of children between the ages of eight and 13 carried excess weight (Sepulveda et al., 2019). In 2004, among Canadian children two to 17 years of age, the prevalence of overweight and obesity was 35%, and in 2016, among children five to 17 years of age, 20% were identified as overweight

while an additional 12% were suffering from obesity (Canadian Task Force on Preventative Health Care, 2015). When Canadian and United States statistics were combined, rates of obesity had increased from eight percent to 17% in the last three generations (Serodio et al., 2015). Currently, one in every five children and adolescents suffer from obesity equating to 124 million youths worldwide (WHO, 2020).

National Data

The highest level of age-adjusted childhood obesity is found in the United States (The GBD Obesity Collaborators, 2017). In the United States, the prevalence of obesity in six to 11-year old children was 18.4% with disparities identified based on race, ethnicity, socioeconomic status, and education level (CDC, 2019). While those who identified as Hispanic had an obesity prevalence of 25.8%, non-Hispanic blacks had a prevalence of 22.0%. Those two groups had the highest prevalence with non-Hispanic whites' prevalence rate at 14.1% and Asians at 11.0%. Obesity prevalence was also higher in low and middle income groups than in high income groups, and obesity prevalence had an inverse relationship with head of household education level. The age groups with the highest obesity rates were adolescents (20.4%) and grade school children (14.3%) and were also higher among boys (20.4%) when compared to girls (16.3%) aged six to 11 (Hales et al., 2017). Overall, the prevalence of obesity among children in the United States was 18.5% in 2019 with an estimated 13.7 million children affected by the disease (CDC, 2019).

State Data

While the data regarding overweight and obesity among children in Indiana is limited, in 2019, the percentage of adults who were overweight or obesity was 34.1% while the percentage of children between the ages of 10 and 17 with this disease was 29.9% which was just below the national average among the same age group for that year (United Health Foundation, 2020). Indiana ranked 24th in a comparison of youth overweight or obesity among American states. This was a marked improvement from the previous year when the state of Indiana ranked 41st

and had a 33.9% youth overweight or obesity rate, but many changes are still necessary (United Health Foundation, 2020b). State obesity rankings were calculated with the first having the lowest percentage of obesity among the population, and the fiftieth holding the highest population percentage of obesity.

Regional Data

The metroplex of Indianapolis, Indiana, falls primarily within Marion County. Within Marion County, the estimated prevalence of obesity is higher than state levels and varies by age: two to five years of age (28.3%), six to 11 years of age (37.9%), and 12 to 17 years of age (46.6%) (Mantinan et al.,2018). While Marion County has access to community resources for physical activity, over 27% of people from the area report high levels of inactivity, and 9% state they have limited access to healthy foods.

Data from the Clinical Agency Supporting Need for the Project

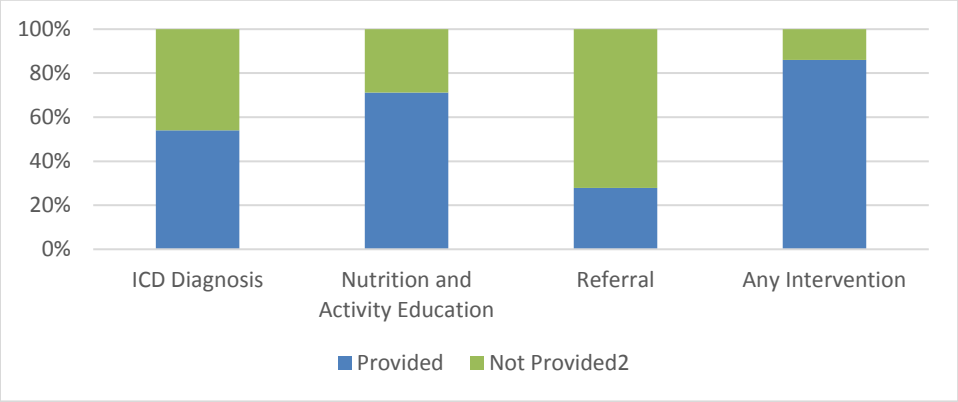
Marion County is home to the pediatric clinical office in which this project was implemented. The majority of the patrons of the clinic were from a low socioeconomic environment and received Medicaid for provision of medical care. Of the 228 children between the ages of five and 12 years of age that came into the clinic between June 8, 2020, and July 7, 2020, 48.7%, or 111 patients, met the criteria for overweight or obesity. The clinical director at the clinic stated that while the providers at the office frequently addressed elevated BMI with their patients by discussing healthy nutrition habits and increasing activity levels, they often missed documentation or completed it incorrectly (M. Keller, personal communication, May 27, 2020). This aligns with a retrospective research study that was recently completed at the facility examining the diagnosis and management of overweight and obesity in patients between the ages of two and 20 years old which revealed that clinicians diagnosed pediatric overweight and obesity with 70.4% accuracy, but that the providers frequently relied on their perception of the patient's size and not the actual calculation of weight, BMI, or *z*BMI (Foster, 2019). Patients are not consistently diagnosed with overweight or obesity based on *z*BMI. Instead, some providers

relied on visual perception which they then compared to current patient *z*BMI and then diagnosed the condition, others regularly observed the *z*BMI as listed and calculated in the electronic health record (EHR) and then made a diagnosis while others missed diagnosing overweight and obesity completely.

The site facilitator of the project expounded upon this clinical problem claiming that not only were patients inconsistently diagnosed, but no guideline for treatment had been established. As a result, patients lacked continuity of care in the management of their overweight and obesity as each provider created their own care plan (K. Smith, personal communication, June 3, 2020). To further contribute to this inconsistency, patients did not regularly visit with the same provider. To follow up on the discussed inconsistencies of diagnosis and treatment, a chart audit was conducted from June 8, 2020, through July 7, 2020. In the audit, the project leader analyzed age, gender, ethnicity, International Classification of Disease (ICD) codes, scheduled return visit recommendations, patient height, weight, BMI, and BMI percentile as well as the documented interventions of nutrition and activity counseling and specialist referrals. Of the 111 patients between the age of five and 12 who had a BMI greater than the 85th percentile, 14% received no intervention (see Figure 1.1). ICD code distribution widely varied with E66.9, the diagnosis code for obesity, as the most frequently applied (34.2%), Z71.3, the code for dietary counseling and surveillance (27.9%), and Z68.54, the code for pediatric BMI greater than the 95th percentile, falling closely behind (21.6%) (see Figure 1.2). While some patients received multiple code designations, 32% of these patients had none applied (see Figure 1.3). In addition, providers did not recommend return visits consistently. While 20% of patients were instructed to return in one month, and 28% were to return in three months, 13% were told to return in one year for their next well-child visit, and another 27% of the time, providers did not specify a recommended follow-up appointment (see Figure 1.4).

Figure 1.1

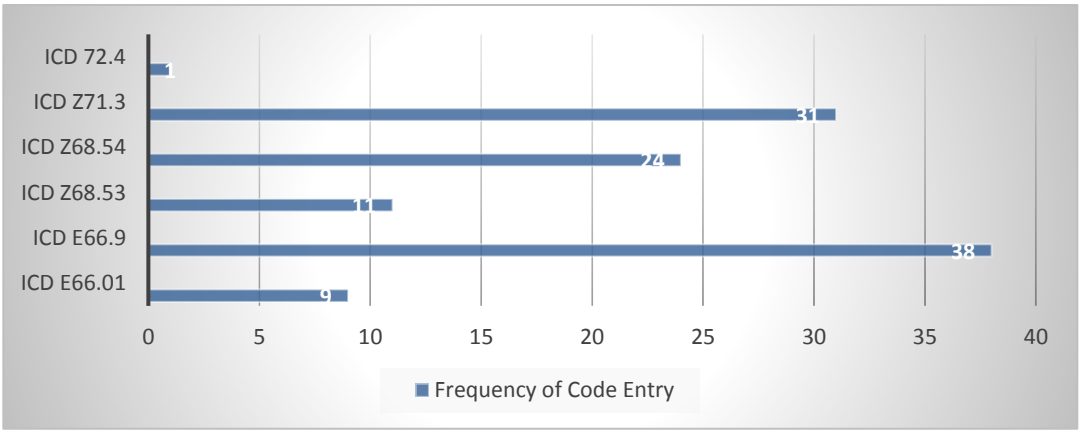
Interventions and Diagnosis of Patients with BMI >85th Percentile



Note. Interventions or diagnosis codes documented.

Figure 1.2

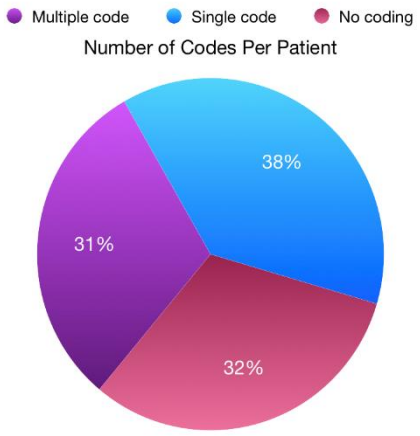
ICD Codes



Note. Distribution of applied ICD codes. Z72.4 = inappropriate diet and eating habits. Z71.3 = dietary counseling and surveillance. Z68.54 = pediatric BMI percentile greater than the 95th for age. Z68.53 = pediatric BMI percentile greater than the 85th but less than the 95th for age. E66.9 = obesity. E66.01 = morbid (severe) obesity.

Figure 1.3

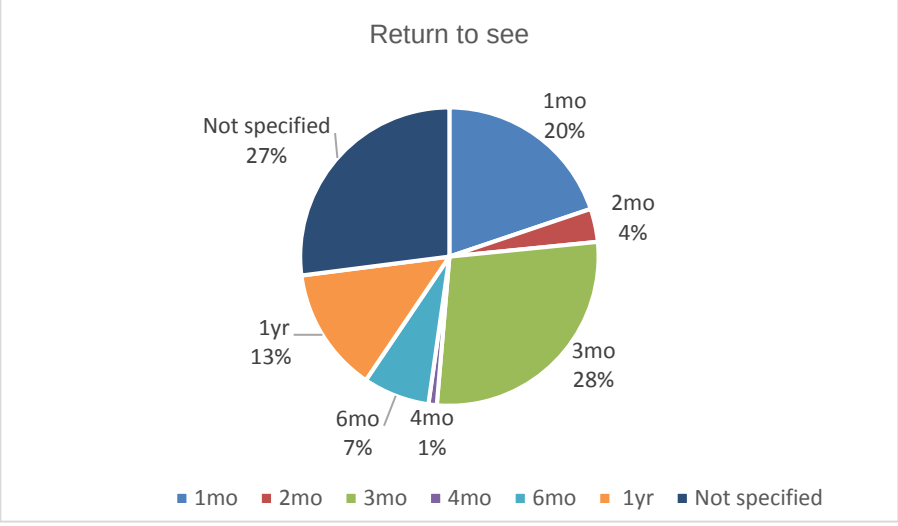
Number of ICD Codes



Note. Distribution of number of applied ICD codes.

Figure 1.4

Appointments



Note. Follow-up appointments as recommended or scheduled by provider.

Purpose of the Evidence-Based Practice Project

The purpose of this evidence-based practice (EBP) project was to address the growing pandemic of pediatric overweight and obesity by, first, identifying best practices for decreasing weight, BMI, and *z*BMI in the primary care setting and then implementing an intervention utilizing the Johns Hopkins Nursing Evidence Based Practice model. As the management of overweight and obesity in pediatrics is a complex issue requiring a multimodal approach to care, increased provider identification and diagnosis of patients based on established overweight and obesity guidelines coupled with interventions such as nutrition and activity counseling and referrals to behavioral intervention clinics and nutritionists should indirectly affect patient weight, BMI, and *z*BMI and improve patient outcomes. The goal was to implement provider interventions to increase the frequency of overweight and obesity diagnosis, increase the incorporation of multimodal methods of treatment into the primary care setting, decrease the time between patient visits, and decrease overweight and obesity in pediatric patients.

PICOT Question

Specifically, this project will address the following PICOT question: In patients between the ages of five and 12 years of age (P), how does the implementation of primary care provider reminders and education (I) compared to current practice (C) impact the diagnosis of overweight and obesity, frequency of nutrition and activity counseling, follow-up visit recommendations, and number of patient referrals as well as patient weight, BMI, and *z*BMI (O) over a 12-week period (T)?

Significance of the EBP Project

Addressing the growing prevalence of overweight and obesity has become a priority for health organizations and governments around the world. Gerards et al. (2011) described it as a significant public health problem with highest prevalence in North America, Europe, and the Pacific while the United Nations (2019) described it as another form of malnutrition and included it in their second sustainable development goal to “end hunger, achieve food security, and

improve nutrition and promote sustainable agriculture." As the prevalence of non-communicable disease has now surpassed the threat of infectious disease, primary care providers are poised in a unique position to decrease overweight and obesity-associated morbidity and mortality and reduce the cost of healthcare (Farpour-Lambert, 2019).

Families trust their primary care providers to supply relevant, reliable health information, and providers have the responsibility to utilize this trusting relationship to influence healthy life change (Daniels & Hassink, 2015). Aligning with the principle of non-maleficence, primary care providers have the duty to identify overweight and obesity early in life as not all parents are aware that their child is overweight (Taylor et al., 2015). When children experience bullying and discrimination, they state that weight becomes a major focus of their lives, and providers have the opportunity to promote open communication to affect change (Slade, 2018). According to the National Association of Pediatric Nurse Practitioners (2015), pediatric providers should also provide age-appropriate anticipatory guidance about food, nutrition, and activity, and they should strive to provide continuity of care.

Continuity of care must be a priority for effective management of elevated BMI (Nguyen, 2020). At this clinic, chart audits exposed the inconsistencies of diagnosis and treatment options. Without consistent identification of overweight and obesity and a well-defined treatment plan, providers have difficulty incorporating effective interventions that influence patient weight, BMI, and *z*BMI in the primary care setting (Sim et al., 2016). Through the introduction of clear provider reminders, this project aimed to increase frequency of accurate patient diagnosis of overweight and obesity. Through provider education, the project aim was to increase the number of children receiving nutrition and activity counseling and decrease the time between patient visits as well as increase the number of provider referrals to the on-site behavioral intervention clinic and/or a nutritionist as appropriate. The measurable outcomes were frequency of diagnosis, number of patient interventions (sub-categorized as nutrition and activity counseling and referrals), number of months between recommended follow-up appointments,

and finally, patient weight, BMI, and *z*BMI which should be affected with increased accurate identification, diagnosis, and interventions supplied by the provider.

This EBP project consisted of the identification of best practice, the implementation of the intervention based on current literature, the consistent and accurate measurement of outcome data, statistical analysis to identify if the intervention yielded a clinical or significant change, and a presentation of the results.

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

The model chosen to be used for the implementation of this project was the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model. In this chapter, an overview of the model as well as its application to this project will be reviewed.

Overview of EBP Model

The JHNEBP was developed to translate nursing research into nursing practice through encouraging nursing leadership and supporting nursing autonomy in the clinical setting. The JHNEBP model approaches clinical decision-making through asking questions aimed at problem-solving and was designed to aid bedside nurses in implementing EBP. Dang and Dearholt (2017) describe the model as “A dynamic, interactive process for practice changes that are likely to impact system, nurse and patient outcomes” (p. 44). The JHNEBP model centers around three elements: inquiry, practice, and learning, and utilizes the PET process, or practice question, evidence, and translation, to accomplish this goal. The PET process is then divided into a total of 18 steps that clarify the process and facilitate understanding of the ideal pathway to follow as the project progresses. This pathway is not always linear and can be restarted at any stage as new inquiries are encountered. The steps of the JHNEBP model embed critical thinking, the nursing process, research evidence, and the American Nurses Association Standards of Care into the implementation of EBP. As new questions arise, the cycle of inquiry, evidence, and translation can be repeated (Dang & Dearholt, 2017).

The JHNEBP model begins with inquiry. When a nurse identifies a concern or experiences a clinical problem, curiosity is sparked, and the process of inquiry is birthed. Inquiry fosters innovation through the collection of qualitative and quantitative data to more clearly define the

clinical problem and incorporates the analysis of current research literature to lead to new evidence-based solutions to the clinical problem (Dang & Dearholt, 2017).

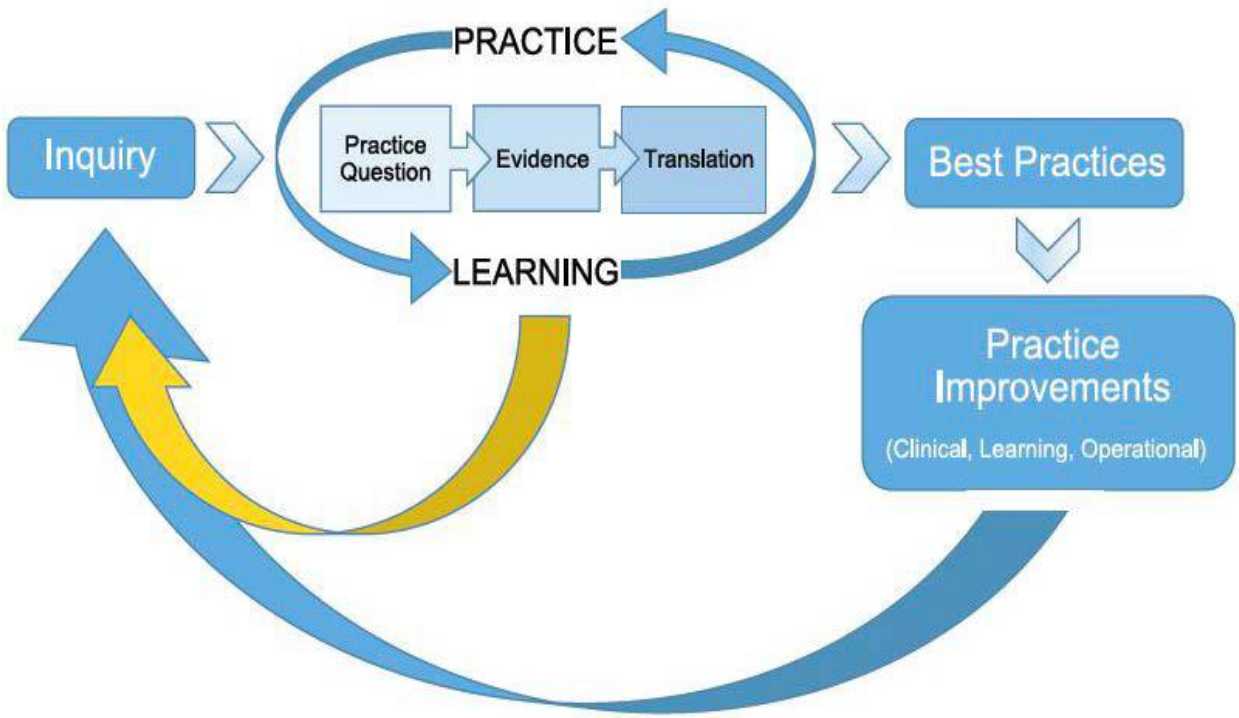
The core of the JHNEBP model is found in the second phase which compiles practice and learning through steps in the PET process. The PET process begins with the practice question. This is referred to as the PICOT or PICO question which stands for patient, population, or clinical problem, intervention, comparison, outcome, and time. The steps progress through this practice question stage focusing on recruiting team members, defining the scope of the problem, developing the PICOT question, identifying stakeholders, assigning leaders, and scheduling team meetings (Dang & Dearholt, 2017). This leads to the “E” or evidence stage of the PET process. During this stage, a search for current, quality evidence is performed to identify current knowledge of best practice. The steps in this stage include: the search for evidence, the critique and quality appraisal of each piece of evidence, and the summary and synthesis of the evidence. At this point, team members are also provided with the opportunity to inject their input into the process and make recommendations for practice changes based on best evidence. The final stage of the practice and learning phase is translation. Translation consists of converting evidential knowledge into a best practice intervention. The team decides which interventional approach is appropriate for the integration of best evidence into the current context and creates a plan to implement the change. This cycle can be repeated if the intervention is not realistically feasible, and the inquiry stage can begin anew, the evidence can be reevaluated, and then translated into an updated intervention. A graphic representation of the JHNEBP model is provided (Figure 2.1) to demonstrate its cyclical and non-linear nature (Dang & Dearholt, 2017).

The final phase of the JHNEBP model reviews best practices and practice improvements. Nursing organizations, such as the American Nurses’ Association, publish the scope and standards of nursing and have advanced the science of nursing through their expectation of interventions based on evidence. For this reason, policies and protocols must utilize an

evidence-based approach to care. The JHNEBP model incorporates this expectation into its third phase. Once the evidence has been applied and the practice change has been made, outcomes must then be analyzed and evaluated, and the results of the intervention must be disseminated. Based on these results, further practice improvements can be made and the cycle of inquiry can begin again. In this way, the JHNEBP model also continues to contribute to the existing body of evidence and influences future practice changes.

Figure 2.1

The Johns Hopkins Nursing Evidence-Based Practice Model (2017)



Note. The Johns Hopkins Nursing Evidence-Based Practice Model. Used with permission from Johns Hopkins Hospital and Johns Hopkins University School of Nursing.

Application of EBP Model to DNP Project

The clinical problem regarding pediatric overweight and obesity management was identified by the clinical director of a pediatric primary care center that primarily serves Medicaid patients on the northern side of Indianapolis, Indiana. Patients with elevated BMI were frequently identified at this clinic. The height and weight of children who saw providers at this primary care clinic were entered into the EHR at each visit. This data entry automatically calculated patient BM and zBMI. However, patients within the clinic were not consistently treated when their *z*BMI indicated overweight or obesity, and patients did not always visit with same provider. In addition, treatment of elevated *z*BMI in the primary care setting can be challenging, so a multifaceted approach utilizing the fluidity of the JHNEBP model should allow flexibility for discovering and implementing a workable approach to elevated *z*BMI. This section will review how the JHNEBP model was applied to this project.

Practice Question

As the first step in the JHNEBP model is inquiry, once the clinical problem of elevated BMI among pediatric patients was identified by the clinical director, further information had to be gathered. During a discussion with the site facilitator, the problem was further delineated as no consistent plan of care was followed clinic-wide for the diagnosis and management of pediatric overweight and obesity. When elevated *z*BMI was identified in a patient, it was up to the individual provider to decide on a plan of care. As no protocol for weight management existed, the treatment of overweight and obesity varied widely among providers, and no continuity of care was provided for the patients. Retrospective chart reviews were conducted for a one-month time period to identify current provider practices. Of patients between the ages of five and 12 years old who visited the clinic who had a zBMI calculation greater than or equal to the 85th percentile (N = 111), 14% had no documentation indicating diagnosis or intervention for the treatment of overweight and obesity. As seen in chapter one, when interventions were provided, they were wildly inconsistent.

The clinical director wanted to focus on the reduction of elevated zBMI in these patients, thus a PICOT question was formed. Inherent differences in the patient population due to age and developmental stage required that the population be narrowed by age. Based on Foster's research study (2018), over a one year timespan, while 1,045 patients between the ages of two and four were diagnosed with overweight or obesity, 1,818 children between five and 12 years old received this same diagnosis, and 686 children between the ages of 13 and 20. Because 52.1% of patients identified with overweight or obesity fell within the grade school age group and as this age group would provide the largest sample size, the focus of the EBP project aimed at the reduction of weight, BMI, and *z*BMI in children aged five years to 12 years old. The intervention required implementation in the primary care office, so patients with surgical options for treatment were excluded from consideration. An exhaustive literature search, review, and critique was then performed with the goal of identifying best practice for the treatment or management of elevated weight parameters among grade school pediatric patients in the primary care setting. As a result of the evidence obtained, the PICOT question that was formed was: In patients between the ages of five and 12 years of age (P), how does the implementation of primary care provider (PCP) reminders, education, and guidelines (I) compared to current practice (C) impact the diagnosis of overweight and obesity, frequency of nutrition and activity counseling, follow-up visit recommendations, and number of patient referrals as well as patient weight, BMI, and *z*BMI (O) over a 12-week period (T)?

Evidence

Evidence for the intervention was gathered through a thorough search of current literature, and the results were discussed with the clinical director and the site facilitator. The specifics of the literature search are clearly delineated in the section of the project entitled "literature search" as well as the evidence summary table (see Table 2.1). A rapid appraisal of the evidence was performed utilizing the Melnyk & Fineout-Overholt Rapid Appraisal Tool (2019). The literature was then critiqued and synthesized using the JHNEBP model before developing

recommendations for a change in practice based on the best current evidence (Dang & Dearholt, 2017). High quality literature that included feasible interventions for this clinical context were included as evidence, and an intervention for practice was decided upon based on best practice as well as input from key stakeholders at the primary care project site.

Translation

While the JHNEBP model aims to ease the translation of research evidence into practice, the implementation of this intervention within a fast-paced clinic with limited financial resources created a unique set of challenges. To complicate the implementation of patient education, many of the patients were Spanish-speaking only while the providers were English-speaking only. The potential for increased interpreter burden also needed to be considered with project implementation. To address these potential challenges, the clinical director, residency program director, and site facilitator as well as clinical staff were invited to provide input into the feasibility of the intervention in the context of their clinical situation. The outcomes of the intervention were evaluated through statistical analysis which compared changes in the weight, BMI, and *z*BMI scores of overweight and obese patients through retrospective analysis of patient charts compared to results experienced during the implementation of a multifaceted approach to weight management. The results were then disseminated to the clinical site as well as presented through a university-reviewed poster presentation and EBP project report.

Strengths and Limitations of EBP Model for DNP Project

As the JHNEBP model was built to facilitate the implementation of research into practice, it had numerous strengths. First, the model was easy to use. The tools provided for the model lead the project leader through a series of questions and guidelines that helped to provide clarity for the project goals. The model also provided a systematic approach with checklists to ensure that steps or stages were not overlooked or forgotten. This was a vital aspect of the model during this project implementation as the project leader had little to no experience implementing an EBP project. Another strength of the model was that it aided in designing interventions based

on research evidence which supplied the project with scientific credibility. This basis in evidence provided the project leader with the ability to approach the change with confidence and present a convincing case for change in practice. Thirdly, the structure of the model allowed flexibility as new issues or questions arose and allowed a recycling through the phases of inquiry, practice question, and best practice as well as the core stages in phase two of practice question, evidence, and translation. Because reduction in overweight and obesity requires a multimodal approach, this flexibility allowed the project to be changed as necessary. This process also allowed for the development of sustainability. Because new problems can be addressed with flexibility, they have the potential to be addressed before the project leader is no longer at the clinical site, which may assist in the sustainability of the intervention.

The limitations of the JHNEBP model were few. First, it was designed to be used by bedside nurses who were readily exposed to straightforward clinical problems and may not be as easily utilized for complex organizational or practice changes. However, the established checklist system allows for implementation on a large or small scale. While the investment of stakeholders is essential to any practice change, one other potential limitation to the model is the inability to move forward with a practice change if extraneous concerns from stakeholders generate a constant recycling of the process. To minimize this, stakeholders should be identified from the beginning as those who are invested in making a practice change.

In summary, the JHNEBP model was a reliable tool for implementing research into practice through its cyclical process of practice questions, evidence base, and translation. Ease of use allowed even the inexperienced project leader to follow set guidelines that could lead to enhanced clinical practice and improved patient outcomes.

Literature Search

Sources Examined for Relevant Evidence

An extensive search of library databases was performed to identify interventions that would affect BMI in overweight and obese pediatric patients between the ages of five and 12 years old

as well as “hand-searching” through journals and citation chasing. The searches were refined several times throughout the process with the input of the class cohort and aid of a librarian from Valparaiso University. The fine tuning of this process was completed to reveal the most relevant information on this topic.

Joanna Briggs Institute

Several searches were performed in the Joanna Briggs Institute (JBI) database. JBI publishes peer-reviewed evidence summaries and systematic reviews to provide researchers with high level evidence. Terms used for this search were pediatric or child or children or pediatric and BMI or body mass index or overweight or obese or obesity with limiters of the English language and publication within the last ten years. The final search of this database generated 231 results. Thirteen of these articles were relevant to the subject, four of which met inclusion and exclusion criteria and were included in the review.

Cochrane Library

An identical search to the JBI search was performed in the Cochrane Library database of systematic reviews. The Cochrane database includes systematic reviews, protocols, editorials, and supplemental materials. The final search of this database generated 50 results. Eight of these articles were considered relevant to the project, three of which were chosen to be included in the review based on inclusion and exclusion criteria.

PubMed

A search was also performed in the PubMed database which is a collection of MEDLINE biomedical literature, scientific journals, and online books. The terms used in this search were pedi* or child* or paediatric and BMI or body mass index or overweight or obes* and intervent* or treat* or strateg* or best practice or manag* and primary care or primary health care or primary healthcare. Results were limited to publications within the last five years, English language, Children ages six to twelve years old, clinical trials, randomized controlled trials (RCTs), systematic reviews, and meta-analysis. This search yielded 349 results of which

33 were considered relevant to the project and 10 met inclusion and exclusion criteria and were included in the literature review.

TRIP Medical Database

The next search was conducted in the TRIP medical database which includes high quality clinical research and national guidelines. Results were limited to United States guidelines that had been published within the last five years. Terms used included ped* or child* and BMI or body mass index or overweight or obes*. This yielded 199 results of which 8 were considered for inclusion in the literature review. The final number selected for use in the literature review were three.

CINAHL

The CINAHL database focuses on the best literature available in nursing and allied health. The search terms for this database were pedi* or child* or paediatric and BMI or body mass index or overweight or obes* and intervent* or treat* or strateg* or best practice or manag* or decreas* or reduc* and primary care or primary health care or primary healthcare. Limiters included publications within the last five years, scholarly, peer-reviewed articles, the English language, and ages six to 12 years. This database was search as well and generated 265 results of which 48 were relevant to the project, and two were included in the review.

Citation Chasing

To ensure that a thorough search was completed, citation chasing was performed on a minimum of five articles. The project leader determined which articles were citation chased based on their use as supporting evidence related to pediatric overweight and obesity. If the articles appeared to provide current, applicable knowledge on the problem, a search was performed to locate the primary research. Of the articles from the performed literature search, five articles contained 21 references that appeared relevant to the subject were chosen. These 21 articles were citation chased as potentially relevant; however, only three of these articles were able to meet all inclusion and exclusion criteria and were included in the literature review.

Hand Searched

Two journals focused on pediatric care were hand searched, *BMC Pediatrics* and *Pediatrics.* Journal articles from the last five years were included in the search, and a total of 284 pieces of evidence were evaluated. However, none of these articles were selected for use.

Table 2.1

Summary of Literature Search

Database/Source	Evidence Selected	LOE/Quality	Evidence Selected	LOE/Quality
Cochrane Library	Brown et al. (2019)	I[a]/B[b]	Mead et al. (2017)	I[a]/B[b]
	Loveman et al. (2015)	I[a]/B[b]		
Joanna Briggs Institute	Chai et al. (2019)	I[a]/A[b]	Nguyen (2020)	I[a]/B[b]
	Fong (2020)	I[a]/A[b]	Nnaji (2019)	I[a]/A[b]
PubMed	Farpour-Lambert (2019)	II[a]/B[b]	Resnicow et al. (2016)	II[a]/B[b]
	Fleischman et al. (2016)	II[a]/B[b]	Sim et al. (2016)	II[a]/B[b]
	Forsell et al. (2018)	II[a]/B[b]	Taveras et al. (2017)	II[a]/A[b]
	Jortberg et al. (2016)	VI[a]/A[b]	Taylor et al. (2015)	II[a]/A[b]
	Parra-Medina et al. (2015)	II[a]/B[b]		
TRIP Medical Database	APA (2018)	I[a]/A[b]	UOM, Obesity Guideline Team (2020)	I[a]/A[b]
	SIGN (2010)	I[a]/A[b]		
CINAHL	Canadian Task Force on Preventative Health Care (2015)	I[a]/A[b]	Sepulveda et al. (2019)	II[a]/B[b]
Citation Chasing	Gerards et al. (2011)	V[a]/B[b]	USPSTF (2016)	I[a]/A[b]
	NICE (2015)	I[a]/B[b]		

Note. Review of literature search with summary of level and quality of evidence.

Inclusion and Exclusion Criteria

Because this project focused on pediatric patients between the ages of 5 and 12 years, studies that focused on infants, toddlers, preschoolers, adolescents, and adults were excluded. Other exclusion criteria included studies that were focused on school-based or community-based interventions as well as surgical interventions as these cannot be completed within the primary care setting. Group interventions were also excluded due to the ongoing COVID-19 pandemic. As this project is addressing generalized elevation of BMI in pediatric patients,

studies that were focused on addressing BMI in relation to specific conditions such as Down's syndrome were also eliminated, and single studies that targeted obesity prevention alone were excluded. Furthermore, drug interventions to address elevated pediatric BMI were not included as pharmacological interventions are not recommended for this age group (Canadian Task Force on Preventative Health Care, 2015). Studies that lacked validity, reliability or applicability according to Melnyk and Fineout-Overholt's Rapid Critical Appraisal tool were also eliminated from the body of evidence (Melnyk & Fineout-Overholt, 2019).

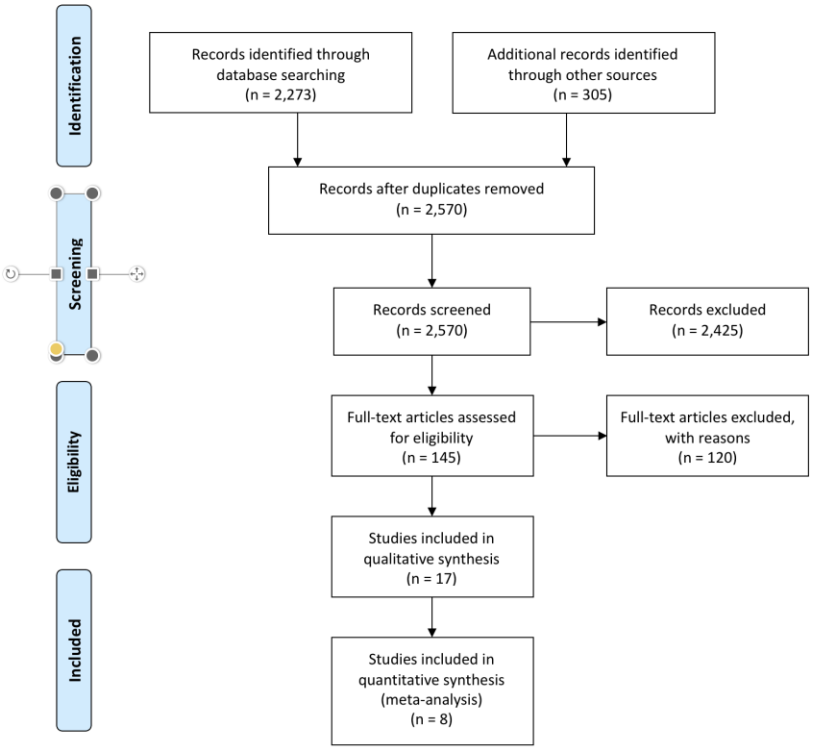
Systematic reviews with a focus on overweight or obesity prevention were included if any of the evidence within them focused on reduction of elevated BMI, and studies that did not differentiate between age groups but did solely address pediatric overweight, obesity, or elevated BMI were included. Evidence was also required to have BMI, *z*BMI, or weight recorded in their statistical analysis. Studies that focused on part, but not all, of the designated age group also met inclusion criteria.

Levels of Evidence

Once the exhaustive search and brief reviews were completed, 130 pieces of evidence remained to be further analyzed. Of these, 28 met both inclusion and exclusion criteria and were pertinent to the PICOT question. The remaining pieces of evidence were then evaluated for validity, reliability, and applicability. Three articles were eliminated due to lack of validity, reliability, or applicability which left 25 pieces of evidence for full appraisal.

Figure 2.2

Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flowsheet



Note. PRISMA flowsheet of literature search pertaining to interventions for overweight and obesity in pediatrics.

Appraisal of Relevant Evidence

Level of evidence was determined using Melnyk and Fineout-Overholt's (2019) levels of evidence pyramid. The evidence appraisal was then conducted with the appraisal tool from the JHNEBP model to rate it as high quality, good quality, or low quality. (Dang & Dearholt, 2017). A majority of high level, quality evidence was discovered.

Melnyk & Fineout-Overholt (2019) view EBP through the lens of a combined knowledge approach using clinical expertise, patient experience, and research. They separate evidence

into seven levels with level one being considered the strongest. Level I consists of the compilation of evidence from systematic reviews and meta-analysis of all relevant RCTs. Level II contains evidence from well-designed RCTs while level III evidence consists of well-designed studies that are not randomized. Case-control and cohort studies are level IV, and systematic reviews of descriptive and qualitative studies would be considered level V evidence. Level VI evidence derives from a singular descriptive or qualitative study. Expert opinion is the final level of evidence, level VII, which is weakest.

While level I evidence is considered the strongest, evidence must also be appraised for its quality to ensure that it is the best evidence. For example, descriptive studies may be considered as a level VI on the level of evidence, but they may still contain quality evidence that can be more valuable in practice than a level II RCT that was erroneous in its statistical analysis, and therefore, a low quality study. The JHNEBP model tool was chosen to complete this appraisal. The JHNEBP tool rates evidence as high quality, good quality, or low quality based on a set of questions that are specific to each evidence type (see Appendix A). These questions were applied to each piece of evidence to determine quality (see Appendix B). While the JHNEBP appraisal tool can be somewhat subjective in nature, it provides an excellent guideline for appraising the quality of evidence.

Level I Evidence

American Psychological Association, Clinical Practice Guideline Panel (APA, 2018). This guideline was considered level I evidence based on its nature as a clinical guideline, and its aim was to provide evidence-based recommendations for behavioral weight management among children and adolescents. The panel examined 101 efficacy trials before they arrived at their recommendations. This guideline was also appraised as high-level evidence according to JHNEBP criteria.

Brown et al. (2019). This article was gathered from Cochrane Library and is a systematic review with the purpose of examining the effectiveness of physical activity and diet on pediatric

BMI for the prevention of obesity among patients who already meet the criteria for overweight. This review included 153 RCTs from the United States, Europe, and other upper-middle income countries with exception of one study which focused on a lower-middle income country. Half of these studies focused on six to twelve-year-old children and the results were delineated by age groups. While Brown et al. (2019) considered the majority of the RCTs in this study to be of low quality, the review itself has a received a high quality rating according to JHNEBP parameters.

Canadian Task Force on Preventative Health Care (2015). Another high-quality evidence guideline examined the primary and secondary prevention of obesity and provided recommendations for practitioners in their treatment of overweight and obesity in pediatric patients between two and 17 years of age. A panel of research experts performed an analysis of a collection of RCTs using the Grading of Recommendations Assessment, Development and Evaluation system to ensure their recommendations were of adequate quality and based on EBP. These research studies included behavioral interventions, interdisciplinary teams, pharmacological interventions, and surgical interventions.

Chai et al. (2019). The purpose of this high-quality systematic review was to synthesize evidence related to improving childhood weight-related outcomes via family-based behavioral interventions and was a high-quality article as it was a compilation of systematic reviews and meta-analysis. Databases were searched between 1990 and May 2016 with a population of children less than 18 years of age who were overweight or obese and were treated with an intervention to affect weight-related outcomes such as BMI, body fat percentage, and waist circumference. This search yielded 14 systematic reviews and meta-analyses published between 2004 and 2015 and contained a total of 47 independent trials from 16 countries. Chai et al. (2019) determined the quality of the systematic reviews by use of the Grading Recommendations Assessment, Development and Evaluation system.

Fong (2020). This high-quality evidence summary consisted of 11 pieces of evidence with the aim of discovering the effectiveness of dietary, physical activity, and lifestyle modifications

on the prevention of obesity in children. Four pieces of evidence in this review addressed the reduction of obesity or weight parameters. The first was a multifaceted intervention focused on mentoring, parent participation, reminders, web-based weight management, and feedback while the second compared diet-only interventions to diet combined with exercise. The third also addressed lifestyle changes with a dietary element plus exercise and affected positive weight change, and the final piece of weight reduction evidence examined how a mobile health app in Sweden affected body weight, improved food choices, or increased activity levels.

Loveman et al. (2015). This Cochrane systematic review was conducted to analyze effectiveness of delivering parent-only interventions that were focused on diet, activity, and behavioral interventions. These children were required to be between five and 11 years of age and were overweight or obese. This high-quality level review examined 20 RCTs that had a low evidence base and high attrition rates. BMI was the most often reported statistic and the length of follow-ups varied from six months to two years.

Mead et al. (2017). The purpose of this review was to examine the effectiveness of diet, physical activity, and behavioral interventions for decreasing weight in children between six and 11 years of age who were identified as overweight or obese. This high-quality review consisted of 70 RCTs which included 64 integrated, multifaceted interventions (variants of behavioral modification, diet, and activity levels) to effect weight reduction which was measured by the BMI or *z*BMI of overweight or obese children. Length of study varied between six months and three years.

National Institute for Health and Care Excellence (NICE, 2015). This high-quality guideline was created to design a quality intervention for the treatment of obesity by informing government and healthcare systems of recommended practices. NICE guidelines were created based on the expert review of a collection of observational, cohort, and cross-sectional studies as well as the input of public stakeholders after consultation and were intended for use by health professionals, patients, and care providers.

Nyugen (2020). This good-quality level evidence summary sought to examine the most effective way to prevent obesity in children. The focus of the study was on a singular systematic review of 153 RCTs which was separated by age group.

Nnaji (2019). Another evidence summary with a high-quality rating attempted to identify the best parent-centered intervention for the prevention and treatment of overweight and obesity in children. While the systematic reviews within this summary primarily focused on interventions within the community setting, some of the recommendations were applicable to the primary care setting, therefore, it was included in this project.

Scottish Intercollegiate Guidelines Network (SIGN, 2010). This high-quality national guideline was created to address the growing obesity epidemic through designing guidelines for the prevention and treatment of obesity in children and adults. SIGN guidelines were derived through an equality impact assessed methodology which could be found on their website.

United States Preventative Services Task Force (USPSTF, 2016). Another high-quality national guideline was set forth by the USPSTF, and it provided PCPs with recommendations regarding the treatment and management of children with obesity. Recommendations by the USPSTF were based on the current body of scholarly, peer-reviewed evidence and undergo rigorous review by members of the USPSTF who first submitted a disclosure regarding any potential conflicts of interest.

University of Michigan, Obesity Guideline Team (2020). This high-quality evidence guideline was created by the University of Michigan to both prevent obesity as well as provide a guideline for the management of obesity and overweight. To reach their recommendations, their team conducted an English-language literature search of systematic reviews from 2008-2012 for people ages two years and above. The resulting recommendations were then made with the goal of decreasing weight gain as patients grew taller.

Of the 25 articles that were chosen for the literature synthesis for this project, 13 were considered level I evidence. Of these 13 level I sources, 12 were ranked as high-quality

according to the JHNEBP model appraisal tool while the remaining one would be considered as good-quality. The rest of the gathered evidence falls below level I.

Level II Evidence

Farpour-Lambert (2019). The first piece of level II evidence was a high-quality RCT comparing the effectiveness of standard care to a six-month lifestyle intervention of either individual or group therapy with results calculated by patient BMI *z*-scores. This sample included 74 pre-pubertal children who had been diagnosed with obesity defined as a BMI greater than the 97th percentile for age and weight. The children were recruited over four years at the Obesity Clinic of the Children's Hospital of Geneva and were assigned to two random groups. The intervention group (n = 52) was split into two further groups who were scheduled for either 35 hours with a multidisciplinary team or three hours with a dietician and four hours with a pediatrician over the course of six months. In addition to their appointments with the specialists, children in the intervention groups were to participate in a weekly program focused on physical activity. The control group (n = 22) received the standard of care.

Fleischman et al. (2016). A good-quality randomized crossover pilot study was performed to compare the BMI changes between one group that received PCP in-office visits in addition to obesity specialist tele-health visits and another group that received in-office PCP clinic visits only. The PCP and the obesity specialists also conducted regular tele-communication visits with one another to ensure clear communication among providers. Patients were required to be between 10 and 17 years of age, and they were randomized into groups. The sample (N = 40) was recruited from Wareham Pediatric Associates and Boston Children's Hospital. While group one received specialized tele-health visits from obesity specialists along with in-office PCP visits during the first six months, group two received only PCP visits for the first six months. After the initial six months, this process was reversed, and group two had tele-health visits from specialists and their PCP while group one only had visits with the PCP. This study received a good-quality rating due to its literature review consisting of articles older than the last five years

and lack of discussion regarding the validity of the instrument used. Although expected as this was a pilot study, the sample size was also insufficient.

Forsell et al. (2018). This retrospective RCT was of good-quality as it lacked a sufficient sample size, the literature review consisted of articles greater than five years in age, and it did not address patient demographics between groups. This RCT examined the four-year outcome of children with obesity who were assigned to lifestyle treatment programs at four primary health centers in western Sweden. The sample consisted of 64 children between the ages of eight and 13 who were diagnosed with obesity and were randomly assigned to two intervention groups for a period of 12 months. They were all treated with non-stigmatizing motivational interviewing (MI) with elements of cognitive behavioral therapy. Group one was managed by a dietician, a nurse, and a physiotherapist with four appointments each. The physiotherapist was also able to provide incentives to the participants. The second group was treated by only a nurse and a dietician who each had six appointments with the patient.

Parra-Medina et al. (2015). A good-quality, randomized pilot study was conducted to determine the effectiveness of interventions for Hispanic patients in the pediatric primary care setting. A convenience sample was recruited from a federally funded health clinic in New Braunfels, Texas and included 236 participants, making up 118 parent-child pairs. Sample inclusion criteria were Hispanic origin, between five and 14 years of age with a BMI greater than the 85th percentile, access to a telephone, and one parent who agreed to participate. Exclusion criteria included any sort of cardiovascular, gastrointestinal, or pulmonary diseases as well as any identified handicap. The participants were randomized into groups by dyads, and control and experimental groups both received a Healthy Lifestyle Prescription from their PCP which taught about 11 healthy lifestyle choices. Needed behavioral interventions were identified through parental self-reported behavioral information which was then run through an algorithm. This generated patient-specific recommended interventions, which were placed in the patient's chart for PCP review at the appointment. All patients were then prescribed two diet strategies

and one physical activity strategy. In addition, the intervention group completed face-to-face counseling with a master's level health educator, a monthly telephone counseling call, and newsletters (four per month). This study received a good-quality rating based on its use of research greater than five years old, its insufficient sample size, and its lack of discussion regarding instrument validity.

Resnicow et al. (2016). The purpose of this RCT was to incorporate brief MI into the primary care setting to influence a reduction in patient BMI. Forty-two primary care offices were recruited from the American Academy of Pediatrics' Pediatric Research in Office Settings network and participated in a two types of MI. 645 children were eligible to participate and cluster randomization was used to separate them into three groups. Group one (usual care) had BMI measured at the start, one year, and two years after intervention initiation at regular annual appointments. Group one PCPs received one-half day instruction on MI and a set of pediatric obesity guidelines. Group two received one and a half days of training on MI and behavioral therapy, a MI DVD, and the PCPs were required to make at least three patient MI appointments in year one and one in year two during the study. Group three was similar to group two with the addition of provider training from a registered dietician. This article received a JHNEBP evidence rating of good quality because it utilized evidence greater than five years of age, did not address patient demographic similarities, and did not discuss instrument validity or reliability.

Sepulveda et al. (2019). Another randomized-controlled pilot study was considered high-quality and was completed among Hispanic patients. This RCT tested the effectiveness, affordability, and feasibility of the ENTREN-F program which is based on psychosocial family-based behavioral interventions as compared to the ENTREN program within a primary care setting. The ENTREN program consisted of nine bi-weekly, two-hour sessions with children followed by three additional biweekly three-hour appointments that included the child and the family. The program included cognitive behavioral therapy as well as MI and addressed nutrition, physical activity, unhealthy behaviors, self-esteem, emotional regulation, and social

skills (Sepulveda-Garcia, 2020). ENTREN-F consisted of the same sessions as the ENTREN program with the addition of six two-hour appointments that focused on family communication and environment and three additional two-hour sessions that included both the family and the child (Sepulveda-Garcia, 2020). Inclusion criteria for the study included the ability to speak Spanish well, a BMI percentile greater than 85, and aged eight to 12 years. A total of 70 participants were randomly assigned to ENTREN or ENTREN-F groups and completed pre-intervention, post-intervention, and six-month post-intervention surveys.

Sim et al. (2016). To examine the effectiveness of brief primary care intervention on the BMI of pediatric patients, a high-quality systematic review and meta-analysis was performed analyzing 10 RCTs and two quasi-experimental studies. The studies included children between the ages of four and 18 who qualified as overweight or obese. The studies were selected based on the generation of *z*BMI scores and were required to compare an office-based weight management program to any other sort of weight management intervention. Interventions involving MI and nutritional education were provided by health educators with the minimum of a bachelor's degree.

Taveras et al. (2017). Another high-quality RCT was performed to determine the effects of two clinical-community interventions on BMI *z*-scores, quality of life, and parental empowerment. Six primary care clinics in Massachusetts recruited 721 children between the ages of two and 12 for this study. They were required to have a BMI greater than the 85th percentile with measurements to be collected at baseline and then again at one year. After randomization into groups, group one (n = 361) received enhanced primary care which included flagging those with a BMI greater than the 85th percentile, use of clinical tools for weight management, parental education, a neighborhood resource guide, monthly texts for public behavioral change resources, and links to the *Let's Move* program. The *Let's Move* program was an initiative begun by First Lady Michelle Obama to address the prevalence of childhood obesity and encourage healthier lifestyles (White House Task Force on Childhood Obesity,

2010). The program had five main ideals: “Creating a healthy start for children, empowering parents and caregivers, providing healthy foods in schools, improving access to healthy, affordable foods, and increasing physical activity” (White House Task Force on Childhood Obesity, 2010) The second group (n = 360) received individualized coaching that was specific to the patient’s social and environmental influences. Trained health coaches utilizing MI techniques contacted families every other month for the first year and helped them to identify resources in their community that could help them make a change. Two text messages or emails per week containing additional education were sent to these families as well as standard mail after each coaching session. Families were also offered a free, one-month membership to the YMCA and an invitation to a healthy grocery program.

Taylor et al. (2015). This good-quality RCT was conducted to identify if a two-year family-oriented program that included frequent provider contact with limited involvement reduced weight gain more than the standard of care interventions. A convenience sample of 260 overweight and obese patients between the ages of four and eight with a BMI greater than the 85th percentile were randomized into two groups. A control group that met with a trained researcher for 30 to 45 minutes discussing diet and activity levels, received general advice on screen time reduction and appropriate sleep habits, and had a follow-up appointment in six months at which no additional education was provided. The intervention group received a singular multidisciplinary consult session with a mentor, parent, dietician, exercise specialist, and psychologist. These patients also attended brief appointments with a nutritionist and an exercise specialist every month for the first year and appointments every three months for the duration of the second year. During this time, behavioral interventions and goals were discussed. A good-quality rating was applied because this RCT lacked demographic data as well as discussion regarding instrument reliability and validity. The literature review also included articles greater than five years old.

Wylie-Rosett et al. (2018). This high-quality RCT was conducted to determine the effectiveness of implementing the recommendations of the American Academy of Pediatrics (AAP) for the management of overweight and obesity into the pediatric primary care context. The sample of 366 children between seven and 12 years of age was randomly assigned to a control group that received standard care or an intervention group that received standard care plus eight core behavioral intervention sessions focused on nutrition and fitness. Core sessions provided patients and caregivers with education on introducing a weight management plan into the family, identification of food groups, reading nutrition labels, planning shopping trips and avoiding sugary drinks, learning about fruits and vegetables, addressing stress and self-esteem, increasing activity and decreasing screen time, and limiting fast-food. Participants were followed over a period of 12 months, and while the intervention group yielded greater results, both groups experienced a significant reduction in BMI.

Level V Evidence

Gerards et. al (2011). This good-quality, systematic review of observational qualitative studies focused on the treatment and prevention of obesity through the examination of parenting styles. This systematic review was considered good-quality according to JHNEBP standards as its literature review exceeded five years of age, and it had an inadequate sample size. Four studies were analyzed. Three of these addressed parents and children while one addressed only parents. The intervention duration ranged from nine weeks to six months, and all yielded low to moderate effects on a minimum of one weight outcome.

Level VI Evidence

Jortberg et al. (2016). The final study included in this review is a good-quality, interventional pilot study that was conducted in 29 primary care clinics in Colorado of which 18 were in an urban setting and 11 were rural. The study was completed to discover if changes in BMI, blood pressure, or lifestyle factors occurred when PCPs and staff incorporated childhood obesity interventions into their care. PCPs at each clinic identified eligible patients between six and 12

years of age who had a BMI greater than the 85th percentile and invited them to the study and participation in the Fit Family Challenge (FFC), Families also completed a web questionnaire called HeartSmart Kids. The FFC consisted of a weekly meeting with the FFC care manager, the setting of weekly goals with the FCC care manager, monthly group visits with other parents or family members of the participant, and monthly collection of weight, height, blood pressure, and lifestyle factor information. This study was ranked as good quality because it failed to discuss the validity of its instrument, had a literature review including articles greater than five years old, and had a response rate of less than 25% on its survey.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

With the review of literature completed, the findings of the evidence were synthesized to determine best practice for decreasing BMI in pediatric patients. After evidence themes were identified, evidence was categorized by nutrition and activity interventions, interventions based on grouping, behavioral interventions, and technological interventions.

Nutrition and Activity Interventions

In the literature, diet and nutrition were frequently identified as approaches to weight management in children with overweight or obesity (Brown et al., 2019; Farpour-Lambert, 2019; Fong, 2020; Resnicow et al., 2016). Activity, including both the increase of physical movement and the reduction of sedentary practices, was also frequently discussed (Brown et al., 2019; Nguyen, 2020), and at times, researchers combined these approaches in attempt to affect change (Brown et al., 2019; Fong, 2020; Mead et al., 2017; Nnaji, 2019; SIGN, 2010; Taylor et al., 2015; UOM, Obesity Guideline Team, 2020; Wylie-Rosett et al., 2018).

Diet Only. In a Cochrane systematic review by Brown et al. (2019), dietary management of weight was compared to activity interventions as well as combined activity and diet interventions. The review concluded that while increasing physical activity reduced BMI by approximately -0.10kg/m2, it had little effect on *z*BMI while diet with physical activity affected

*z*BMI (mean deviation [MD] of -0.02). Diet interventions alone did not yield a statistically significant reduction in participant BMI or *z*BMI. Any dietary intervention was an inclusion criterion for this systematic review without differentiating type of diet. This aligns with the findings of Fong (2020) who examined a RCT comparing diet only versus diet with exercise interventions, and diet alone was found to be less effective than the combined intervention. Types of dietary interventions were not delineated.

Activity Only. When Brown et al. (2019) analyzed evidence from 153 RCTs, the findings from 14 RCTs indicated with moderate certainty that increasing physical activity decreased participant BMI but did not affect *z*BMI scores. The findings of Brown et al. (2019) reinforced activity interventions without a focus on diet as their results found no difference in BMI or *z*BMI scores when diet and activity interventions were combined. This remains clinically significant because a reduction in BMI still signifies that a child is closer to achieving an ideal weight. *Z*BMI is much more difficult to affect as it is a percentile based on height, weight, gender, and age. As a result of an analysis of a systematic review of 153 RCTs, a JBI evidence summary recommends treatment aimed at addressing physical activity for the reduction of obesity in children six to 12 years of age (Nguyen, 2020).

Diet Plus Activity. Taylor et al. (2015) found that incorporating MI into the discussion of diet and activity changes did not yield statistically significant results; however, a slight reduction in *z*BMI was experienced. This finding aligns with Fong (2020) who found that exercise combined with dietary changes is effective for weight change. The University of Michigan (2020) guidelines recommended a focus on lean meats, increased fruit, vegetable, and dairy intake and decreased high fat foods. SIGN's (2010) management of obesity guidelines also included decreasing total energy intake while increasing physical activity levels and reducing sedentary activity. Similarly, the study by Wylie-Rosett (2018) determined that monthly sessions focused on diet and fitness yielded statistically significant reductions in patient BMI. In addition, JBI

recommends that nutrition and activity education be provided in the primary care setting for a minimum of six months to reduce patient BMI (Nnaji, 2019).

Interventions By Group

The integration of interventions such as nutrition and activity education into primary care has been attempted through multiple means. While some primary care offices have the capacity to initiate multidisciplinary interventions, other offices seek to minimize professional support while positively influencing patient outcomes through family-based or parent-based interventions. Research in the literature reflects these various methods.

Multidisciplinary interventions. Taylor et al. (2015) compared a usual care control group receiving education on proper diet and exercise levels to a multidisciplinary consulting session that involved a patient mentor, parent, dietician, exercise specialist, and psychologist. When measured at two years, the intervention group experienced a greater reduction in BMI; however, it did not differ in a statistically significant amount from the control and was associated with a much higher cost level. Outcomes in both groups were reported at 12 months and two years. The BMI *z*-score difference when comparing the control group to the intervention group was 0.12. While not statistically significant, the reduction indicates a decrease in weight gain for height (Taylor et al., 2015).

Forsell et al. (2018) also conducted a RCT using interdisciplinary teams which aimed at a reduction in BMI with analysis at 12 months and after four years. The outcome at the end of four years nearly mirrored the outcome at the end of the 12-month intervention. At the end of the four years, the mean change in BMISDS was -0.37 when the two groups were combined. When statistically separated by intervention group, in the nurse, dietician, physiotherapy group the BMISDS was -0.50, and in the nurse/dietician group, it was -0.26 ($p = 0.25$) There was no statistically significant difference between the groups (Forsell et al., 2018).

Additionally, a reduction in BMI was found in the RCT conducted by Farpour-Lambert et al. (2019) who engaged patients with either a multidisciplinary team consisting of a pediatrician

and a dietician plus physical activity or the control group who received only an appointment with a pediatrician every three months. BMI and BMI *z*-scores were measured and compared to the control group after six months. The BMI mean and BMI *z*-score reduction for individual delivery by the multidisciplinary team versus standard pediatrician care only were 0.21 and 0.06 respectively ($p = 0.48$) at six months and 0.31 and 0.02 ($p = 0.49$) at 12 months. While both groups showed improvement, there was no significant BMI differences between the intervention group and the control group after six or 12 months leading to the conclusion that multidisciplinary individual care is not a cost-effective way of reducing patient BMI (Farpour-Lambert, 2019). However, the results were clinically significant. Clinical significance guidelines remain to be established in pediatric overweight and obesity, but one recommended definition was a reduction in BMI *z*-score between 0.01 and 0.10 (Kolsgaard et al., 2011.

Resnicow et al. (2016) also achieved clinically significant results when a dietician was part of the interdisciplinary team. The study concluded that there was a statistically significant difference between the BMI of group one in which PCPs received a half day of education on MI and treatment guidelines and group three who receive a day and a half of training about MI and behavioral therapy as well as a MI DVD, training from a registered dietician, and follow-up requirements ($p = 0.02$). A non-significant difference was found between group one and group two ($p = 0.11$) who received the same interventions as group three with exception of the training by a registered dietician. After two years, the BMI results were: group one had a BMI percentile of 90.3, group two achieved a BMI percentile of 88.1, and group three finished with a BMI percentile of 87.1. While the children in all three groups still qualified as overweight, this reduction is BMI percentile remains clinically significant (Resnicow et al., 2016). The high intensity interventions of multidisciplinary teams yielded significant results but raised questions of cost, time constraints, and sustainability as a standardized intervention.

Family-based Interventions. Several studies examined the effects of family-based interventions on BMI, *z*BMI, and weight. Jortberg et al. (2016) initiated the FFC which

incorporated a monthly meeting with family members and parents. The family was challenged to implement lifestyle changes together. When participants remained in the program for greater than six months, they experienced significant improvement in BMI ($p = 0.0001$), and an improvement was also seen in BMI *z*-scores when participants remained in the program for at least nine months ($p = 0.0329$). In both rural and urban settings, PCPs were able to affect changes in pediatric weight through identification of elevated BMI and initiation of weight management interventions. SIGN (2010) also recommended involving family in the patient care plan but did not provide specified interventions. The treatment recommendations by SIGN (2010) were as follows: Initiate lifestyle interventions, decrease total energy intake, increase physical activity, decrease sedentary practices, involve the family in patient care, and implement behavioral modification interventions that incorporate stimulus control, self-monitoring, goal setting, problem solving, and rewards for achieving goals.

According to NICE (2015) guidelines which address the treatment of obesity in children in a primary care health clinic, NICE recommended involving both the patients and their family members in the plan of care and providing them with information on lifestyle change programs in their area and encouraging their use. In a pilot RCT, participants demonstrated a significant reduction in BMI when ENTREN-F, a psychosocial, family-based intervention was initiated in the primary care setting (Sepulveda et al., 2019). Both the ENTREN and ENTREN-F groups reported high satisfaction rates by the parents and reduced BMI, but the ENTREN-F group was more successful at lowering patient BMI by a mean score of -0.19 ($p = 0.85$). In addition, program compliance rates were higher in the ENTREN-F group with an 86.6% participation rate versus a 62.5% participation rate in the ENTREN group. While results were not statistically significant, this reduction in BMI could be considered clinically significant (Sepulveda et al., 2019). Overall, the evidence indicated that family involvement in patient interventions for weight management helps to reduce BMI.

Parent-centered Interventions. The literature also contained several interventions focused on parental behaviors. In a Cochrane's Library systematic review, Loveman et al. (2015) compared results from RCTs focusing on parent-only interventions to several other treatment approaches including parent-child interventions, wait list control groups, and minimal contact groups. Parent-only interventions resulted in no significant change ($p = 0.56$) when compared to parent-child interventions while parent-only interventions compared to wait list control groups did yield statistically significant results ($p = 0.04$). When parent-only interventions were compared to a minimal contact control group, the changes were not significant ($p = 0.81$) leading to the conclusion that parent-only interventions were more effective when a wait list study design was utilized (Loveman et al., 2015).

Fong (2020) also recommended parental participation as part of a multimodal approach to weight reduction. This aligned with the guideline by NICE that stated patients with obesity and their family members should be provided with education on lifestyle changes and referred to lifestyle change programs in their communities. Chai et al. (2019) built upon this by stating that the most successful family-based interventions were ones that were aimed at parents and that positive parenting and role modeling affected weight management in children. In this analysis of 14 systematic reviews and meta-analyses, all, with the exception of one, identified family-based interventions that addressed parents were successful in improving weight or healthy habits. They concluded that lifestyle behavioral interventions were effective to manage weight in children and worked well when coupled with physical activity and diet modification. Success was achieved through use of role modeling, positive parenting, nutrition and activity education, and behavior management (Chai et al., 2019).

A systematic review of observational studies regarding parenting approaches to the management of obesity also emphasized the importance of the parental role stating that authoritative parenting that encouraged active, autonomous thinking and facilitated others-oriented, rule-abiding behaviors was associated with effective outcomes (Gerards et al., 2011).

While not statistically significant, this review indicated that primary care encouragement of authoritative parenting through anticipatory guidance and discussion of appropriate discipline for age positively effects weight management outcomes.

In a JBI evidence summary Nnaji (2019) made recommendations for practice that could be used in primary care that included behavior modification, nutrition, and activity education for a minimum of 6 months to see a reduction in BMI and waist circumference.

Behavioral Interventions.

Multiple pieces of evidence addressed behavior interventions as a part of weight management in pediatric patients (APA, 2018; Canadian Task Force on Preventative Health Care, 2015,; Fleischman et al., 2016; Jortberg et al., 2016; Mead et al., 2017; Parra-Medina et al., 2015; SIGN, 2010; Taylor et al., 2015; USPSTF, 2016; UOM, Obesity Guideline Team, 2020; Wylie-Rosett et al., 2018). A behavioral intervention is a psychotherapy that should engage the patient, last only 20 to 30 minutes, be structured, require minimal professional training, be relevant and applicable to the patient, and be based on EBP (University of Washington, 2020). Mead et al. (2017) found that behavioral interventions could affect weight change if part of a multimodal approach to patient care. The studies in this systematic review consisted of varying behavioral modification, diet, and activity levels among its intervention groups. In a summary of 37 trials, BMI *z*-score was 0.06 units lower than the control group with a 95% CI and a *p*-value of 0.001. In a summary of 24 of the RCTs, BMI was on average 0.53kg/m2 ($p < 0.00001$) lower in the intervention group, and the final group of 17 RCTs had an average weight of 1.45kg lower than the control group ($p < 0.00001$).

According to the Canadian Task Force on Preventative Health Care (2015) and based upon the RCT evidence that their research experts collected and analyzed, behavioral interventions are effective short-term for reducing BMI and are safer than medications. The most effective behavioral interventions involved group session, interdisciplinary care, and family or parent participation. The recommendation included that PCPs should offer behavioral

interventions or refer to interdisciplinary teams who could accomplish this. This literature review revealed several factors regarding behavioral lifestyle changes that were frequently utilized including self-reporting, goal setting, adequate sleep, and MI as well as frequent provider or interdisciplinary contact to address elevated BMI (APA, 2018; Canadian Task Force on Preventative Health Care, 2015,; Fleischman et al., 2016; Jortberg et al., 2016; Mead et al., 2017; Parra-Medina et al., 2015; SIGN, 2010; Taylor et al., 2015; USPSTF, 2016; UOM, Obesity Guideline Team, 2020; Wylie-Rosett et al., 2018).

Self-Reporting. In a randomized pilot study, behavioral interventions were recommended based on self-reported behavioral information about lifestyle habits (Parra-Medina et al., 2015) Lifestyle habits addressed were: eating at least five fruits and vegetables per day, decreasing screen time to less than two hours per day, engaging in at least one hour of physical activity per day, decreasing or eliminating sugary beverage consumption, encouraging greater than five family meals per week, limiting meals eaten outside the home, consuming breakfast daily, reducing overly restrictive diet habits, and allowing children to self-regulate their eating. In the intervention group, patient responses were entered into an algorithm that generated specified diet and activity strategies that the PCP could use to address self-reported, negative lifestyle habits paired with face-to-face counseling, telephone visits, and newsletters. In the control group, patients were given standard care equal to that recommended by the AAP. Children in the intervention group experienced less of an increase in *z*BMI (32.1% of participants increased) as compared to the control group (41.4% increased their *z*BMI). The authors concluded that children who received the intervention were more likely to achieve weight maintenance instead of weight gain (Parra-Medina et al., 2015).

Sleep. Taylor et al. (2015) emphasized the importance of appropriate sleep as a lifestyle modification that affected patient weight and this was reinforced by UOM guidelines (2020). School-aged children between five and 12 years of age should get 10 to 11 hours of sleep per night as inadequate sleep is associated with increased weight gain. Key components to

achieving proper sleep are a daily schedule, a consistent bedtime, consistent bedtime routines, a quiet and dark bedroom, and an area that is designated for sleep only (UOM, Obesity Guideline Team, 2020). While the consensus was that behavioral lifestyle changes were necessary to reduce BMI, when the APA (2018) created guidelines, no behavioral intervention pathway had sufficient evidence to be considered a superior method.

Motivational Interviewing

Resnicow et al. (2016) conducted a RCT to discover the effect of MI appointments on pediatric patient weight. The RCT consisted of three comparison groups of providers who all received varying levels of education on MI techniques. Only group three who received one and a half days of training on MI and behavioral therapy, a MI DVD, training from a registered dietician, and required the PCP to schedule at least three patient MI appointments in the first year and one appointment in the second year yielded significant results (Resnicow et al., 2016). This indicates that intensive provider training is required for MI to be effective. In the systematic review and meta-analysis by Sim et al. (2016) when MI was utilized with nutritional education, *z*BMI was reduced slightly but significantly with a MD of -0.04 ($p = 0.02$).

Contact Frequency

A common theme among behavioral interventions was frequency of contact. APA guidelines (2018) recommended that obese children between two and 18 years of age had a minimum of 26 hours of multifaceted behavioral interventions which agreed with the USPSTF recommendation that 26 or more contact hours reduced patient weight (2016). Additionally, they concluded that those with greater than 56 hours of contact experienced greater weight loss than those with only 26 hours of contact. In a randomized crossover study, participants who were contacted by an obesity specialist, in addition to their PCP, experienced a statistically significant difference from baseline weight by one year (Fleischman et al., 2016). Those who spent 35 hours with a multidisciplinary team as well as those who visited with a dietician for three hours

and a pediatrician for four hours over a six month period experienced an improvement in BMI and *z*BMI (Farpour-Lambert et al., 2019).

Technology Interventions

Several technological interventions were also investigated for their effect on the reduction of pediatric BMI. In a randomized crossover study by Fleischman et al. (2016), one group of participants received tele-health visits from obesity specialists accompanied by visits with their PCP for the first six months, and a significant difference from baseline was calculated at nine months. Patients in group two, who only received visits with their PCP for the first six months, but then received tele-health visits from obesity specialists in the six months thereafter, achieved a significant difference by 12 months (Fleischman et al., 2016). Web-based management of obesity was utilized in conjunction with a multimodal approach involving reminders, mentoring, and parental participation and was able to help decrease weight in participants (Fong, 2020). However, an RCT conducted by Taveras et al. (2017) that involved patients receiving two text messages or emails per week did not yield significant results. While the intervention had a positive reception from parents, the reduction in *z*BMI scores was minimal with the enhanced primary care group having a MD of -0.06 whereas the enhanced care plus coaching group experiencing a MD of -0.9 ($p = 0.39$) (Taveras et al., 2017). While the reduction was not statistically significant, it is clinically significant as increased weight gain did not occur in either group and may contribute to positive quality of life; however, the intervention was intensive and expensive and would most likely fail a cost-benefit analysis. A mobile health application for children in Sweden with obesity also did not result in a reduction in body weight (Fong, 2020).

Best Practice Model Recommendation

Based on the extensive review and synthesis of varying evidence, a multimodal approach to the management of overweight and obesity in children ages five to 12 years was most appropriate. The integration of a behavioral intervention focused on lifestyle changes

coupled with parental education and participation in nutrition and physical activity counseling appeared most likely to yield the greatest cost effective and sustainable impact on patient BMI, zBMI, and weight while aligning with national and international guidelines.

Technological interventions, while innovative, have not yielded consistent, significant results that justify their development and use for EBP. However, when readily available, they could be integrated into a larger, multifaceted approach. Similarly, the high cost of multidisciplinary interventions did not return results that were significant enough to survive a cost-benefit analysis.

The majority of high-level evidence supported the use of a multicomponent approach for the effective decreasing of weight, BMI, and *z*BMI in pediatric patients (APA, 2010; Chai et al., 2019; Fong, 2020; Jortberg et al., 2016; Mead et al., 2017; Nnaji, 2019; Resnicow et al., 2017; SIGN, 2010; Sepulveda et al., 2019; Taveras et al., 2017; UOM, Obesity Guideline Team, 2020; Wylie-Rosett et al., 2018). Based on the literature, a multifaceted intervention would include frequent contact from the primary care office with a focus on behavioral interventions that addressed lifestyle changes and educate patients and families on proper nutrition, caloric intake, sleep, and physical activity levels. The guidelines of various countries (Canadian Task Force on Preventative Health Care, 2015; NICE, 2015; SIGN, 2020; USPSTF, 2016) reinforced the importance of family involvement, increased activity levels, decreased caloric intake, and goal setting with frequent contact with healthcare professionals. While a couple pieces of evidence supported a goal of greater than 26 contact hours within a few months of diagnosis (APA, 2018; USPTFS, 2026), this goal is not achievable within the current United States healthcare climate (Fleishman et al., 2016; Farpour-Lambert, 2019). Specific intervention details for this project are provided in chapter three and consists of a provider reminder system aimed at increasing consistency of diagnosis as well as provider education on appropriate and timely interventions involving in-office discussion of nutrition and activity levels, referral to the on-site behavioral intervention energy clinic, referral to a nutritionist, and basic guidelines of MI.

While results for these interventions did not always reveal statistically significant results, clinical differences can be observed that improve patient outcomes. For pediatric patients struggling with overweight and obesity, a multifaceted approach to decreasing weight, BMI, and *z*BMI had the potential to impact their quality of life and alter the trajectory of their relationship with the healthcare system. As the most frequent point of contact with healthcare for these patients is with their provider, this multifaceted approach to care required beginning at the core of diagnosis and disease management which is initiated in the pediatric office. As a result, the PICOT question addressed in this project was: In patients between the ages of five and 12 years of age (P), how does the implementation of primary care provider reminders and education (I) compared to current practice (C) impact the diagnosis of overweight and obesity, frequency of nutrition and activity counseling, follow-up visit recommendations, and number of patient referrals as well as patient weight, BMI, and *z*BMI (O) over a 12-week period (T)?

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

Based on the provided evidence, to best affect a practice change in this pediatric primary care setting, providers needed to first recognize overweight and obesity in pediatric patients when they arrived for their appointments. At the time of the project, the clinical site used AthenaNet as its electronic health record (EHR) which automatically calculated BMI and BMI percentile whenever weight and height were entered by the front desk nurse. Implementation of a provider reminder system flagged patients who were above the 85th percentile for weight by age and gender. This reminder system was implemented via a post-it system. The front desk nurse who already entered height and weight for the patients placed a yellow post-it in the clip outside the patient room if the patient was between the 85th and 95th percentile and placed a pink post-it in the same spot if the patient was above the 95th percentile for a period of 12 weeks. These clips were already being used to hang immunization sheets for patients, so this reminder system should not have inhibited the flow of the office. However, inconsistencies occurred during the first four and a half weeks of the project and some patient's BMIs were flagged while others were not. Nursing was re-educated on the system. However, when they informed their nursing supervisor, this portion of the project was temporarily halted. The nursing supervisor was contacted but it took several weeks to fully communicate and re-implement the reminder system as designed. In the final four weeks of implementation, the desired consistency was finally achieved.

To prepare the office for the intervention, provider education was supplied at one of the ongoing, noon educational sessions. Those who were unable to attend this education received a copy of the PowerPoint presentation with noted slides and any provider handouts via e-mail. The project leader also contacted these providers after one week to inquire about any questions. All education was provided by the project leader with approval from the clinical

director and site facilitator and addressed the diagnosis of overweight and obesity, proper ICD code entry, the importance of frequency of provider contact, addressing overweight and obesity at each appointment, providing diagnosed patients with educational handouts at each visit, referrals to the energy clinic or a nutritionist, timing of follow-up appointments, and a brief overview of motivational interviewing (MI) techniques. While MI is an intensive process that requires in-depth training, a brief overview of its principles was included to minimize patient risk of feeling stigmatized when discussing weight interventions and to give providers a basis for beginning tough conversations. During the education session, providers were also informed of the use of the new post-it flagging system. A recommended treatment algorithm was provided to aid in providing continuity of care among providers. This algorithm was designed based on the American Academy of Pediatrics algorithm for the treatment of overweight and obesity in children between the ages of two and 20 years old (American Academy of Pediatrics Institute for healthy Childhood Weight, 2015). The project was approved by the key office stakeholders and was able to be implemented without further review from either the site institutional review board (IRB) or the Valparaiso University IRB. The goal was to reach a level of evidence-based care that consistently addressed elevated BMI regardless of which provider was conducting the patient visit and creating a treatment plan with secondary measurable outcomes of decreased patient weight, BMI, and *z*BMI.

Participants and Setting

The clinical setting was a high-volume pediatric clinic on the north side of Indianapolis, Indiana. The primary population of this clinic was patients from low socioeconomic backgrounds who were on Medicaid, many of whom spoke English as a second language with their first language being Spanish.

All providers providing primary care at this Indianapolis-based clinic for pediatric patients between five and 12 years of age were encouraged to participate in the project and received information on the implementation of the post-it system as well as provider education. This

collection of providers consisted of second- and third-year medical residents as well as experienced pediatricians and one certified nurse practitioner. Upon their visit to the clinic, data on age, gender, race/ethnicity, weight, height, BMI, BMI percentile and were collected for all children between five and 12 years of age who had a BMI equal to or greater than the 85th percentile. Information about the frequency and type of ICD code entry, nutrition and activity counseling, and patient referrals to the on-site energy clinic and off-site nutritionists as well as the provider recommended time period for a follow-up appointment were also collected. This data was collected and compared to the same data types from the pre-intervention period.

Intervention

Patient Flags

The flow of patient care within the clinic began with the desk nurse who collected patient weight and height. This information was then entered into the EHR which automatically calculated patient BMI and BMI percentile and plotted the patient information along the patient's growth chart. The patient was then escorted to the examination room. The nurse placed an immunization sheet outside the exam room for the provider to gather when they entered the room and visited the patient. The project leader informed the nurses of the new post-it system. With this system, the nurse stuck either a yellow post-it for patients whose measurements were equal to or greater than the 85th percentile but less than the 95th percentile or a pink post-it for patients with a BMI percentile greater than the 95th to the same clip as the immunization sheet. This supplied the provider with a reminder to check the patient's BMI percentile which prompted them apply a diagnosis code and initiate a treatment plan for overweight or obesity.

Provider Education

Provider education took place in a one-hour time slot during one of the site's previously scheduled education sessions. For providers who were unable to attend the education, a detailed e-mail was sent delineating the details of the practice change of the flagging system as well as the PowerPoint presentation (see Appendix A) that was used for the in-person provider

education. Providers were encouraged to contact the project leader with any questions or concerns. Education topics consisted of the diagnosis of overweight and obesity and proper ICD code entry, the evidence regarding frequency of provider contact and accomplishing this evidence-based goal by addressing overweight and obesity at each appointment as well as providing diagnosed patients with educational handouts at each visit, referrals to the energy clinic or a nutritionist, the timing of follow-up appointments for overweight and obesity management, and an overview of motivational interviewing techniques.

Diagnosis and ICD codes

Diagnosis for overweight or obesity was determined by viewing the patient problem list as well as searching for the appropriate ICD diagnosis code. During the provider education session, providers were informed of the CDC definition of overweight and obesity. Diagnosis codes for overweight and obesity in pediatrics were also reviewed. E66.3 was the diagnosis code for to be used for overweight while E66.9 was the ICD code for obesity and E66.01 pertained to morbid (severe) obesity (ICD-10-CM code E66, 2020). These were non-billable medical codes that were diagnostic in nature. Pediatric BMI percentile Z codes were billable but were not considered primary diagnosis codes, so they had to be paired with a primary diagnosis E code unless they were paired with coding from a well-child visit. The Z codes to be recorded were Z68.53 for pediatric BMI from the 85th percentile to less than the 95th percentile for age and Z68.54 for pediatric BMI equal to or greater than the 95th percentile for age which are consistent with the CDC (2018) definition of overweight and obesity (ICD-10-CM code Z68.5, 2020). In addition, when nutrition counseling was completed the billable code Z71.3 for dietary counseling and surveillance was to be applied (ICD-10-CM code Z71.3, 2020). Providers were given a handout (see Appendix B) that specified the CDC definition of overweight and obesity, the diagnosis E and Z codes, and the recommended algorithm for treatment and follow-up.

Provider Contact and Patient Education

During the education session, the project leader also reviewed the EBP regarding frequent provider contact. This included the recommendation by the APA (2018) and the USPSTF (2016) of a minimum of 26 hours of provider contact to address overweight and obesity. The project leader explained that while reaching that goal is not realistic in this primary care setting, the clinical site's goal was to increase frequency of contact as increase contact hours which could result in a decreased BMI (APA, 2018; Farpour-Lambert et al., 2019; Fleishman et al., 2016; USTSPF, 2016). At a minimum, all patients who were diagnosed with overweight or obesity should be seen by a primary care provider at least once per month (American Academy of Pediatrics Institute for Healthy Childhood Weight, 2015).

Providers were encouraged to integrate discussion of nutrition and activity levels into each patient appointment for those who were diagnosed as overweight or obese even if the primary patient complaint was not weight-related, and they were to document it in their care plan and enter the Z71.3 code. Handouts were supplied in both English and Spanish for the providers to give to patients and were updated monthly to ensure that patients were not receiving repeat information (see Appendix C). While the information on the English and Spanish versions of the handouts was not identical, the patient education was congruent. Providers were sent email reminders to utilize the handouts, but they were seldom used even by the site facilitator. Nutrition and activity level education information was provided based on the United States Department of Agriculture (USDA, n.d.-a), MyPlate recommendations as well as the Childhood Obesity Foundation's (n.d.) Healthy Lifestyle 5-2-1-0 Rule.

MyPlate information focused on food and drink choices and creation of a healthy lifestyle of eating (USDA, n.d.-b). Its pillars included choosing a variety of foods, decreasing saturated fats, sodium, and sugars, beginning with small changes, and eating the right amount for the person (USDA, n.d.-b). The right amount for each person is determined by age and gender. For children between five and eight years of age, total portions for the day should be equivalent to

one and one-half cups of vegetables, one to one and one-half cups of fruits, five ounces of grains, four ounces of protein, two and one-half cups of dairy, and four teaspoons of oils (Super Healthy Kids, Incorporated, 2020). For children nine to twelve years of age, total daily female portion sizes should be equivalent to two cups of vegetables, one and one-half cups of fruits, five ounces of grains, five ounces of protein, three cups of dairy, and five teaspoons of oil while males total daily intake should consist of two and one-half cups of vegetables, one and one-half cups of fruits, six ounces of grains, five ounces of protein, three cups of dairy, and five teaspoons of oil (Super Healthy Kids, Incorporated, 2020).

While My Plate spoke only to nutrition, the Healthy Lifestyle 5-2-1-0 Rule addressed both nutrition and activity levels (Childhood Obesity Foundation, n.d.). The rules of Healthy Lifestyle 5-2-1-0 were as follows: eat five or more serving of fruits and vegetables in a day, limit screen time to less than two hours per day, engage in one hour or more of cumulative physical activity per day, and drink zero sugar sweetened beverages such as soda, tea, or juice per day (Childhood Obesity Foundation, n.d.).

Referrals and Follow-up

Another aspect of the provider education session was initiating a plan for referral and follow-up. For patients with a diagnosis of overweight, in-office nutrition and activity counseling by the primary care provider was to be performed at each visit. These patients were also to be provided with a handout on nutrition in their primary language if possible. A follow-up appointment should have been made every three months to monitor patient weight. Referrals to the onsite energy clinic, which focused on family behavioral interventions and included the setting of goals and reward incentives, were to be made for any child who met the criteria for obesity. While ideally all overweight and obese pediatric patients would receive this intervention, due to limited appointment availability at the in-office energy clinic, this referral was limited to those most in need. When a diagnosis of obesity was made, every effort should have been made to get the child their first energy clinic appointment within one month. Follow-up visits at

the energy clinic were scheduled for every three months thereafter. If the child had a BMI greater than the 99th percentile, an additional referral to a nutritionist should also have been considered to promote a more intensive care plan and increase healthcare professional contact hours.

Motivation Interviewing

The final subject of the provider education session consisted of an overview of MI. Patient weight is a sensitive subject, and patients can feel stigmatized which impacts their quality of life (Guardabassi et al., 2018). MI concepts gave the providers guidelines for discussing weight while remaining cognizant of patients' emotional wellbeing. MI was based on the following five principles: Expressing empathy with reflective listening, helping the patient to perceive discrepancies between their behavior and their goal, avoiding placing the patient in a defensive position through confrontation and argument, adjusting to resistance through reframing and reflection, and supporting self-efficacy and optimistic attitudes towards behavioral change (Center for Substance Abuse Treatment, 1999).

Comparison

As discussed in chapter one, data from the clinical agency revealed inconsistency regarding the identification and treatment of pediatric patients with overweight or obesity. Fourteen percent of patients who qualified as overweight or obese who came into the pediatric clinic from June 8, 2020, to July 7, 2020 received no intervention for the disease. For other patients, no diagnosis was applied based on the CDC definition of overweight and obesity in children. Follow-up appointment recommendations given by the providers also ranged with categories of one month (20%), two months (4%), three months (28%), four months (1%), six months (7%), and one year (13%). For the other 27% of patients with overweight or obesity, no recommended follow-up timeline was documented. Referral data was also collected from this time period. Of 111 patients, 35 patients were either currently being treated outside of primary care appointments or received an additional referral to specialized care. During this period, 21

patients were current attendees of the on-site energy clinic, 13 additional referrals to the energy clinic were made, one patient referral was completed to a dietician, and one additional patient was referred to both an endocrinologist and a dietician. Of the 13 referrals made to the energy clinic, two parents of patients declined. One provider also noted intent to refer to the energy clinic at next visit if improvement in patient BMI was not experienced within the month.

Outcomes

The primary measurable outcomes for this project were calculated based on the documentation of overweight or obesity in the patient problem list and the documentation of the diagnosis codes E66.01, E66.3, or E66.09 by providers which revealed that the patient diagnosis was made. An accurate diagnosis based on the CDC criteria for overweight and obesity will be verified by the project leader before it is included in the project's statistics. The number of accurate diagnoses of overweight and obesity documented were compared to the pre-intervention documentation numbers from the clinic that were verified as accurate by the project leader. Number of referrals made by the providers to either the on-site energy clinic or any nutritionist referrals were also collected and compared to pre-intervention calculations. To assess the frequency of nutrition and activity counseling being supplied by the providers in office, the percentage of patients who are documented with a Z71.3 code or as having been provided with nutrition and activity counseling without an ICD code was also observed. Patient education handouts were supplied from a central location where each provider typically gathered other patient education materials. These were individually numbered by the project leader. Total number of handouts given to patients will be calculated based on remaining number of handouts at the end of three weeks when a new set of handouts were provided. This was used to assess if providers were supplying this additional method of education to patients. At the end of the project, the total number of supplied patient handouts should have been equal to the number of patients who met criteria for overweight or obesity. To secondarily account for patient handouts, a checklist was placed above them. The providers were to place a check mark

beneath either “Spanish” or “English” to identify that they removed a handout for the purpose of providing further education to a patient who had been diagnosed with overweight or obesity (see Appendix D). Secondary outcomes included the recorded measurements of patient weight, BMI, and *z*BMI that were completed at each visit and recorded by the primary nurse in the patient’s chart.

Data was collected by the project leader in-office through chart audits. No identifiable patient or provider information were collected. Data collected included: patient age, gender, race/ethnicity, height, weight, BMI, *z*BMI, ICD codes documented, referrals made, nutrition and activity counseling recorded.. Pre- and post-intervention data were then analyzed and compared to identify if the EBP intervention made a statistically significant difference.

Time

The education of the pediatric care providers was completed on September 24, 2020, as it was the best date and time for both the project site and the project leader. Once the education had been provided, implementation as well as the recording of data began. The final date of implementation was December 18, 2020. The project leader received approval to implement this project from the site organization and was exempt from review through their IRB. The project did not require further review as it consisted of a provider intervention at a singular site and did not directly involve a vulnerable patient population. The Valparaiso University IRB had already approved this project. The project leader continued to follow-up with providers to answer questions and ensure ease of implementation.

Protection of Human Subjects

Human subjects were protected as the collection of data did not include any identifiable patient or provider information. All data was pooled into spreadsheets which eliminated the prospect of identifying which providers were recognizing, diagnosing, and managing patient overweight and obesity which eliminate risk of employment repercussions. While patient demographics were collected, patient medical record numbers and names were not. The patient

demographics were also entered onto a spreadsheet. The spreadsheets were stored on a password protected hard drive that was known only to the project leader. Patients that returned for monthly visits were assigned a code number so that weight, BMI, and *z*BMI statistics could be linked and compared at the end of 12 weeks. No identifiable patient data was collected or removed from the site's encrypted database. The code sheet was only accessible to the project leader and was saved in a password protected file on a password protected database. These passwords were only known to the project leader.

All patients received a minimum of the current standard of care in the office and were to receive the EBP interventions delineated above. Providers were encouraged to ask questions and bring concerns to the project leader to make changes as necessary when flaws were identified. Assigning color-coded post-it notes without any markings as flags to remind providers to check patient BMI percentile and make appropriate interventions eliminated the risk of other patients in the office knowing the purpose of the note.

A brief overview of MI was discussed during the provider education session. It simply highlighted the key points of expressing empathy, avoiding argument, drawing attention to the difference between patient goals and patient behavior, reframing resistance, and supporting self-efficacy. This was to protect patients from potential psychosocial effects associated with discussion of patient weight by creating an environment where weight management was a collaborative process. This was simply a brief overview and was not to be considered comprehensive training.

Allowable billing for the treatment of overweight and obesity was also a concern regarding the protection of human subjects because the majority of patients in this office were from low socioeconomic status and qualified for Medicaid. These patients would not have been able to afford treatment beyond what Medicaid could provide, and finances needed to be considered in order to provide holistic care. According to the Early and Periodic Screening, Diagnostic, and Treatment benefit and under provision of the Affordable Care Act, all medically-necessary

services for children, including those related to obesity prevention and treatment, were covered by Medicaid which allowed these patients to receive frequent treatment for their diagnosis (Centers for Medicare and Medicaid, n.d.).

CHAPTER 4

FINDINGS

The purpose of this project was to affect patient outcomes through the implementation of a multifactorial intervention aimed at reducing overweight and obesity in pediatric patients based on best current evidence. As the first step to weight management begins with diagnosis and treatment, the project examined how the implementation of reminders and education for providers affected the frequency of overweight and obesity diagnosis, the frequency of nutrition and activity counseling, return to see time, and frequency of patient referrals in patients between the ages of five and 12 compared to pre-intervention office practices. Secondary outcomes of patient weight, BMI, and *z*BMI were also analyzed among repeat patients.

Participants

Size

Participants were included if they met the criteria for diagnosis of overweight or obesity. The total number of participants in the pre-intervention group was 111 while the intervention group totaled 391 participants. A total of 27 patients had repeat appointments with recorded height, weight, BMI, and *z*BMI during the 12-week timeframe. Of these, 24 patients came into the office for two separate visits while three patients had three recorded appointments with providers.

Demographics

Age

The age range for this project was predetermined, so both the pre-intervention and intervention groups ranged in age from five to 12 years. In the pre-intervention group, the mean age was 8.5 (*SD* = 2.39628) while the intervention group age was 8.7442 (*SD* = 2.33393) (see Figure 4.1). An independent t-test determined that there was no significant age difference between groups ($t(2) = -1.092$, $p = 0.275$). See Figure 4.1.

Gender

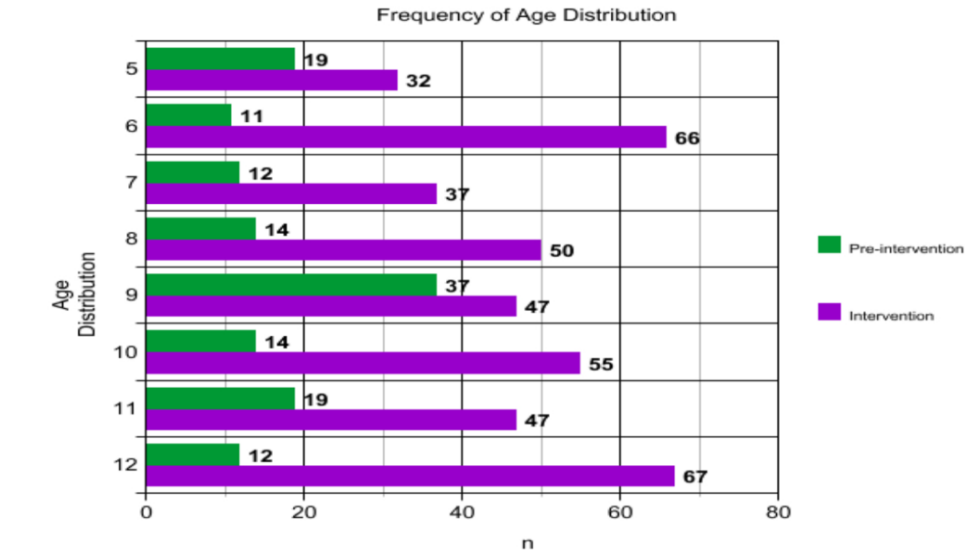
Gender comparison was less similar with the pre-intervention group consisting of 40.5% males and 59.5% females while the intervention group was 43.5% female and 56.6% male. A chi-square of independence was calculated to compare the frequency of males and females in the pre-intervention and intervention groups. A significant difference was found (X^2 (1) = 8.864, p = .003)

Race

Race remained relatively consistent. The largest group pre-intervention identified as Hispanic or Latino (57.7%) followed by African American or Black (28.8%), White or Caucasian (7.2%), and those who declined or identified as other totaling 6.3% (see Figure 4.2). In the intervention group, race was as follows: Hispanic or Latino (46.5%) followed by African American or Black (29.7%), White or Caucasian (10.5%), Asian (1.3%) and those who declined or identified as other (12.1%). A chi-square test of independence was completed to determine if there was a difference in race frequency among the groups. A chi-square test determined there was no significant difference (X^2 (5) = 7.315, p = .198). See Figure 4.2.

Figure 4.1

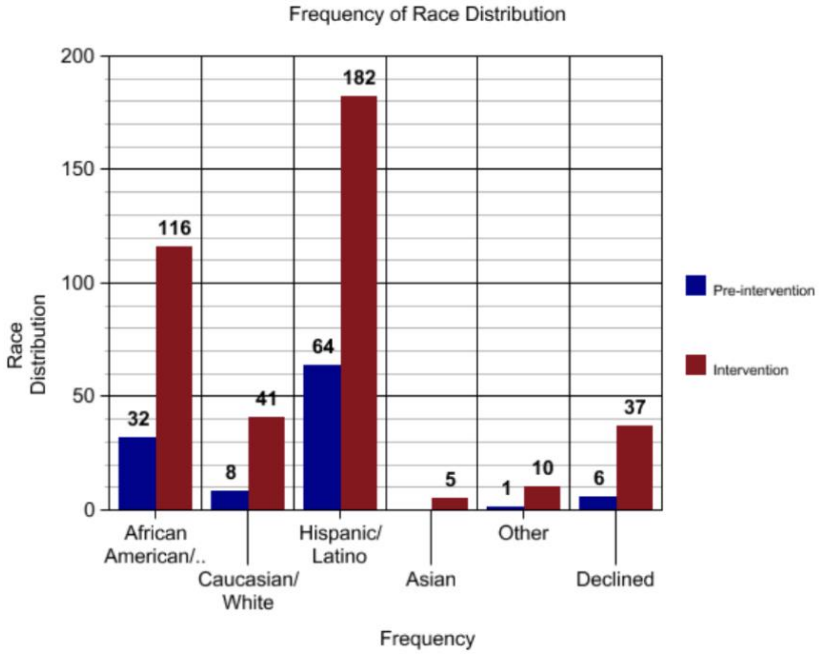
Frequency of Age Distribution



Note. Comparison of age distribution in pre-intervention and intervention groups.

Figure 4.2

Frequency of Race Distribution



Note. Comparison of race distribution in pre-intervention and intervention groups.

Previous Diagnosis

Prior to June 2020, when pre-intervention data were collected, some patients had already received a diagnosis of overweight or obesity. This diagnosis appeared in these patients' problem list in the EHR. Because previous diagnosis may be its own reminder for the provider to address the problem, a comparison of previous diagnosis in the pre-intervention and intervention groups was completed to evaluate this potential for bias. Frequency of previous diagnosis in the pre-intervention group was 62.1% (n = 69) while frequency of previous diagnosis in the intervention group was 42.5% (n = 166). A chi-square test of independence revealed that there was a significant difference between the two groups (X^2 (1) = 13.485, p = .00024) with the pre-intervention group having more previously diagnosed patients than the intervention group.

Changes in Outcomes

Primary outcomes for data analysis included a comparison of the frequency of diagnosis, frequency of nutrition and activity counseling, and frequency of patient referrals between the pre-intervention and intervention groups.. Secondary outcomes included a within-groups analysis of weight, BMI, and *z*BMI for repeat patients over the 12-week period.

Statistical Testing and Significance

To make a comparison of the frequency of diagnosis, nutrition and activity counseling, and patient referrals, nominal between-groups frequency distribution and chi-square testing was completed. Frequency of diagnosis was determined by the recording of either an "E" ICD code or a "Z" ICD code or a combination of both. The reason for the variation of codes was due to the structure of the billing system. When a patient presented for an annual exam, a "Z" code could be used as an add-on diagnosis; however, when not paired with another exam code, an "E" diagnostic code was used for a primary diagnosis. Nutrition and activity counseling was determined by provider entry of a Z71.3 code or other annotation in the patient chart that nutrition and activity was discussed during the visit. No qualitative data on the consistency of the

nutrition and activity counseling content was recorded for analysis. Frequency of referrals was determined by provider documentation within the patient's EHR that a referral had been made to the behavioral clinic or a nutritionist. Providers also documented if parents refused this recommendation.

To determine the significance of the intervention on patient weight, BMI, and *z*BMI, a secondary set of within-group testing was performed. A comparison of the patients' first appointment to final appointment was made using a paired *t*-test for the 27 patients who presented for multiple in-office visits during the intervention period.

Primary Outcomes

Frequency of Diagnosis

Pre-intervention Group. In the pre-intervention group, "E" ICD codes were entered as diagnostic for a total of 47 patients or 42.3% of patients who qualified as overweight or obese as defined by the CDC (see Table 4.1). No "E" codes were documented for 57.7% of patients (*n* = 64). Documentation of "Z" diagnostic codes were entered for 9.9% of patients (*n* = 35). Of these, 11 met the criteria for overweight while 24 were obese (see Table 4.2). Some overlap occurred for 19.8% of patients (*n* = 22) in which they were assigned both an "E" and a "Z" code designation. To account for this, a cross-tabulation was performed (see Table 4.3). This overlap resulted in a total diagnostic recording of 54.1% (*n* = 60) of patients as overweight or obese. This means that 45.9% (*n* = 51) of patients who met CDC criteria were not diagnosed according to current EBP recommendations.

Intervention Group. In the intervention group, "E" ICD codes were recorded for 49.9% of patients (*n* = 195) while 61.1% of patients (*n* = 239) received a "Z" code diagnostic designation. Diagnosis for three patients (2.7%) was recorded incorrectly. Overlap was present in 41.4% of patients (*n* = 162). When overlap is accounted for, 70.1% (*n* = 274) of patients who met CDC criteria received an accurate diagnosis while 29.9% (*n* = 117) did not.

Table 4.1

Frequency of E Code Distribution

E Codes	Pre-intervention	Intervention
	Percent (*n*)	Percent (*n*)
E66.0	0% (0)	0.3% (1)
E66.01	8.1% (9)	12.8% (50)
E66.3	0% (0)	2.0% (8)
E66.8	0% (0)	0.5% (2)
E66.9	34.2% (38)	34.3% (134)
No E Code	57.7% (64)	50.1% (196)

Note. A side-by-side comparison of the frequency of assigned E code distribution in the pre-intervention and intervention groups.

Table 4.2

Frequency of Z Code Distribution

Z Codes	Pre-intervention	Intervention
	Percent (*n*)	Percent (*n*)
Z68.53	9.9% (11)	14.8% (58)
Z68.54	21.6% (24)	46.3% (181)
Incorrect Code	0% (0)	0.8% (3)
No Z Code	68.5% (76)	38.1% (149)

Note. A side-by-side comparison of the frequency of assigned Z code distribution in the pre-intervention and intervention groups.

Table 4.3

Cross-tabulation of E and Z Code Distribution

Group			ICD Z Code				
			Z68.53	Z68.54	No Z Code	Incorrect	Total
Pre-intervention	ICD E Codes	E66.01	0	16	22	0	38
		E66.9	3	3	3	0	9
		No E Code	8	5	51	0	64
	Total		11	24	76	0	111
Intervention	ICD E Codes	66.0	0	0	1	0	1
		66.01	0	47	3	0	50
		66.3	0	4	4	0	8
		66.8	0	1	1	0	2
		66.9	1	109	24	0	134
		No E Code	57	20	117	2	196
	Total		58	181	150	2	391

Note. A cross-tabulation to determine diagnosis frequency by accounting for patients who were assigned two diagnostic codes on the same visit.

Comparison of Groups. A chi-square test of independence was calculated to determine if there was a statistically significant difference in frequency of diagnosis between the pre-intervention and intervention groups. To account for diagnostic code overlap, patients were identified as having received either an E or Z diagnosis at their visit or not. A chi-square test of independence was calculated comparing the frequency of diagnosis in the pre-intervention and intervention groups. A significant difference was found (X^2 (1) = 8.636, p = .003).

Frequency of Nutrition and Activity Counseling

Pre-intervention Group. In the pre-intervention group, nutrition and activity counseling was documented as provided for 73.0% (*n* = 81) of patients compared to 27.0%% (*n* = 30) of patients who were not provided with nutrition or activity counseling at their appointment with the provider. While 81 patients had documentation within their EHR discussion notes that they had received counseling, only 28.8%% of them (*n* = 32) were assigned a dietary or activity ICD code. Two ICD codes were used for this entry, but only ICD 71.3 was encouraged for use by the project leader. ICD 71.3 is allocated as dietary counseling and surveillance, and the other was ICD Z72.4 which is the code for inappropriate diet and eating habits.

Intervention Group. In the intervention group, 77.0% (*n* = 301) of patients received nutrition and activity counseling at their primary care appointment. Of the 391 patients, a total of 167 dietary and activity counseling ICD codes (42.7%) were applied (see Table 4.4).

Comparison of Groups. A chi-square test of independence was performed to compare the frequency of nutrition and activity counseling between the groups. No statistically significant difference was identified (X^2 (1) = 1.587, p = .208).

Table 4.4

Frequency of Nutrition and Activity ICD Codes

Group		ICD Code Entry			
		Z71.3	Z72.4	No code	Total
Pre-intervention	Counseling Provided	31	1	49	81
	Not Provided	0	0	30	30
	Total	31	1	79	111
Intervention	Counseling Provided	163	4	137	304
	Not Provided	0	0	87	87
	Total	163	4	224	391

Note. Comparison of pre-intervention and intervention group ICD codes for nutrition and activity counseling.

Frequency of Referrals

Pre-intervention Group. Ten patients (9.0%) in the pre-intervention group were referred to the on-site behavioral intervention clinic while 1.8% (*n* = 2) were referred to a nutritionist at their visit. Seventeen patients (15.3%) were already a part of the behavioral intervention clinic, and the remaining 73.9% (*n* = 82) of patients did not receive any sort of referral (see Table 4.4).

Intervention Group. In the intervention group, 47 patients (12.0%) were referred to r the on-site behavioral intervention clinic while 18 patients (4.6%) were referred to a nutritionist. Another 59 patients (15.1%) of patients were already attending the behavioral clinic. The remaining 68.3% (*n* = 267) of patients did not receive a referral and were not already part of the clinic.

Table 4.5

Frequency of Referrals

		Group	
		Pre-intervention	Intervention
Referral	Behavioral Intervention Clinic	10	47
	Nutritionist	2	18
	Current Behavioral Intervention Attendee	17	59
	No Referral	82	267
Total		111	391

Note. A side-by-side comparison of the frequency of referrals in the pre-intervention and intervention groups.

Comparison of Groups. To make a comparison between the pre-intervention and intervention groups, total number of referrals were combined regardless of whether the patient was referred to a nutritionist or the behavioral intervention clinic (see Table 4.6). This combination allowed the data to be compared using a chi-square test for independence, and it did not affect the primary outcome of number of referrals. Frequency of current behavioral clinic attendees was also compared to account for this variable. Of the 11 patients in the pre-intervention group, 15% were already a member of the onsite behavioral intervention clinic. This is similar to the intervention group in which 15.1% of the population was already involved with the on-site behavioral clinic. A chi-square test of independence was performed to determine if there was a significant *difference* between the frequency of referrals in the pre-intervention (provide percentage and number) and intervention groups (percentage and number). No statistically significant difference was found (X^2 (2) = 2.296, p =.317).

Table 4.6

Chi-square Comparison of Groups

	X^2	df	*p*
Frequency of Diagnosis	8.636	1	.003
Frequency of Nutrition and Activity	1.587	1	.208
Frequency of Referrals	2.296	3	.317

Note. Chi-square comparison of pre-intervention and intervention data to determine statistical significance regarding frequency of diagnosis, nutrition and activity counseling, and referrals.

Secondary Outcomes

Secondary outcome measurements consisted of weight, BMI, *z*BMI among repeat patients. Repeat patient information was collected during the implementation process any time that a patient returned. Three patients had three separate appointments while the remaining 24 had two appointments. Table 4.7 consists of individual patient measurements so that individualized comparisons can be made. A paired *t*-test analysis was completed using repeat patients' first visit measurements compared to their final visit measurements regardless of number of visits or time between visits to identify statistical significance (see Table 4.8). Pre-intervention and intervention return to see recommendations were compared using an independent *t*-test to determine statistical significance.

Weight

While patient weight in kilograms was recorded during the process, it is not the most reliable indicator of weight loss in school-aged children as they are continually growing and are expected to gain weight as they gain height. The initial average weight was 49.4663 (*SD* = 18.8799) while the final average patient weight was 50.4211 (*SD* = 19.19820). A paired *t*-test was performed to compare overall initial patient weight to final patient weight. An overall

increase in weight was found (t (26) = -3.620, p = .001). However, while the p-value result for this fell within the range of statistical significance, the mean weight gain was only .95481 kilograms. The resulting p-value is most likely due to the large standard deviation which mathematically results in a decreased p-value but does not necessarily reflect a statistically significant difference (Dahiru, 2008).

BMI

Patient BMI is also not the most accurate way of measuring this age groups' change over time, but it may give clues to a patient's progress. A paired t-test was performed to compare initial visit patient BMI to final visit BMI. The mean for the initial visit was 24.8704 (SD = 4.63663) and the mean of the final visits was 24.9815 (SD = 4.62843). No significant difference between the groups was found (t (26) = -.792, p = .436). Repeat patient BMI was also compared using a paired t-test to determine if patients whose BMI did decrease experienced a statistically significant decrease. The mean BMI for these patients decreased from 25.4286 (SD = 7.51392) to 24.6429 (SD = 7.43233). The amount of decrease was found to be statistically significant (t (6) = 4.040, p = .007)

zBMI

A school-age child's BMI percentile is the recommended way to gauge progress because zBMI most accurately reflects loss of adiposity in pediatric patients (CDC, 2018; Hunt et al., 2007). A paired t-test was calculated to compare repeat patients' initial visit zBMI to their final visit zBMI. The mean patient zBMI for the initial visits was 97.3704 (SD = 2.15100) while the mean patient zBMI for the final visits was 97.3333 (SD = 1.90142). While the overall zBMI of patients was decreased, no statistically significant difference was found (t (26) = .166, p = .869). Among repeat patients that experienced a decrease in zBMI, a paired t-test was conducted to determine if those patients experienced a statistically significant decrease. The mean BMI for these patients decreased from 97.8333 (SD = 2.40139) to 96.3333 (SD = 2.73252). A mean zBMI decrease of 0.50 is typically considered to be statistically significant in interventions less

than six months long (Hunt et al., 2007). The mean decrease among repeat patients who experienced a reduction of zBMI during this intervention was 1.5. The paired t-test also determined that the amount of reduction in *z*BMI for these patients was statistically significant ($t(5) = 6.708$, $p = .001$).

Table 4.7

Individual Measurements of Secondary Outcomes

	Initial Weight (kg)	Final Weight (kg)	Initial BMI	Final BMI	Initial *z*BMI	Final *z*BMI
Pt No. 1	27.78	28.58	21.7	21.6	99	98
Pt No. 2	73.6	74.75	30.7	31.7	>99	>99
Pt No. 3	73.65	75.38	28	28.6	97	98
Pt No. 4	30.96	30.96	20.8	20.8	99	98
Pt No. 5	44.95	45.18	23.9	24.2	97	97
Pt No. 6	31.52	36.38	25.2	26.4	>99	98
Pt No. 7	30.96	30.11	20.8	19.4	99	97
Pt No. 8	55.07	54.94	27.2	25.8	98	98
Pt No. 9	64.13	65.54	26.7	27	97	98
Pt No. 10	45.93	45.98	22.3	22.1	94	94
Pt No. 11	37.68	38.28	20.2	20.3	95	95
Pt No. 12	53.75	53.75	26.6	27	99	99
Pt No. 13	56.3	58.51	27.8	28.6	99	99
Pt No. 14	21.9	22.68	17.2	18.1	91	95
Pt No. 15	40.09	41.73	21.7	22	98	98
Pt No. 16	68.15	68.1	26.6	26.6	97	97
Pt No. 17	28.21	28.18	19.8	19	98	96
Pt No. 18	30.56	32.57	19.9	21	97	98
Pt No. 19	39.92	40.37	25	25	>99	>99
Pt No. 20	51.35	52.33	25.6	26	>99	>99
Pt No. 21	32.75	31.84	23.5	22.6	>99	>99
Pt No. 22	42.75	44.54	22.8	23.7	94	95
Pt No. 23	59.15	60.5	26.3	26.5	98	98
Pt No. 24	65.32	63.5	24.7	24	93	91
Pt No. 25	104.6	107.41	41.5	40.6	>99	>99
Pt No. 26	63.05	65.69	26.9	27.6	98	98
Pt No. 27	61.51	63.59	28.1	28.3	98	98

Note. Individual weight, BMI, and *z*BMI statistics of patients who had multiple provider encounters during the 12-week implementation time frame.

Table 4.8

*Paired T-test Comparison of Repeat Patient Weight, BMI, and z*BMI

Group		*N*	*M*	*SD*	*t*	*df*	*p*
Weight	Initial Weight	27	49.4663	18.87990			
	Final Weight	27	50.4211	19.19820			
					-3.620	26	.001*
BMI	Initial BMI	27	2.5856	0.66699			
	Final BMI	27	2.5856	0.70243			
					-.792	26	.436
*z*BMI	Initial *z*BMI	27	24.8704	4.63663			
	Final *z*BMI	27	24.9815	4.62843			
					.166	26	.869

*$p < .05$

Note. Paired *t*-test results of patient weight, BMI, and *z*BMI for return visits during the 12-week implementation period.

Return To See

As frequency of provider contact was recommended in the literature, recommended return to see times in the pre-intervention and intervention groups were compared using an independent *t*-test. Return to see times are the number of months between office follow-ups that were recommended by the provider. The mean return to see time for the pre-intervention group was 6.4 months (*SD* = 4.76290) and the mean for the intervention group was 5.8 months (*SD* = 4.28997). No significant difference between the groups was found (t (500) = 1.263, p = .207).

Pediatric patients should be returning to their provider once annually for a well-child visit regardless of overweight or obesity diagnosis. The independent *t*-test included these visits in the recommended return to see times. To account for this variable, a chi-square test for independence was conducted that compared the frequency of recommendations to return in less than one year in the pre-intervention group (59.5%) to the frequency of recommendations for return visits within the year in the intervention group (70.3%). The results of this test were statistically significant ($p = .030$).

Conclusion

To summarize, statistically significant results were found regarding frequency of diagnosis. Providers were more likely to diagnose a patient with overweight or obesity during the intervention period. However, no statistically significant difference was evident regarding frequency of nutrition and activity education or referrals. Patient weight did experience an increase, however, this is an expected finding as pediatric weight should increase with height. No statistically significant difference between groups was found when patient BMI and *z*BMI were compared. However, seven repeat patients experienced a decrease in BMI and six experienced a decrease in *z*BMI, and the amount of reduction among these patients was found to be statistically significant. Return to see time was also improved with a decrease of approximately half a month overall, and this was not statistically significant, however, providers increased the frequency of recommended return to see time of less than one year with statistically significant results.

CHAPTER 5

DISCUSSION

The prevalence of overweight and obesity is continuing to rise among pediatric populations worldwide with an estimated one in every five children now meeting criteria for diagnosis (WHO, 2020). Disparities are also evident based on race, ethnicity, income, and education level (CDC, 2019). To effectively treat overweight and obesity across all demographics, continuity of care must be provided (Nguyen, 2020). Improved management of overweight and obesity is achieved through frequent provider contact, patient education, and behavioral interventions focused on nutrition and activity levels, but to manage the disease, it must first be recognized and diagnosed in the primary care setting (APA, 2016; Farpour-Lambert et al., 2019, Fleishman et al., 2016; USPSTF, 2016). This chapter will include the interpretation of the project findings, the connection of those findings to current literature, evaluation of the EBP model utilized during this project as well as the project's strengths and weaknesses. The chapter will also discuss implications for future research and recommendations.

Explanation of Findings

The PICOT question addressed in this EBP project was: In patients between the ages of five and 12 years of age, how does the implementation of primary care provider reminders and education compared to current practice impact the diagnosis of overweight and obesity, frequency of nutrition and activity counseling, and the number of patient referrals as well as patient weight, BMI, and *z*BMI and return visit recommendation over a 12-week period?

Primary Outcomes

The primary outcomes of the EBP project were evaluated with the completion of a chi-square analysis of the frequencies of diagnosis, nutrition and activity education, and patient

referrals. During the intervention period, there was a significant increase in the number of diagnoses (p = .003), however, no statistically significant difference was identified regarding nutrition and activity education or patient referrals.

Minimal pediatric research has been conducted that attempts to directly connect diagnosis of overweight and obesity to a decrease in patient weight. Physical reminder cards have been found to increase provider diagnosis of overweight and obesity (Shungu et al., 2015). Current research reveals that while reminders do not directly improve weight loss, the formal diagnosis of overweight or obesity is associated with a decrease in patient weight that is not statistically significant (O'Grady, Thacher, & Chaudry, 2013). These findings are consistent with the results of this EBP project. Provider reminders resulted in a significant increase in patient diagnosis (p = .003), but this was not reflected in patient weight as these patients gained weight over time (p = .001). Examination of pediatric patient weight is complicated by the fact that pediatric patients are expected to gain weight as they gain height making zBMI a more appropriate measurement than weight to measure changes in the pediatric population (CDC, 2018). *z*BMI did not experience a statistically significant difference with the introduction of provider reminders. This result is consistent with the literature and unlikely to be attained in a 12-week intervention timeframe.

In a study conducted by Shungu et al. (2015), printed reminders were not associated with a statistically significant increase in provided nutrition and activity counseling. This is consistent with the results of this EBP project. In the study, the authors concluded that the lack of a statistically significant increase was due to the existence of auto-generated EHR order sets which included dietary counseling when BMI was auto-generated (Shungu et al., 2015). In this EBP project, zBMI data was automatically calculated but not flagged by the EHR, however providers were already documenting nutrition and activity counseling for 73% of patients. While the frequency of nutrition and activity counseling increased from 73.0% to 77.0%, this result was not statistically significant (p = .208). However, older literature has shown that EHR reminders

are associated with an increase in nutrition and activity counseling (Bordowitz et al., 2007; Schriefer et al., 2009). This contrast from the EBP project results may be due to the nature of the project as the providers received physical reminders and not EHR reminders. Providers were also already providing more nutrition and activity education prior to the intervention period than they were accurately providing diagnosis, so there was less area for improvement.

Behavioral interventions have been utilized with success in multiple studies as part of a multi-factor approach to care (APA, 2018; Canadian Task Force on Preventative Health Care, 2015; Fleishman et al., 2016; Jortberg et al., 2015; USPSTF, 2016; UOM Obesity Guideline Team, 2020; Wylie-Rosett et al., 2018). A behavioral intervention clinic to address overweight and obesity was already established on-site at this clinic. Providers were encouraged to refer patients to this clinic during the provider education session based on the recommendation by the Canadian Task Force on Prevention Health Care (2015) that PCPs should refer patients with overweight and obesity to a professional specialized in behavioral interventions if they cannot provide this themselves. Provider education resulted in an increase in the frequency of referrals from 12.8% of eligible patients to 19.6%, but these results were not statistically significant (p = .317) Mead et al. (2017) found that weight change was affected when behavioral interventions were incorporated into a multimodal approach to care. The 12-week duration of the project did not allow for the collection of longitudinal results. When patients were referred to the behavioral clinic, the minimal wait for an appointment was one month. The EBP intervention timeframe did not allow for the repeat patients to be followed long enough to identify if the behavioral intervention clinic had any effect on weight outcomes.

Recommended time period for the patient's next follow-up appointment was also evaluated as 26 hours of provider contact is recommended as a way to affect patient weight outcomes (APA, 2018; USTSPF, 2016). A decrease in the time between patient visits will increase the patients' contact time with the provider. Farpour-Lambert et al. (2019) found that BMI and *z*BMI were reduced when patients experienced 35 hours of contact with various

providers over a six-month period. Fleischman et al. (2016) also found that increased contact time resulted in decreased weight when patients were followed over one year. Participants in this EBP project did not see a statistically significant decrease in weight, BMI, or *z*BMI during the intervention timeframe. This is an expected finding due to the short timeframe of the project. To see if providers were encouraging frequent contact, an independent *t*-test was conducted comparing provider follow-up appointment time recommendations. The analysis found that recommended return to see times decreased from 6.4 months to 5.8 months, but these results were not statistically significant ($p = .207$). However, when a chi-square test of independence was completed comparing the number of pre-intervention return to see times that were less than one year to the number of recommended return to see times of less than one year in the intervention group, a statistically significant difference was found ($p = .030$). This comparison was made as pediatric patients should return to see the provider annually with or without an overweight or obesity diagnosis. This may indicate an association between provider education about current guidelines with decrease in the provider recommended time period between patient visits.

Secondary Outcomes

A paired *t*-test was performed to evaluate the overall weight of patients during the intervention period and found a statistically significant increase ($p = .001$). However, weight increase is not the best measure of change in pediatrics as children are still growing and are expected to gain weight as they gain height. BMI was also compared via a paired *t*-test, but no statistically significant difference between groups was found ($p = .436$). When *z*BMI was compared, no statistically significant difference was found ($p = .869$); however, overall mean *z*BMI did decrease from 97.3704 ($SD = 2.151$) to 97.3333 ($SD = 1.90142$). Additionally, five of the 27 repeat patients experienced a decrease in *z*BMI, and one-third of repeat patients experienced a decreased BMI over the 12-week period.

These results are consistent with other multifactorial interventions aimed at decreasing overweight and obesity. Brown et al. (2019) found that multifaceted interventions led to a decrease in BMI but not in *z*BMI while Taylor et al. (2015) found a slight decrease in *z*BMI that was not statistically significant. Forsell et al. (2018) also studied BMI and zBMI in pediatric overweight and obesity and found that at 12-month and four-year intervals, multifactorial interventions led to a decrease in BMI without statistical significance. Mead et al. (2017) also found a decrease in BMI when behavioral interventions were incorporated into the care plan, but those results were not statistically significant.

Jortberg et al. (2016) conducted a study using a multifaceted approach that incorporated behavioral interventions to manage overweight and obesity, and it did yield statistically significant results; however, the intervention was far more intensive with weekly meetings and goal setting with a care manager and a monthly family and group visit. Parra-Medina et al. (2015) found that behavioral interventions were more likely to result in weight maintenance than improved weight, BMI, or *z*BMI. Of repeat patients during the implementation period, 59.3% maintained their *z*BMI.

Overall, the results of this EBP project are consistent with current literature. While BMI and *z*BMI may be reduced by multifaceted patient interventions, the results are not usually statistically significant without intensive treatments. More intensive treatments would not be feasible within the primary care setting as they often involve weekly visits or the participation of multidisciplinary care. As patients with overweight and obesity experience less effective results when primary care is the sole manager of the diagnosis, primary care should serve as the stepping stone for initiation of more intensive interventions through involving multidisciplinary teams of behavioral health specialists and dietitians. Referrals to these professionals as well as providing information on community resources for weight management could be accomplished in primary care. If providers increase referrals, then parental education on the long-term effects of overweight and obesity should also be addressed as this lack of knowledge is a potential

barrier to treatment. Within this 12-week project, three parents declined referral to the on-site clinic. A lack of parental knowledge about poor diet, activity levels, obesity, and nutrition as well as denial or misunderstanding of the diagnosis are primary parental barriers to involvement in a behavioral intervention clinic or follow-up appointments (Bouch, 2017).

This EBP project was conducted over a 12-week period, and it has been noted that a minimum of six months is necessary to fully affect weight parameters (Nnaji, 2019). While statistical significance was not achieved, the intervention results may be clinically significant for patient *z*BMI. While pediatric guidelines for clinical significance of *z*BMI reduction have not yet been established, the guideline for adults recommends that a mean change in *z*BMI of -0.01 to -0.10 is clinically significant (Kolsgaard et al., 2011). If that same principle is applied to pediatrics, then the reduction of *z*BMI suggest a change of -0.0371 may indicate clinical significance.

The review of literature found that while dietary and activity interventions did not result in statistically significant results, patients did experience a decrease in *z*BMI (Brown et al., 2019; Taylor, 2015). A reduction in BMI has also been associated with the combined approach of nutrition and activity interventions including patient education about these subjects (Fong, 2020; Wylie-Rosett, 2018).

Strengths and Limitations of the DNP Project

The strengths and limitations of this project varied widely. Patient demographics, implementation at the project site, and the use of the JHNEBP model must all be considered.

Strengths

One of the greatest strengths of this EBP project was the number of participants with a total of 111 in the pre-intervention group and 391 in the intervention group. These groups were consistent along most demographic lines with no significant difference in age or race distribution. There was also no significant difference in the patient population that was already a

part of the behavioral intervention clinic. As they were already part of the clinic and could not be provided with a referral, it was important to ensure that a difference between groups did not affect the outcome of the frequency of referrals. Additionally, a comparison of previous diagnoses was completed between patient groups to ensure that this diagnosis was not already serving as a reminder to the physician, and while the analysis was statistically significant, previously assigned diagnoses were more prevalent within the pre-intervention group. Patients should be assigned a diagnostic code at each visit regardless of previous diagnosis, thus eliminating previous diagnosis serving as a provider reminder as a confounding variable.

Another strength of the project was the project site. The clinical director was invested in the project as a key stakeholder as she was interested in improving the site's quality scores concerning diagnosis and management of overweight and obesity. The site facilitator was also eager to press forward with implementation as she was passionate about addressing this disease in children and was highly involved in the on-site behavioral intervention clinic. Not only were the key stakeholders extremely interested in the project, but the population that frequents the clinic often meets the criteria for overweight and obesity, and a research study on the subject had been completed on site within the last five years. Because overweight and obesity diagnosis and management was an identified need at the project site, it was easier to gain buy-in from providers.

The education session for the providers was the strongest aspect of the implementation. The providers were extremely attentive and engaged in the learning process. They had multiple questions about the diagnostic criteria, the management plan, Medicaid coverage, and assignment of diagnosis codes. The questions made it evident that the intervention was filling a knowledge deficit. This recognized need for change was influential in creating an environment that was open to change among clinicians.

The EBP model chosen to guide this project was the JHNEBP model, and its flexibility added strength to the project process. The JHNEBP model consists of three primary phases

with a total of 18 steps (Dang & Dearholt, 2017). For this project, phase one began with recruiting the team of the project leader and the site facilitator. Together, they defined the problem and began asking the practice question or the PICOT question. Key stakeholders were then identified at the clinical site which included nurses, providers, and the clinical site director. Four nurses and two medical assistants were identified as key stakeholders for flagging patient BMI percentile. Providers consisted of the clinical director, the site facilitator, and seven other pediatricians. Leadership responsibility was to be taken by the project leader with the site facilitator overseeing her, and residents who came to the site during the implementation were instructed on the process and overseen by the clinical site director. A primary need at this clinic was identification and treatment of patient weight which would be addressed by the PICOT question.

The next phase in the JHNEBP model was to review the current evidence. A chart audit was performed at this site to collect internal evidence, and the information from this process served as the basis for the pre-intervention data. Once the audit was performed, the JHNEBP model directed cycling back to the PICOT question to refine it as necessary (Dang & Dearholt, 2017). The audit helped to identify the inconsistency of return to see recommendations and referrals, and these were added to the PICOT question. Phase two involved appraisal of the literature for level and quality and synthesis of the information. To complete the next step in the JHNEBP model, the project leader designed recommendations based on the literature and presented the clinical director and the site facilitator with the current evidence. The site director and the project leader were then able to brainstorm and create an implementation plan which began the third phase of the JHNEBP model. The site facilitator and the project leader engaged in conversation about how to minimize nursing and provider burden while implementing the plan, how to fit provider reminders into the natural flow of the clinic, and how to best provide the patient reminders while protecting patient privacy. They also discussed what material needed to be covered during the provider education session. During phase 3, step 13, securing support for

the plan, and step 14, implementation of the plan, were revisited several times during the 12-week timeframe as the project leader had some difficulty obtaining full support of some staff members (Dang & Dearholt, 2017). Support for the project was initially gained through the identification of the need from speaking to the clinical director. Once the idea for implementation was organized, it was provided to the clinical site director for approval. The clinical director also provided some insight about ICD code entry, and the billing department (or personnel) had to be contacted to help clarify proper entry for provider education. Added support was gained from communication with another pediatrician who desired for the project to improve quality indicators and scheduled the provider education session. The fluidity of the JHNEBP model allowed the project leader to easily flow between steps as she refined the project and ensured that she incorporated EBP into the needs of the clinic and integrated the suggestions of the primary stakeholders. The most rewarding part of implementation was the provider education session. Providers were incredibly supportive of the process, were active listeners, engaged in the learning process, and desired to make practice change. The education session included the significance of the problem which helped to garner support as the change was presented as an opportunity to positively affect patient outcomes. At the beginning of project implementation, the nursing staff was without a supervisor. Because this key stakeholder could not be obtained, the project leader spoke to nursing staff directly. The nursing staff stated that they were supportive, but then did not follow through with the reminder system as instructed. As they were instrumental in the reminder system, it was vital to gain their support. The project leader spoke to the nursing staff and medical assistants individually at several points during the implementation process to clarify the flagging system. The nursing staff were also reminded of the process via email and received the same PowerPoint presentation that was used in the provider education session. Unfortunately, as the project leader was usually only on the site weekly and nursing staff rotated, communication was often delayed. During the implementation period, a new nursing supervisor was hired. Despite the fact that the project had already been

implemented for several weeks, gaining support from the new nursing supervisor was difficult. Nursing staff had spoken to her before the project leader knew that a new supervisor had been hired, and they had informed the supervisor that implementation was too difficult. Several attempts were made to set up an appointment to discuss the project, but the nursing supervisor preferred to be contacted by email. She was also slow to respond to these which resulted in a longer time period with lack of support from the nursing staff. The project leader reached out to the clinical director to finally receive an adequate response from the supervisor. Once all of her questions about the project were addressed, she then spoke to nursing staff about implementing the project for the last several weeks of the project.

The final steps in the JHNEBP model were aimed at evaluation of the findings, reporting the outcomes back to the site facilitator, identifying ideas for future research and how to achieve sustainability, and dissemination of the results to the project site and the university through an oral presentation and publication of an EBP report (Dang & Dearholt, 2017). As nursing found the implementation to be time-consuming, the project leader deemed the post-it system to be unsustainable. However, the provider education session increased lifelong knowledge, and the project leader contacted the EHR company to inquire about adding *z*BMI as an automated quality flag for pediatric patients who fall within CDC criteria for overweight or obesity. If the EHR was able to add this to the quality tab algorithm, then sustainability of provider reminders would be achieved and automated.

Another strength of the project was the overwhelming amount of evidence available on the identification and treatment of overweight and obesity. While extra care was taken to add appropriate inclusion and exclusion criteria to narrow the population, the project still pulled from 25 pieces of high quality evidence. The scope of the literature supplied a wide evidence base and allowed for a multifaceted project.

Limitations

Some limitations were derived from a difference in patient demographics. The pre-intervention group contained a statistically significant greater number of females than the intervention group. As *z*BMI is calculated based on age and sex, this should not have altered final results, however, it was a notable difference. The other primary limitation regarding demographics was that the distribution of race, while congruent in both the pre-intervention and intervention groups, is not reflective of the general population. The number of participants who identified as Hispanic or Latino was near 50% in both groups followed by those who identified as African American or Black near 30%. This varies greatly from the general United States population which is primarily White at 72.0% with a Hispanic or Latino population of 18.4% and an African American or Black population of 12.8% (United States Census Bureau, 2021). This difference limits the generalizability of these results. However, the results may still apply to urban communities with similar population percentages around the nation. A further limitation of the project was the lack of foresight to collect data on language and income. The project site was part of a non-profit organization that primarily cared for Medicaid patients and had a large Spanish-speaking population. As a portion of the project was dedicated to nutrition and activity education, health literacy and language barriers may have affected outcomes. To minimize this effect, patients should be supplied with written material in their native language and an interpreter should be used at each visit. Patient culture should be considered as well, so providers must be educated on the cultural practices of those that they serve.

Another unforeseen barrier was that not all parents wanted to have their children treated for overweight or obesity. This was usually because they did not view their child as unhealthy. While this did not affect the frequency of diagnosis or referral, it may have had an impact on the secondary outcomes of weight, BMI, and *z*BMI.

The greatest limitation to this EBP project was difficulty with the implementation of the reminder system. While nurses were informed of the criteria for flagging BMI, nurses in the office were often rotated. This made communicating the plan to everyone very difficult. To

complicate matters, the office did not have a nurse manager at the beginning of implementation, so the project leader was unable to garner this support and spoke to nursing staff directly. Initially, nursing staff misunderstood the flagging criteria (all patients between five and 12 years of age with a BMI percentile greater than or equal to 85%). The nurses were flagging some patients but not all, and providers reported back stating that they were infrequently receiving the reminders. Gaining the support of nursing was extremely difficult and was ultimately obtained through consulting the new nurse supervisor who had the authority to help with implementation. The nurse supervisor was able to reinforce to nursing staff that the project was to be implemented as designed, and she assigned a nurse to the project implementation. Even though the implementation was created with the idea of a minimal burden on nursing, the nurses already felt overburdened and their full support was never achieved. This resulted in inconsistencies in the flagging system. However, even without this consistency, there was a statistically significant increase in the number of diagnoses and a clinically significant decrease in patient zBMI.

The Hawthorne effect may have affected the frequency of diagnosis as providers knew this would be examined by the project leader. However, there was not a statistically significant difference in the frequency of referrals or nutrition and activity education, and providers also knew that these were being examined as well. This inconsistency would indicate that the Hawthorne effect was not responsible for the significant change.

Implications for the Future

The purpose of an EBP project is not only to impact patient outcomes through the implementation of high quality evidence and advance the profession of nursing but also to contribute further to the existing body of evidence. Therefore, it is vital to explore the potential impact of this EBP project on practice, the JHNEBP model, research, and education.

Practice

Improving recognition and increasing diagnosis of overweight and obesity in pediatric patients has the potential to decrease patient weight, BMI, and *z*BMI long-term due to increased management of the condition over time. As pediatric providers are already overwhelmed in the ever-changing landscape of healthcare, recognizing yet another parameter for diagnosis when it is not the patient's primary complaint, can prove challenging. One way to overcome this difficulty is the addition of provider reminders. Within AthenaNet, the EHR used at this clinical site, an automated flagging system for adult BMI already exists within their quality tab. A similar parameter could be integrated into pediatrics by flagging BMI percentile of greater than or equal to 85. To attempt to initiate this change, the project leader reached out to AthenaNet regarding the implementation of this new parameter. AthenaNet has an ideas page that allows its users to submit ideas for improvements to the EHR. If this addition could be accomplished, the computer program would bypass the need for a dedicated nursing staff that was willing to help identify the disease. AthenaNet has responded to this inquiry and is looking into other organizations to see if this would be valuable to them.

The project leader could have made a more significant improvement in practice with better communication to the nursing staff. Scheduling a meeting that gathered all the nursing staff would have been ideal, but it was not feasible without greatly inconveniencing them. However, improved communication may have decreased project leader frustration and the number of limitations in the project. In the future, the project leader will take greater care establishing the practice change and ensuring that all responsible members express understanding of the EBP process.

EBP Model

The use of the JHNEBP model was ideal for the implementation of this project. The JHNEBP model is based on a problem-solving approach to making a clinical change (Dang & Dearholt, 2017). Once a clinical need was found at this site, the model guided the project leader through the implementation process. The JHNEBP model also has tools that can be utilized

through each step in the process. One of these is the evidence level and quality guide which helped to determine which research was included in the literature review for this project. Another helpful tool that guided project completion was the action plan tool. This tool examines workflow and funding, but it also has a segment dedicated to foreseeable barriers and plans for overcoming them so they can be addressed before they become problematic (Dang & Dearholt, 2017). This action plan helped identify the importance of how reminders would easily fit into the current workflow of the clinical site. The model could improve by addressing communication barriers. While it mentions gaining the support of key stakeholders, it does not address whom to engage when a key stakeholder cannot be identified. The model also does not address how to gain support when key stakeholders appear to be supportive, but then they do not participate in the process. The model is intuitive to the process of practice change implementation and is easy to use. Its cyclical nature is an added advantage. Because the process can be reversed, revised, and restarted at any point, the model can continue to be used even as technology advances and healthcare continues to change.

Research

This EBP project aimed at increasing diagnosis, nutrition and activity education, and patient referral to affect weight, BMI, and *z*BMI outcomes. Future research should aim to identify a more direct association between diagnosis and weight outcomes. In the review of literature, there was ample information supporting the use of multifaceted interventions including patient referrals to behavioral interventions and increased nutrition and activity education directed at affecting pediatric overweight and obesity. The literature also contained information on reasons that providers and parents do not always recognize this disease. However, there is an existing gap in the literature between increased diagnosis and its effect on overweight and obesity. Most research currently attempts to link the process of overweight and obesity management to a decrease in patient weight, BMI, and *z*BMI.. Longitudinal research should be conducted that aims to identify if an increase in patient diagnosis contributes to a disease.

Another research opportunity derives from the unexpected barrier of parental decisions to decline overweight and obesity management. A qualitative study should be conducted to identify any existing cultural barriers to weight management. Through addressing these barriers, providers may have more success initiating management of this disease.

Education

One of the most successful aspects of this EBP project was the provider education session. Despite the difficulties with the flagging system, there was still a significant increase in the number of diagnoses. The providers at this pediatric site consisted primarily of pediatricians, but there was still a knowledge deficit regarding criteria for pediatric overweight and obesity. This is in part because *z*BMI instead of BMI is the defining criteria for these diagnoses. Prior to the intervention, pediatricians at this site frequently diagnosed overweight and obesity based on visualization (Foster, 2019). There was also a lack of knowledge regarding how to properly apply ICD codes which may be attributable to a lack of education on ICD code application. The providers were also unfamiliar with the AAP algorithm for management of overweight and obesity and the current recommendation of at least 26 hours of provider contact. Increasing provider knowledge about overweight and obesity criteria and management is necessary to stem the tide of this growing epidemic. Finally, providers must seek to be educated on the status of Medicaid in their state and what types of services and community resources can be provided to help patients with overweight and obesity decrease their weight and increase their quality of life.

Conclusion

This EBP project aimed to reduce overweight and obesity in pediatric patients over a 12-week period. Provider reminders and education were implemented to affect the primary outcomes of frequency of diagnosis, nutrition and activity education, and referrals to the on-site behavioral intervention clinic or a nutritionist. Secondary outcomes were patient weight, BMI, and *z*BMI. A wealth of high-quality evidence offered modalities for decreasing overweight and

obesity in pediatrics resulting in the implementation of a multifaceted approach to care. The JHNEBP model was an appropriate guide for all phases of the project due to its flexible and cyclical nature that allowed for adjustments. The model was also straightforward, easy to use, and accounted for barriers to implementation.

When pre-intervention diagnosis was compared to intervention diagnosis, there was a statistically significant increase (p = .003). However, this increase in diagnosis did not correlate to an increase in the frequency of nutrition and activity education provided or patient referrals. While patient weight significantly increased over the 12-week timeframe, this was expected as children continue to gain weight as they grow. Patient BMI remained relatively unaffected by the intervention, and while not statistically significant, *z*BMI was found to have a mean decrease of 0.0371 revealing that some patients benefitted from the intervention. Providers also suggested earlier return to see times.

Based on these findings, provider reminders and education increase the recognition and diagnosis of overweight and obesity in children which is the first step in affecting patient weight, BMI, and *z*BMI. Provider reminders and education led to an increase in formal diagnosis which should lead to increased management, and ultimately, better patient quality of life. While patient weight outcomes did not experience a significant decrease, individual children did benefit from increased diagnosis and management, which is consistent with the current body of evidence. Implementation of a multifaceted approach to care can improve weight outcomes, but further research is required to identify how to implement these most effectively. In approximately 75% of cases, providers were already offering nutrition and activity education to patients with overweight and obesity even in the absence of an accurate diagnosis. Therefore, the frequency of nutrition and activity education alone does not seem to be the key to decreasing pediatric weight parameters. The frequency of referrals showed greater need for improvement. No significant difference was found in the frequency of referrals, and providers must give greater focus to the referral of patients to multidisciplinary teams as more intensive management is

associated with improved outcomes (Jortberg et al., 2016). Future research should continue to examine the relationship between the use of multidisciplinary teams for weight management as this may be the key to decreasing weight in pediatric patients.

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BIOGRAPHICAL MATERIAL

Mrs. Michelle L. Warren graduated from Valparaiso University with a Bachelor's of Science degree in nursing in 2018. Upon graduation, she enrolled in graduate school at Valparaiso University and is currently pursuing her DNP with expected completion in May of 2021. During her time at Valparaiso University, Michelle had the opportunity to travel to Northern Ireland and study mental health care for those recovering from the Troubles of the late 1960s through the 1990s. She is also a member of Sigma Theta Tau International-Zeta Epsilon chapter. Since 2018, she has been serving full-time as a medical progressive bedside nurse at Ascension St. Vincent in Indianapolis, Indiana. In March of 2020, her unit was converted to care for patients during the ongoing pandemic and was transitioned to a COVID-19 unit. Michelle's experience with the loss of her mother to glioblastoma last year and the experience of transitioning COVID-19 patients to comfort care has increased her desire to care for patients and families in hospice care settings. She also desires to pursue medical missions and care for underserved populations.

ACRONYM LIST

AAP: American Academy of Pediatrics

APA: American Psychological Association

BMI: Body Mass Index

BMISDS: Body Mass Index Standard Deviation Score

CDC: Centers for Disease Control and Prevention

EBP: Evidence Based Practice

EHR: Electronic Health Record

FFC: Fit Family Challenge

JBI: Joanna Briggs Institute

JHNEBP: Johns Hopkins Nursing Evidence Based Practice

IRB: Institutional Review Board

MD: Mean Deviation

MI: Motivational Interviewing

NICE: National Institute for Health and Care Excellence

PCP: Primary Care Provider

RCT: Randomized Controlled Trial

SIGN: Scottish Intercollegiate Guidelines Network

USDA: United States Department of Agriculture

USPSTF: United States Preventative Services Task Force

UOM: University of Michigan

WHO: World Health Organization

APPENDIX A

The Johns Hopkins Critical Appraisal Tool

Johns Hopkins Nursing Evidence-Based Practice

Appendix E

Research Evidence Appraisal Tool

Evidence level and quality rating:	
Article title:	Number:
Author(s):	Publication date:
Journal:	
Setting:	Sample (composition and size):

Does this evidence address my **EBP** question?

☐ Yes

☐ No-*Do not proceed with appraisal of this evidence*

Is this study:

☐ **QuaNtitative** (collection, analysis, and reporting of numerical data)
Measurable data (how many; how much; or how often) used to formulate facts, uncover patterns in research, and generalize results from a larger sample population; provides observed effects of a program, problem, or condition, measured precisely, rather than through researcher interpretation of data. Common methods are surveys, face-to-face structured interviews, observations, and reviews of records or documents. Statistical tests are used in data analysis.

➡ Go to ***Section I: QuaNtitative***

☐ **QuaLitative** (collection, analysis, and reporting of narrative data)
Rich narrative documents are used for uncovering themes; describes a problem or condition from the point of view of those experiencing it. Common methods are focus groups, individual interviews (unstructured or semi structured), and participation/observations. Sample sizes are small and are determined when data saturation is achieved. Data saturation is reached when the researcher identifies that no new themes emerge and redundancy is occurring. Synthesis is used in data analysis. Often a starting point for studies when little research exists; may use results to design empirical studies. The researcher describes, analyzes, and interprets reports, descriptions, and observations from participants.

➡ Go to ***Section II: QuaLitative***

☐ **Mixed methods** (results reported both numerically and narratively)
Both quaNtitative and quaLitative methods are used in the study design. Using both approaches, in combination, provides a better understanding of research problems than using either approach alone. Sample sizes vary based on methods used. Data collection involves collecting and analyzing both quaNtitative and quaLitative data in a single study or series of studies. Interpretation is continual and can influence stages in the research process.

➡ Go to ***Section III: Mixed Methods***

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Appendix E

Research Evidence Appraisal Tool

Section I: QuaNtitative		
Level of Evidence (Study Design)		
A Is this a report of a single research study?	☐ Yes	☐ No **Go to B**
1. Was there manipulation of an independent variable?	☐ Yes	☐ No
2. Was there a control group?	☐ Yes	☐ No
3. Were study participants randomly assigned to the intervention and control groups?	☐ Yes	☐ No
If **Yes to questions 1, 2, and 3**, this is a randomized controlled trial (RCT) or experimental study.		**LEVEL I**
If **Yes to questions 1 and 2 and No to question 3** or **Yes to question 1 and No to questions 2 and 3**, this is quasi-experimental. *(Some degree of investigator control, some manipulation of an independent variable, lacks random assignment to groups, and may have a control group).*		**LEVEL II**
If **No to questions 1, 2, and 3**, this is nonexperimental. *(No manipulation of independent variable; can be descriptive, comparative, or correlational; often uses secondary data).*		**LEVEL III**
Study Findings That Help Answer the EBP Question		
Skip to the **Appraisal of QuaNtitative Research Studies** section		

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Johns Hopkins Nursing Evidence-Based Practice

Appendix E

Research Evidence Appraisal Tool

Section I: QuaNtitative (continued)		
B Is this a summary of multiple sources of research evidence?	☐ Yes *Continue*	☐ No **Use Appendix F**
1. Does it employ a comprehensive search strategy and rigorous appraisal method? *If this study includes research, nonresearch, and experiential evidence, it is an integrative review (see Appendix F).*	☐ Yes *Continue*	☐ No **Use Appendix F**
2. For systematic reviews and systematic reviews with meta-analysis (see descriptions below):		
a. Are all studies included RCTs?		**LEVEL I**
b. Are the studies a combination of RCTs and quasi-experimental, or quasi-experimental only?		**LEVEL II**
c. Are the studies a combination of RCTs, quasi-experimental, and nonexperimental, or non- experimental only?		**LEVEL III**
A **systematic review** employs a search strategy and a rigorous appraisal method, but does not generate an effect size. A **meta-analysis**, or systematic review with meta-analysis, combines and analyzes results from studies to generate a new statistic: the effect size.		
Study Findings That Help Answer the EBP Question		
Skip to the **Appraisal of Systematic Review** (With or Without a Meta-Analysis) section		

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Appendix E

Research Evidence Appraisal Tool

Appraisal of QuaNtitative Research Studies			
Does the researcher identify what is known and not known about the problem and how the study will address any gaps in knowledge?	☐ Yes	☐ No	
Was the purpose of the study clearly presented?	☐ Yes	☐ No	
Was the literature review current (most sources within the past five years or a seminal study)?	☐ Yes	☐ No	
Was sample size sufficient based on study design and rationale?	☐ Yes	☐ No	
If there is a control group: • Were the characteristics and/or demographics similar in both the control and intervention groups?	☐ Yes	☐ No	N/A
• If multiple settings were used, were the settings similar?	☐ Yes	☐ No	N/A
• Were all groups equally treated except for the intervention group(s)?	☐ Yes	☐ No	N/A
Are data collection methods described clearly?	☐ Yes	☐ No	
Were the instruments reliable (Cronbach's α[alpha] ≥ 0.70)?	☐ Yes	☐ No	N/A
Was instrument validity discussed?	☐ Yes	☐ No	N/A
If surveys or questionnaires were used, was the response rate ≥ 25%?	☐ Yes	☐ No	N/A
Were the results presented clearly?	☐ Yes	☐ No	
If tables were presented, was the narrative consistent with the table content?	☐ Yes	☐ No	N/A
Were study limitations identified and addressed?	☐ Yes	☐ No	
Were conclusions based on results?	☐ Yes	☐ No	
Complete the **Quality Rating for QuaNtitative Studies** section			

Johns Hopkins Nursing Evidence-Based Practice

Appendix E

Research Evidence Appraisal Tool

Appraisal of Systematic Review (With or Without Meta-Analysis)		
Were the variables of interest clearly identified?	☐ Yes	☐ No
Was the search comprehensive and reproducible? • Key search terms stated	☐ Yes	☐ No
• Multiple databases searched and identified	☐ Yes	☐ No
• Inclusion and exclusion criteria stated	☐ Yes	☐ No
Was there a flow diagram that included the number of studies eliminated at each level of review?	☐ Yes	☐ No
Were details of included studies presented (design, sample, methods, results, outcomes, strengths, and limitations)?	☐ Yes	☐ No
Were methods for appraising the strength of evidence (level and quality) described?	☐ Yes	☐ No
Were conclusions based on results?	☐ Yes	☐ No
• Results were interpreted	☐ Yes	☐ No
• Conclusions flowed logically from the interpretation and systematic review question	☐ Yes	☐ No
Did the systematic review include a section addressing limitations **and** how they were addressed?	☐ Yes	☐ No
Complete the Quality Rating for QuaNtitative Studies section (below)		

Quality Rating for QuaNtitative Studies

Circle the appropriate quality rating below:

A High quality: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence.

B Good quality: Reasonably consistent results; sufficient sample size for the study design; some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence.

C Low quality or major flaws: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.

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Appendix E

Research Evidence Appraisal Tool

Section II: QuaLitative		
Level of Evidence (Study Design)		
A Is this a report of a single research study?	☐ Yes **this is Level III**	☐ No **go to II B**
Study Findings That Help Answer the EBP Question		
Complete the Appraisal of Single QuaLitative Research Study section (below)		

Appraisal of a Single QuaLitative Research Study		
Was there a clearly identifiable and articulated: • Purpose?	☐Yes	☐No
• Research question?	☐Yes	☐No
• Justification for method(s) used?	☐Yes	☐No
• Phenomenon that is the focus of the research?	☐Yes	☐No
Were study sample participants representative?	☐Yes	☐No
Did they have knowledge of or experience with the research area?	☐Yes	☐No
Were participant characteristics described?	☐Yes	☐No
Was sampling adequate, as evidenced by achieving saturation of data?	☐Yes	☐No
Data analysis: • Was a verification process used in every step by checking and confirming with participants the trustworthiness of analysis and interpretation?	☐Yes	☐No
• Was there a description of how data were analyzed (i.e., method), by computer or manually?	☐Yes	☐No
Do findings support the narrative data (quotes)?	☐Yes	☐No
Do findings flow from research question to data collected to analysis undertaken?	☐Yes	☐No
Are conclusions clearly explained?	☐Yes	☐No
Skip to the Quality Rating for QuaLitative Studies section		

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Appendix E

Research Evidence Appraisal Tool

B For summaries of multiple quaLitative research studies (meta-synthesis), was a comprehensive search strategy and rigorous appraisal method used?	☐Yes **Level III**	☐No go to **Appendix F**
Study Findings That Help Answer the EBP Question		
Complete the **Appraisal of Meta-Synthesis Studies** section (below)		

Appraisal of Meta-Synthesis Studies		
Were the search strategy and criteria for selecting primary studies clearly defined?	☐Yes	☐No
Were findings appropriate and convincing?	☐Yes	☐No
Was a description of methods used to: • Compare findings from each study?	☐Yes	☐No
• Interpret data?	☐Yes	☐No
Did synthesis reflect:	☐Yes	☐No
• New insights?	☐Yes	☐No
• Discovery of essential features of phenomena?	☐Yes	☐No
• A fuller understanding of the phenomena?	☐Yes	☐No
Was sufficient data presented to support the interpretations?	☐Yes	☐No
Complete the Quality Rating for QuaLititative Studies section (below)		

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Appendix E

Research Evidence Appraisal Tool

Quality Rating for QuaLitative Studies

Circle the appropriate quality rating below:

No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria.

For meta-synthesis, there is preliminary agreement that quality assessments should be made before synthesis to screen out poor-quality studies[1].

A/B High/Good quality is used for single studies and meta-syntheses[2].

The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry.

Evidence of some or all of the following is found in the report:

- **Transparency:** Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated.
- **Diligence:** Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence.
- **Verification:** The process of checking, confirming, and ensuring methodologic coherence.
- **Self-reflection and self-scrutiny:** Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations.
- **Participant-driven inquiry:** Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated.
- **Insightful interpretation:** Data and knowledge are linked in meaningful ways to relevant literature.

C Lower-quality studies contribute little to the overall review of findings and have few, if any, of the features listed for High/Good quality.

1 https://www.york.ac.uk/crd/SysRev/!SSL!/WebHelp/6_4_ASSESSMENT_OF_QUALITATIVE_RESEARCH.htm
2 Adopted from Polit & Beck (2017).

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Appendix E

Research Evidence Appraisal Tool

Section III: Mixed Methods

Level of Evidence (Study Design)

You will need to appraise both the quaNtitative and quaLitative parts of the study independently, before appraising the study in its entirety.

1. Evaluate the quaNitative part of the study using **Section I.**	**Level**	**Quality**
Insert here the level of evidence and overall quality for this part:		
2. Evaluate the quaLitative part of the study using **Section II.**	**Level**	**Quality**
Insert here the level of evidence and overall quality for this part:		

3. To determine the level of evidence, circle the appropriate study design:

- **Explanatory** sequential designs collect quaNtitative data first, followed by the quaLitative data; and their purpose is to explain quaNtitative results using quaLitative findings. The level is determined based on the level of the quaNtitative part.
- **Exploratory** sequential designs collect quaLitative data first, followed by the quaNtitative data; and their purpose is to explain quaLitative findings using the quaNtitative results. The level is determined based on the level of the quaLitative part, and it is always Level III.
- **Convergent** parallel designs collect the quaLitative and quaNtitative data concurrently for the purpose of providing a more complete understanding of a phenomenon by merging both datasets. These designs are Level III.
- **Multiphasic** designs collect quaLitative and quaNtitative data over more than one phase, with each phase informing the next phase. These designs are Level III.

Study Findings That Help Answer the EBP Question

Complete the **Appraisal of Mixed Methods Studies** section (below)

Appendix E
Research Evidence Appraisal Tool

Appraisal of Mixed Methods Studies[3]			
Was the mixed-methods research design relevant to address the quaNtitative and quaLitative research questions (or objectives)?	☐Yes	☐No	☐N/A
Was the research design relevant to address the quaNtitative and quaLitative aspects of the mixed-methods question (or objective)?	☐Yes	☐No	☐N/A
For convergent parallel designs, was the integration of quaNtitative and quaLitative data (or results) relevant to address the research question or objective?	☐Yes	☐No	☐N/A
For convergent parallel designs, were the limitations associated with the integration (for example, the divergence of quaLitative and quaNtitative data or results) sufficiently addressed?	☐Yes	☐No	☐N/A
Complete the **Quality Rating for Mixed-Method Studies** section (below)			

3 National Collaborating Centre for Methods and Tools. (2015). Appraising Qualitative, Quantitative, and Mixed Methods Studies included in Mixed Studies Reviews: The MMAT. Hamilton, ON: McMaster University. (Updated 20 July, 2015) Retrieved from http://www.nccmt.ca/ resources/search/232

Quality Rating for Mixed-Methods Studies

Circle the appropriate quality rating below

A **High quality:** Contains high-quality quaNtitative and quaLitative study components; highly relevant study design; relevant integration of data or results; and careful consideration of the limitations of the chosen approach.

B **Good quality:** Contains good-quality quaNtitative and quaLitative study components; relevant study design; moderately relevant integration of data or results; and some discussion of limitations of integration.

C **Low quality or major flaws:** Contains low quality quaNtitative and quaLitative study components; study design not relevant to research questions or objectives; poorly integrated data or results; and no consideration of limits of integration.

APPENDIX B

JHNEBP Critical Appraisal Tool – Application to Included Research

	APA (2018)	Brown et al. (2019)	Canadian Task Force on Preventative Health Care (2015)	Chai et al. (2019)	Farpour-Lambert (2019)	Fleischman et al. (2016)	Fong (2020)	Forsell et al. (2018)	Gerards et al. (2011)	Jortberg et al. (2016)	Loveman et al. (2015)	Mead et al. (2017)	NICE (2015)
Does the researcher identify what is known and not known about the problem and how the study will address gaps in knowledge?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the purpose of the study clearly presented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the literature review current (most sources within the past five years or seminal study)?	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Was the sample size sufficient based on	N/A	Yes	N/A	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	N/A

study design and rationale?													
If control group: Were the characteristics and/or demographics similar in both the control and intervention groups?	N/A	N/A	N/A	N/A	Yes	Yes	N/A	Un-defined	N/A	Yes	N/A	N/A	N/A
If multiple settings were used, were the settings similar?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A
Were all groups equally treated except for the intervention group?	N/A	N/A	N/A	N/A	Yes	Yes	N/A	Yes	N/A	Yes	N/A	N/A	N/A
Are data collection methods clearly described?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were the instruments reliable (Cronbach's alpha >0.70)?	N/A	Yes	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes
Was the instrument validity discussed?	N/A	Yes	Yes	Yes	Yes	No	N/A	Yes	N/A	No	Yes	Yes	N/A

If surveys or questionnaires were used was the response rate yes>25%?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Were the results presented clearly?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If tables were presented, was the narrative consistent with the table content?	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes
Were study limitations identified and addressed?	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	No
Were conclusions based on results?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quality Rating	High	High	High	High	High	Good	High	Good	Good	Good	High	High	High

	Nguyen (2020)	Nnaji (2019)	Parra-Medina et al. (2015)	Resnicow et al. (2016)	SIGN (2010)	Sepulveda et al. (2019)	Sim et al. (2016)	Taveras et al. (2017)	Taylor et al. (2015)	USPSTF (2016)	University of Michigan Obesity Guideline Team (2020)	Wylie-Rosett et al. (2018)
Does the researcher identify what is known and not	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

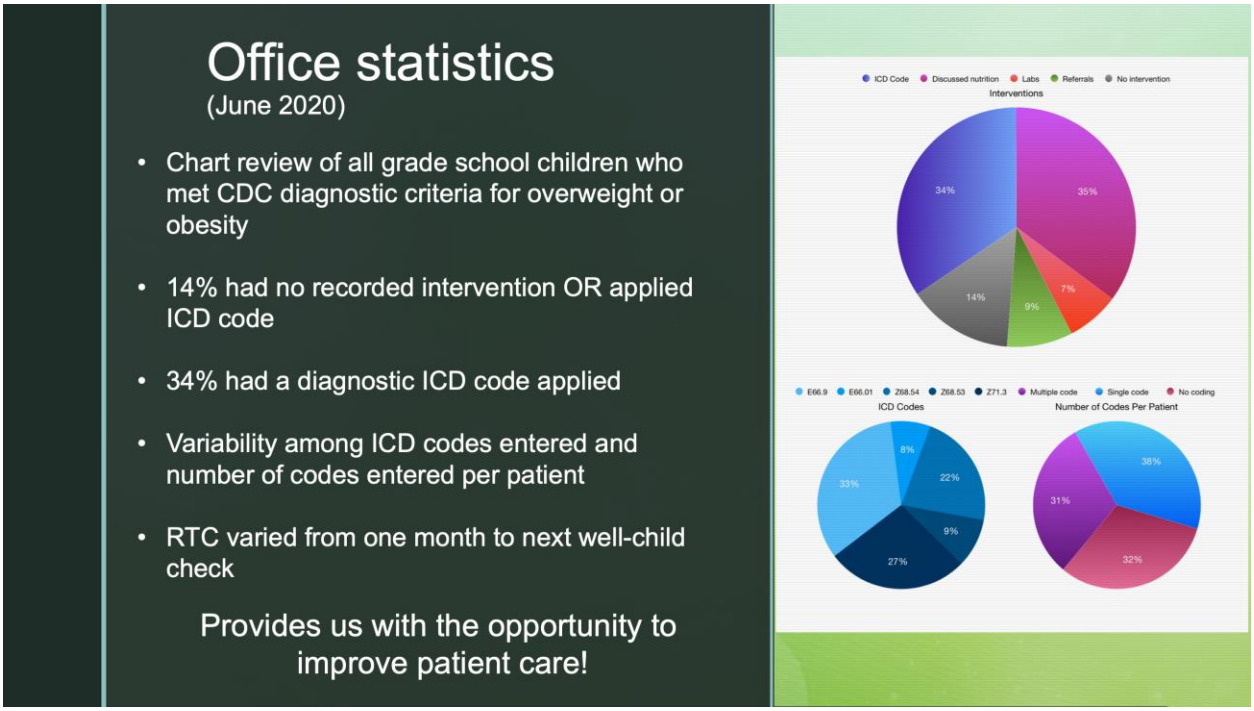
known about the problem and how the study will address gaps in knowledge?												
Was the purpose of the study clearly presented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the literature review current (most sources within the past five years or seminal study)?	Yes	No	No	No	No	No	No	No	No	No	No	No
Was the sample size sufficient based on study design and rationale?	No	Yes	No	Yes	N/A	N/A	Yes	Yes	Yes	Yes	N/A	Yes
If control group: Were the characteristics and/or demographics similar in both the control and intervention groups?	N/A	N/A	Yes	No	N/A	N/A	Yes	Yes	Yes	N/A	N/A	Yes
If multiple settings were used, were the settings similar?	N/A	N/A	N/A	Yes	N/A	N/A	N/A	Yes	Yes	N/A	N/A	N/A

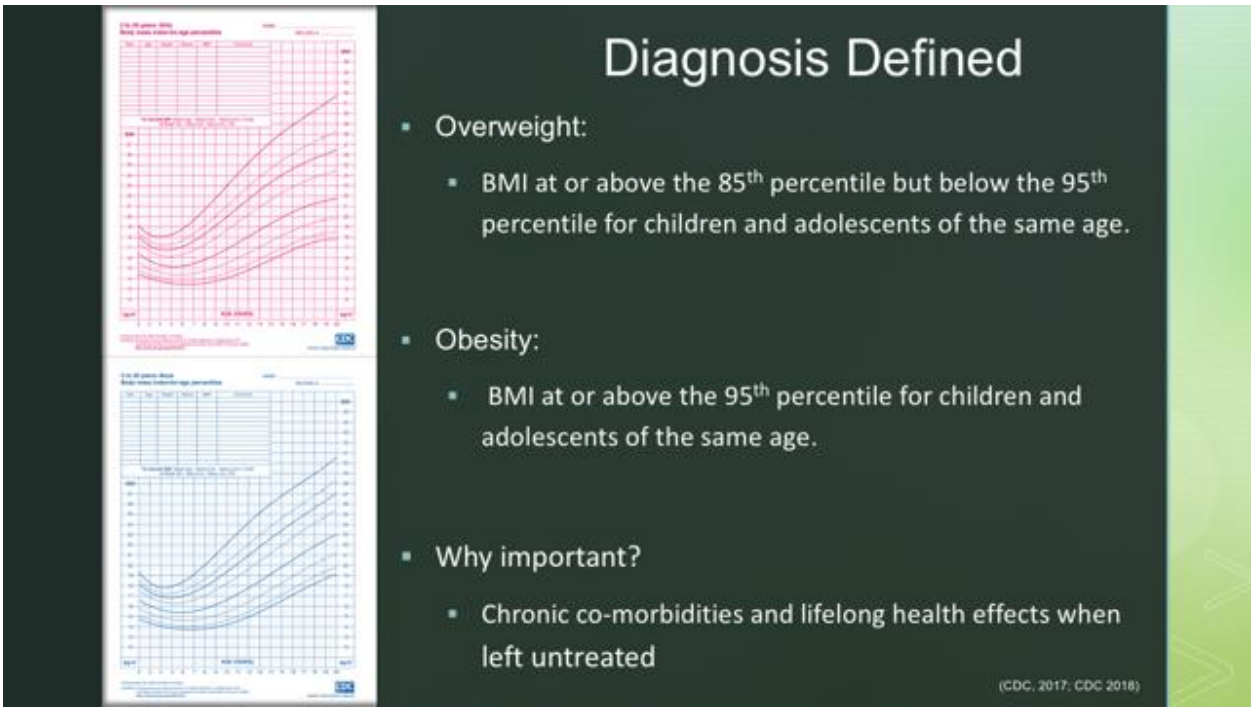
Were all groups equally treated except for the intervention group?	N/A	N/A	Yes	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A	Yes
Are data collection methods clearly described?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Were the instruments reliable (Cronbach's alpha >0.70)?	N/A	N/A	Yes	No	Yes	Yes	Yes	Yes	No	N/A	N/A	Yes
Was the instrument validity discussed?	N/A	N/A	No	No	Yes	Yes	Yes	Yes	No	N/A	N/A	Yes
If surveys or questionnaires were used was the response rate >25%?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Were the results presented clearly?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If tables were presented, was the narrative consistent with the table content?	No	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were study limitations	No	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

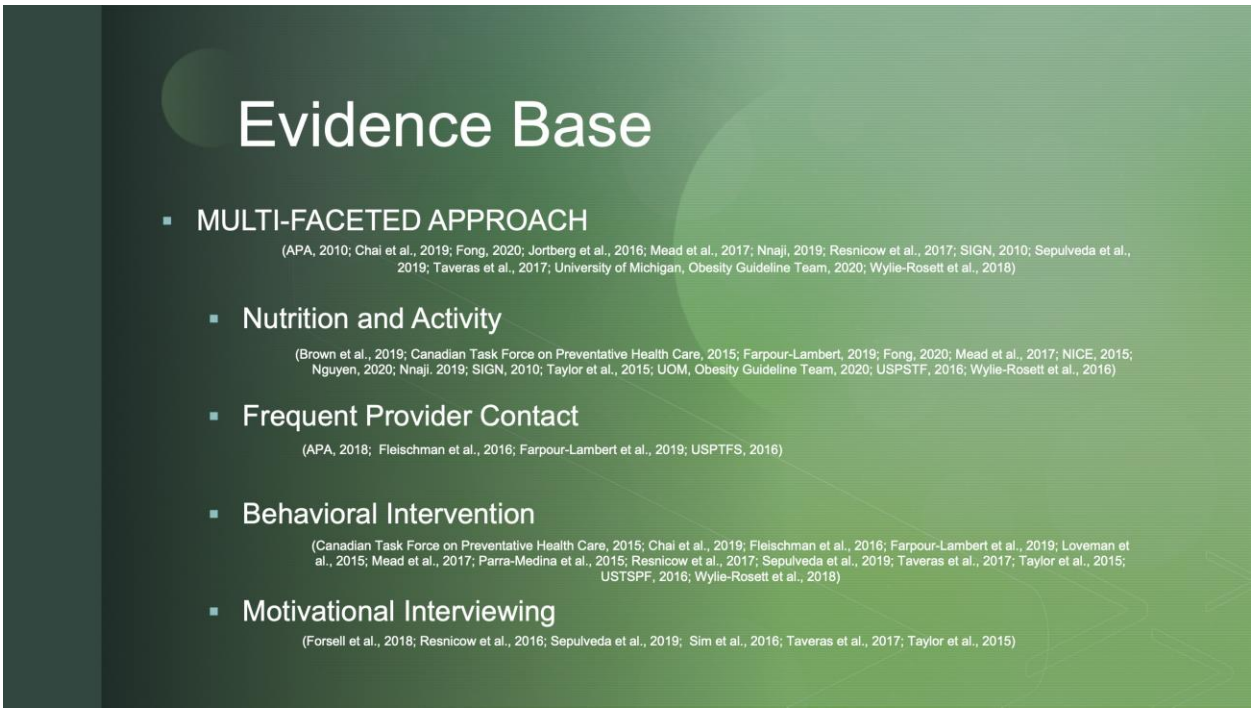
identified and addressed?												
Were conclusions based on results?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quality Rating	Good	High	Good	Good	High	High	High	High	Good	High	High	High

APPENDIX C

PowerPoint Provider Presentation







Nutrition and Activity

- 5 – Eat 5 or more fruits and vegetables in a day
- 2 – Limit screen time to less than 2 hours per day
- 1 – Be active for at least 1 hour per day
- 0 – Drink 0 sugary beverages per day
- Our goal: Provide parents and families with education to encourage healthy eating and increased activity!

What is healthy 4 simple steps anyone can take .... [Digital image]. (2019). JumpIN for healthy kids. https://blog.jumpinforhealthykids.org/what-is-healthy-four-simple-steps-anyone-can-take/

(Brown et al., 2019; Canadian Task Force on Preventative Health Care, 2015; Farpour-Lambert, 2019; Fong, 2020; Mead et al., 2017; NICE, 2015; Nguyen, 2020; Nnaji, 2019; SIGN, 2010; Taylor et al., 2015; UOM, Obesity Guideline Team, 2020; USPSTF, 2016; Wylie-Rosett et al., 2016)

Frequent Provider Contact

- Current recommendation from USPSTF and Canadian Task Force on Preventative Health Care
  - 26 hours of provider contact!
- Our goal: Increase provider contact hours
  - Recommended RTC timeline
  - Referral to energy clinic
  - Referral to nutritionist

(APA, 2018; Fleischman et al., 2016; Farpour-Lambert et al., 2019; USPTFS, 2016)

Behavioral Intervention

- Refer to In-office Energy Clinic
  - Focuses on behavioral interventions
  - Goal-setting
  - Positive reinforcement
  - Reward and Progress
- Our goal: Increase number of patients who are receiving focused care to increase healthy habits!

(Canadian Task Force on Preventative Health Care, 2015; Chai et al., 2019; Fleischman et al., 2016; Farpour-Lambert et al., 2019; Loveman et al., 2015; Mead et al., 2017; Parra-Medina et al., 2015; Resnicow et al., 2017; Sepulveda et al., 2019; Taveras et al., 2017; Taylor et al., 2015; USTSPF, 2016; Wylie-Rosett et al., 2018)

Motivational Interviewing

- Express empathy.
- Avoid argument.
- Roll with resistance.
- Reinforce self-efficacy.
- Delineate the difference between the patients' goals and behaviors.
- Our goal: Increase patient awareness of a need for change.

(Center for Substance Abuse Treatment, 1999; Forsell et al., 2018; Resnicow et al., 2016; Sepulveda et al., 2019; Sim et al., 2016; Taveras et al., 2017; Taylor et al., 2015)

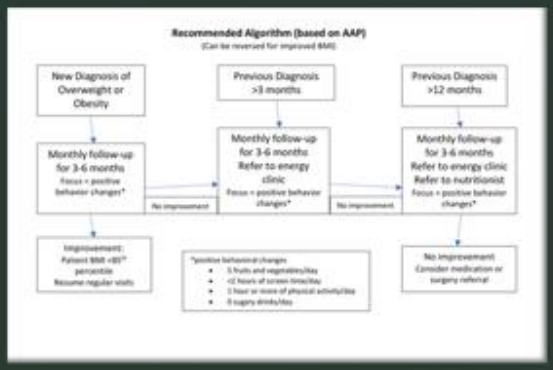
ICD Code Entry

ICD Code	Definition	Billing
E66.0	obesity, due to excess calories	Non-billable
E66.3	overweight	Billable
E66.9	obesity, unspecified	Billable
Z68.53	pediatric BMI 85th to 95th percentile for age	Billable, if accompanied by billable E-code
Z68.54	pediatric BMI greater than or equal to	Billable, if accompanied by billable E-code
Z71.3	dietary counseling and surveillance	Billable

(ICD-10-CM code E66, 2020; ICD-10-CM code Z68.5, 2020; *ICD-10-CM code Z71.3,* 2020).

The Plan

- Nurses will tag the door clips with a:
  - Yellow post-it for BMI percentile of 85th to 94th
  - Pink post-it for BMI percentile 95th and greater
- Enter ICD for patient diagnosis
- Briefly discuss nutrition and activity
- Provide patient handout (English and Spanish will be available)
- Refer as appropriate (see handout for recommended algorithm based on AAP guidelines)
- Note recommended RTC follow-up



(AAP, 2015)

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APPENDIX D

Provider Reference Sheet Handout

Overweight and Obesity in Pediatrics

Overweight:
BMI at or above the 85th percentile but below the 95th percentile for children and adolescents of the same age.

Obese:
BMI at or above the 95th percentile for children and adolescents of the same age.

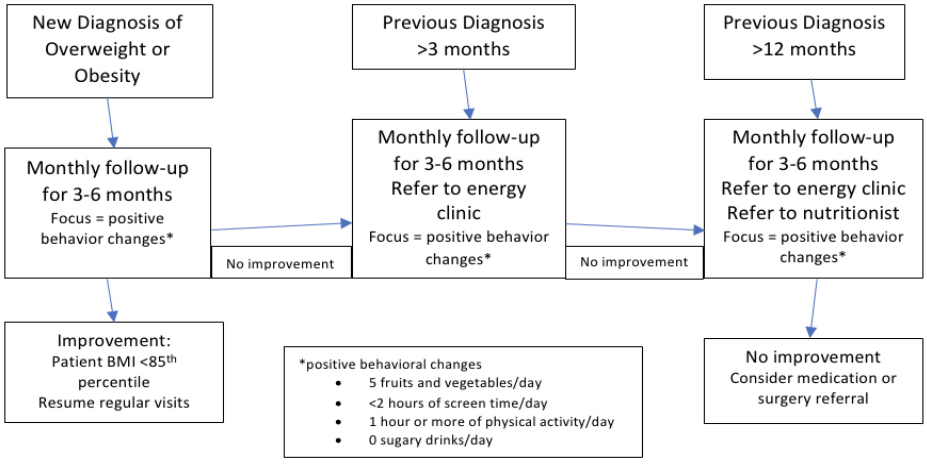
ICD Code Entry

ICD Code	Definition	Billing
E66.0	obesity, due to excess calories	Non-billable
E66.3	overweight	Billable
E66.9	obesity, unspecified	Billable
Z68.53	pediatric BMI 85th to 95th percentile for age	Billable, if accompanied by billable E-code
Z68.54	pediatric BMI greater than or equal to	Billable, if accompanied by billable E-code
Z71.3	dietary counseling and surveillance	Billable

Key points:

- BMI Z-codes must be used in conjunction with E-codes to be billable
- Pediatric BMI Z-codes are for children and adolescents, age 2-20
- BMI percentile for diagnosis code is based on CDC growth charts

Recommended Algorithm (based on AAP)
(Can be reversed for improved BMI)



APPENDIX E

Patient Education Handouts

What's a Healthy Portion?

Food portions are larger than ever these days—usually much more than you need. The recommended serving size is enough. But how much is that? These tips will help keep your portions, as well as your waistline, right-sized.

Here are some tips to help you keep your portions under control:

- Teach your children portion size by relating food to everyday items. For example, a deck of cards is equal to a serving of meat, fish, or poultry. An apple or serving of fruit is about the size of a tennis ball. Please note: For young children, use the palm of their hand as an indicator of portion size

- Teach your children the concept of the divided plate. Think of a plate divided into four equal sections. Use one of the top sections for protein, and the other one for starch, preferably a whole grain; fill the bottom half with veggies (none of the foods should overlap or be piled high).
- Check the label on your food to see if it meets some basic needs in your diet, like calcium or Vitamin C; if it's not "good" for you, eat less of that food.
- Check the serving size and remember that if you eat more than one serving, you are eating more calories.
- Avoid eating directly out of the package. Try putting snacks into a small bowl or snack-size baggie.
- Eat three meals a day; this way you won't stuff yourself if you have skipped a meal.
- Serve food on smaller plates.
- Serve meals from the stove. This tip will keep you from feeling tempted to eat more when you are not hungry.
- Skip the "clean plate" club. Instead, encourage your children to start with smaller portions and eat until they are satisfied.
- At restaurants, ask for a lunch-size portion or share your meal.
- Role model the behaviors that you want your children to develop.

5210 LET'SGO!

www.letsgo.org

(JumpIN for Healthy Kids, n.d.)

¿Qué Es Una Ración Saludable?

Hoy más que nunca las raciones de la comida son muy grandes—por lo general mucho más de lo que usted necesita. Es suficiente con la ración que se recomienda. ¿Pero cuál es ésta? Estos consejos le ayudarán a conservar el tamaño de las raciones y el de la cintura.

Aquí hay algunos consejos que le ayudarán a controlar las raciones:

Enséñeles a sus hijos a comparar el tamaño de las raciones de la comida con artículos del uso diario. Por ejemplo: una baraja de cartas equivale a una ración de carne, pescado o ave de corral. Una manzana o una ración de fruta es más o menos del tamaño de una pelota de tenis. (Tenga en cuenta: utilice la palma de la mano de los niños pequeños) como indicador de la ración para ellos.

Enséñeles a sus hijos el concepto de la división de un plato. Piense en un plato dividido en cuatro partes iguales. Legumbres Legumbres. Utilice un lado de arriba para la proteína y el otro para el almidón; preferiblemente algún grano entero. Llene el lado de abajo con vegetales (ninguno de los alimentos debe pasarse al otro lado ni hacer un morro).

- Revise las etiquetas de las comidas para ver si tienen las cosas básicas que necesita en su dieta así como el calcio o la vitamina C; si no le "convienen" consúmalas menos.
- Revise la ración que se indica consumir y recuerde que si consume más de lo indicado va a consumir más calorías.
- No coma directamente del paquete. Coloque los bocadillos en un plato pequeño o en una bolsa del tamaño del bocadillo.
- Coma tres veces al día, así no se llenará más de la cuenta si deja de comerse una de las comidas.
- Sirva los alimentos en platos pequeños.
- Sírvase las comidas en la estufa. Este consejo le evitará la tentación de comer sin tener hambre.
- Olvide lo de dejar "limpio el plato". Más bien anime a sus hijos a empezar con raciones pequeñas y a comer hasta que se llenen.
- En los restaurantes pida la ración del tamaño de un almuerzo o comparta su plato.
- Déle a sus hijos el ejemplo de los hábitos que quiere que ellos desarrollen.

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(JumpIN for Healthy Kids, n.d.)

1 get at least
HOUR OF PHYSICAL ACTIVITY every day

Move an hour every day!

Physical Activity Can Be Free and Fun!

- Take a walk with your family
- Play with your pet
- Play tag
- Take a bike ride (remember to wear your helmet)
- Turn on music and dance
- Jump rope
- Play Frisbee
- Take the stairs
- Park the car at the end of the parking lot
- Make snow angels

Make Physical Activity Easier.

- Make gradual changes to increase your level of physical activity.
- Track the level of your physical activity using a pedometer, fitness band, or online tracker.
- Choose toys and games that promote physical activity (e.g. balls, hula hoops, jump ropes, scarves).
- Do physical activities together with friends or family.
- Turn off the TV and computer and keep them out of the bedroom.
- Limit recreational screen time (e.g. TVs, computers, video games, etc.).
- Encourage lifelong physical activity by incorporating it into your routine.
- Keep physical activity fun! You'll be more likely to do it.

Did you know?

One hour of moderate physical activity means:

- Doing activities where you breathe hard, like fast walking, hiking, or dancing.

20 minutes of vigorous physical activity means:

- Doing activities where you sweat, like running, aerobics, or basketball.

Physical activity…

- Makes you feel good.
- Makes your heart happy.
- Makes you stronger.
- Makes you flexible.

Be a Role Model.

- Schedule active family play time daily.

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(JumpIN for Healthy Kids, n.d.)

Life is a lot more fun when you join in!

Try These Activities Instead of Watching TV.

- Ride a bike.
- Go on a nature hike.
- Put together a puzzle.
- Turn on music and dance.
- Read a book or magazine.
- Spend time catching up with your family.
- Take your kids to the park or beach.
- Play board games.
- Walk, run, or jog.
- Start a journal.
- Play ball (basketball, catch, soccer, etc.).
- Go to the library.
- Explore free activities in your community.
- Rollerblade.
- Play charades.
- Go play in the snow (e.g. sled, ski, snowshoe, build a snowman or fort).

Tame the TV and Computer! Set Limits and Provide Alternatives.

- Set some basic rules, such as no TV or computer before homework or chores are done.
- Do not watch TV during mealtime.
- Use a timer. When the bell rings, it's time to turn off the TV.
- Eliminate TV time during the week.
- Set family guidelines for age-appropriate shows.
- Make a list of fun activities to do instead of being in front of a screen.
- Keep books, magazines, and board games in the family room.

Healthy Screen Time Means:

- No TV/computer in the room where the child sleeps.
- No TV/computer under the age of 2.
- One hour of educational TV/computer time between ages 2 and 5.
- After the age of 5, two hours or less per day.

Did you know?

- Screen time includes time spent on TVs, computers, gaming consoles/handhelds, tablets, and smartphones. It's important to limit the use of ALL screens.
- Watching TV is associated with more snacking and increased obesity.
- Too much TV has been linked to lower reading scores and attention problems.

JumpIN FOR HEALTHY KIDS

5210 LET'S GO!
www.letsgo.org

(JumpIN for Healthy Kids, n.d.)

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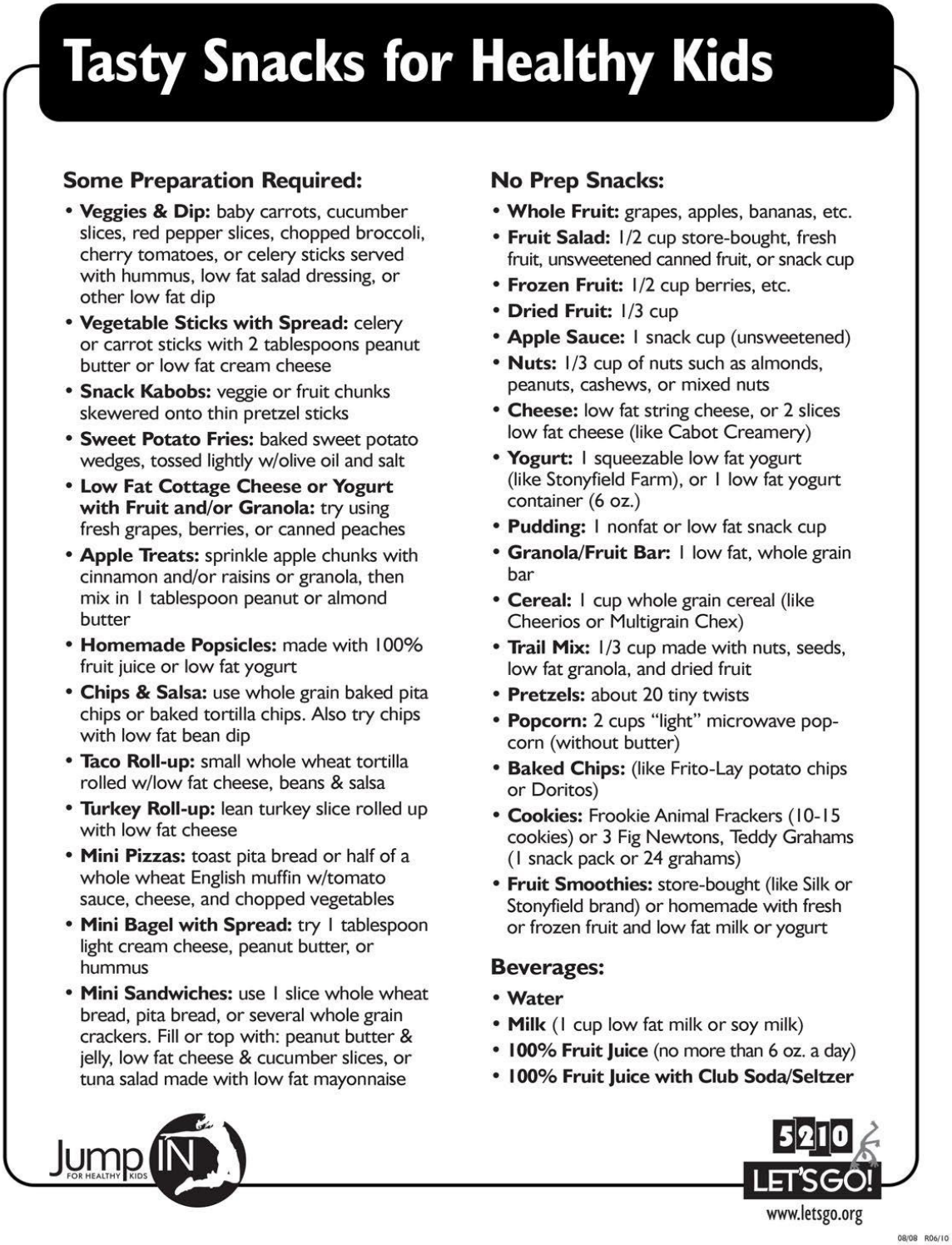


Tasty Snacks for Healthy Kids

Some Preparation Required:

- **Veggies & Dip:** baby carrots, cucumber slices, red pepper slices, chopped broccoli, cherry tomatoes, or celery sticks served with hummus, low fat salad dressing, or other low fat dip
- **Vegetable Sticks with Spread:** celery or carrot sticks with 2 tablespoons peanut butter or low fat cream cheese
- **Snack Kabobs:** veggie or fruit chunks skewered onto thin pretzel sticks
- **Sweet Potato Fries:** baked sweet potato wedges, tossed lightly w/olive oil and salt
- **Low Fat Cottage Cheese or Yogurt with Fruit and/or Granola:** try using fresh grapes, berries, or canned peaches
- **Apple Treats:** sprinkle apple chunks with cinnamon and/or raisins or granola, then mix in 1 tablespoon peanut or almond butter
- **Homemade Popsicles:** made with 100% fruit juice or low fat yogurt
- **Chips & Salsa:** use whole grain baked pita chips or baked tortilla chips. Also try chips with low fat bean dip
- **Taco Roll-up:** small whole wheat tortilla rolled w/low fat cheese, beans & salsa
- **Turkey Roll-up:** lean turkey slice rolled up with low fat cheese
- **Mini Pizzas:** toast pita bread or half of a whole wheat English muffin w/tomato sauce, cheese, and chopped vegetables
- **Mini Bagel with Spread:** try 1 tablespoon light cream cheese, peanut butter, or hummus
- **Mini Sandwiches:** use 1 slice whole wheat bread, pita bread, or several whole grain crackers. Fill or top with: peanut butter & jelly, low fat cheese & cucumber slices, or tuna salad made with low fat mayonnaise

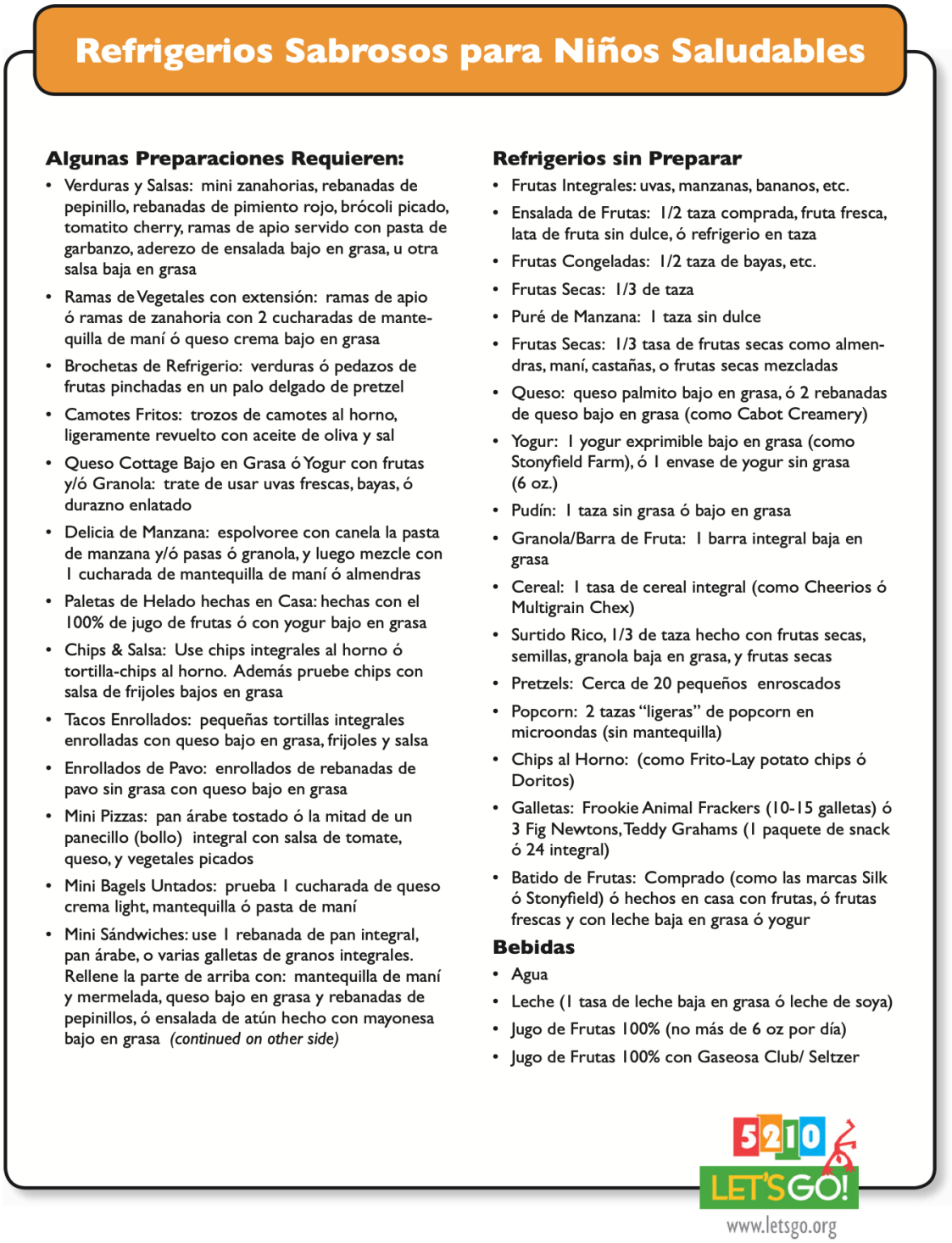
No Prep Snacks:

- **Whole Fruit:** grapes, apples, bananas, etc.
- **Fruit Salad:** 1/2 cup store-bought, fresh fruit, unsweetened canned fruit, or snack cup
- **Frozen Fruit:** 1/2 cup berries, etc.
- **Dried Fruit:** 1/3 cup
- **Apple Sauce:** 1 snack cup (unsweetened)
- **Nuts:** 1/3 cup of nuts such as almonds, peanuts, cashews, or mixed nuts
- **Cheese:** low fat string cheese, or 2 slices low fat cheese (like Cabot Creamery)
- **Yogurt:** 1 squeezable low fat yogurt (like Stonyfield Farm), or 1 low fat yogurt container (6 oz.)
- **Pudding:** 1 nonfat or low fat snack cup
- **Granola/Fruit Bar:** 1 low fat, whole grain bar
- **Cereal:** 1 cup whole grain cereal (like Cheerios or Multigrain Chex)
- **Trail Mix:** 1/3 cup made with nuts, seeds, low fat granola, and dried fruit
- **Pretzels:** about 20 tiny twists
- **Popcorn:** 2 cups "light" microwave popcorn (without butter)
- **Baked Chips:** (like Frito-Lay potato chips or Doritos)
- **Cookies:** Frookie Animal Frackers (10-15 cookies) or 3 Fig Newtons, Teddy Grahams (1 snack pack or 24 grahams)
- **Fruit Smoothies:** store-bought (like Silk or Stonyfield brand) or homemade with fresh or frozen fruit and low fat milk or yogurt

Beverages:

- **Water**
- **Milk** (1 cup low fat milk or soy milk)
- **100% Fruit Juice** (no more than 6 oz. a day)
- **100% Fruit Juice with Club Soda/Seltzer**

(JumpIN for Healthy Kids, n.d.)



Refrigerios Sabrosos para Niños Saludables

Algunas Preparaciones Requieren:

- Verduras y Salsas: mini zanahorias, rebanadas de pepinillo, rebanadas de pimiento rojo, brócoli picado, tomatito cherry, ramas de apio servido con pasta de garbanzo, aderezo de ensalada bajo en grasa, u otra salsa baja en grasa
- Ramas de Vegetales con extensión: ramas de apio ó ramas de zanahoria con 2 cucharadas de mantequilla de maní ó queso crema bajo en grasa
- Brochetas de Refrigerio: verduras ó pedazos de frutas pinchadas en un palo delgado de pretzel
- Camotes Fritos: trozos de camotes al horno, ligeramente revuelto con aceite de oliva y sal
- Queso Cottage Bajo en Grasa ó Yogur con frutas y/ó Granola: trate de usar uvas frescas, bayas, ó durazno enlatado
- Delicia de Manzana: espolvoree con canela la pasta de manzana y/ó pasas ó granola, y luego mezcle con 1 cucharada de mantequilla de maní ó almendras
- Paletas de Helado hechas en Casa: hechas con el 100% de jugo de frutas ó con yogur bajo en grasa
- Chips & Salsa: Use chips integrales al horno ó tortilla-chips al horno. Además pruebe chips con salsa de frijoles bajos en grasa
- Tacos Enrollados: pequeñas tortillas integrales enrolladas con queso bajo en grasa, frijoles y salsa
- Enrollados de Pavo: enrollados de rebanadas de pavo sin grasa con queso bajo en grasa
- Mini Pizzas: pan árabe tostado ó la mitad de un panecillo (bollo) integral con salsa de tomate, queso, y vegetales picados
- Mini Bagels Untados: prueba 1 cucharada de queso crema light, mantequilla ó pasta de maní
- Mini Sándwiches: use 1 rebanada de pan integral, pan árabe, o varias galletas de granos integrales. Rellene la parte de arriba con: mantequilla de maní y mermelada, queso bajo en grasa y rebanadas de pepinillos, ó ensalada de atún hecho con mayonesa bajo en grasa *(continued on other side)*

Refrigerios sin Preparar

- Frutas Integrales: uvas, manzanas, bananos, etc.
- Ensalada de Frutas: 1/2 taza comprada, fruta fresca, lata de fruta sin dulce, ó refrigerio en taza
- Frutas Congeladas: 1/2 taza de bayas, etc.
- Frutas Secas: 1/3 de taza
- Puré de Manzana: 1 taza sin dulce
- Frutas Secas: 1/3 tasa de frutas secas como almendras, maní, castañas, o frutas secas mezcladas
- Queso: queso palmito bajo en grasa, ó 2 rebanadas de queso bajo en grasa (como Cabot Creamery)
- Yogur: 1 yogur exprimible bajo en grasa (como Stonyfield Farm), ó 1 envase de yogur sin grasa (6 oz.)
- Pudín: 1 taza sin grasa ó bajo en grasa
- Granola/Barra de Fruta: 1 barra integral baja en grasa
- Cereal: 1 tasa de cereal integral (como Cheerios ó Multigrain Chex)
- Surtido Rico, 1/3 de taza hecho con frutas secas, semillas, granola baja en grasa, y frutas secas
- Pretzels: Cerca de 20 pequeños enroscados
- Popcorn: 2 tazas "ligeras" de popcorn en microondas (sin mantequilla)
- Chips al Horno: (como Frito-Lay potato chips ó Doritos)
- Galletas: Frookie Animal Frackers (10-15 galletas) ó 3 Fig Newtons, Teddy Grahams (1 paquete de snack ó 24 integral)
- Batido de Frutas: Comprado (como las marcas Silk ó Stonyfield) ó hechos en casa con frutas, ó frutas frescas y con leche baja en grasa ó yogur

Bebidas

- Agua
- Leche (1 tasa de leche baja en grasa ó leche de soya)
- Jugo de Frutas 100% (no más de 6 oz por día)
- Jugo de Frutas 100% con Gaseosa Club/ Seltzer

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APPENDIX F

Provider Checklist for Patient Education Handouts

Checklist for Removal of Patient Education Material

ENGLISH							SPANISH						