

Bringing the Clinic Home Through Technology: A Quality Improvement Project

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Abstract

Background: According to the Centers for Disease Control (2019), childhood obesity affects more than 13.7 million children in the United States. Childhood obesity can lead to chronic illness and early mortality. Unfortunately, current treatment plans for childhood obesity have been unsuccessful. This quality improvement project aims to determine whether the use of technology, specifically online website modules, can improve outcomes and the quality of care for patients attending a specialty clinic for childhood obesity.

Methods: A prospective designed mixed-method study was performed in a pediatric clinic specializing in treating pediatric patients who were overweight and obese. The primary investigator created evidence-based, interventional online modules for patients to access outside of clinic hours. The measured outcomes were module views, caregiver satisfaction with the online modules, provider adherence to electronic health record documentation and their satisfaction with online modules. Module views were tracked through Google Analytics. Questionnaires were dispersed after the implementation to gauge provider and caregiver satisfaction with the clinic. A retrospective chart review was performed to track provider compliance with the electronic health record for quality measures.

Results: There was insufficient participation in the quality improvement project; thus, no significant data results are reportable.

Conclusion: The aim was to improve compliance and attrition at a pediatric weight management clinic. The quality improvement project was unsuccessful for several reasons. Further recommendations include performing a similar project after a global pandemic, increase availability of internet resources, and an increase in education of how to utilize technology for providers.

Keywords: Obesity, pediatric care, attrition, quality improvement

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In the United States, approximately 14.4 million children are overweight or obese (Centers for Disease Control and Prevention [CDC], 2021). A body mass index (BMI) equal to or greater than 95% is the diagnostic criteria for childhood obesity, whereas those diagnosed as overweight have a BMI greater than or equal to 85% (CDC, 2021). Childhood obesity increases the likelihood of developing serious, life-threatening diseases in childhood and adulthood, including hypertension, high cholesterol, asthma, sleep apnea, and type 2 diabetes mellitus (Kelly et al., 2013). Childhood obesity affects a child's physical and mental health and self-esteem. Poor mental health can lead to decreased academic performance and poor quality of life (Sahoo et al., 2015).

The U.S. Preventive Services Task Force (n.d.), a panel of experts in preventive medicine and evidence-based practice, recommends children who are obese participate in multifaceted behavioral interventions to promote a healthy lifestyle. Among the most strongly recommended behavioral interventions are lifestyle modifications, such as increased physical activity and healthy dietary habits (Kamath et al., 2008). A team approach is favorable due to the expertise provided by each member (Hodgkin et al., 2010). Success rates are better with a team approach but are still not significant (Fals & Abraham-Pratt, 2019). Newer specialty outpatient clinics are combining evidence-based behavioral interventions with specialized clinicians to treat the causes and effects of childhood obesity.

Attrition is one of the leading causes of treatment failure, and rates can be as high as 75% among participants in a weight management program (Geer et al., 2014). The use of technology increases communication among clinicians, caregivers, and patients. Technology expands the reach of clinicians beyond direct patient contact times, thus decreasing attrition and increasing

compliance in patients with childhood obesity (Geer et al., 2014). Peer-reviewed studies have shown success in childhood weight management using phone calls, text messages, phone applications, and internet-based curricula (Abraham et al., 2015; Armstrong et al., 2018; Geer et al., 2014).

The coronavirus disease 2019 (COVID-19) has highlighted the importance of technology in the American healthcare system (Keesara et al., 2020). Through various telehealth applications, technology has been shown to improve healthcare quality and decrease healthcare costs (Keesara et al., 2020). Moreover, although COVID-19 disrupted the delivery of direct healthcare contact, the novel coronavirus propelled healthcare forward by forcing organizations to employ technology to continue patient care. Technology use, such as online modules or phone applications, can serve as a resource to keep patients safe at home during pandemics or other disruptions of direct clinically provided services.

Literature Review

In pediatric weight management, childhood obesity is defined as a body mass equal to or greater than 95% (CDC, 2019). Children involved in the following studies were diagnosed with childhood obesity and enrolled in various weight management programming. Attrition, compliance, and lack of follow-up were the identified barriers to effective weight management (Abraham et al., 2015; Armstrong et al., 2018; García et al., 2017; Geer et al., 2014; Kelleher et al., 2016; Mariz et al., 2016; Pratt et al., 2015). Successful interventions in weight management employ specialty outpatient clinics, interdisciplinary teams, behavior modifications, increased patient contact, and family-centered care (Abraham et al., 2015; Armstrong et al., 2018; García et al., 2017; Geer et al., 2014; Kelleher et al., 2016; Mariz et al., 2016; Pratt et al., 2015). This review aims to assess successful interventions, barriers to successful weight management, and

technology use as an intervention in weight management programs. Although weight management has proved successful in multiple settings, such as patient's schools, after-school programs, and primary care offices, studies performed primarily at these locations were excluded from the literature review (Wang et al., 2015).

Success in Weight Management

Identifying successful interventions in weight management clinics is essential (García et al., 2017). Successful interventions include therapeutic relationships between the healthcare team, caregiver, and patient; enhanced family participation; provider motivation toward the patient; and increased clinic appointment availability (García et al., 2017). Factors contributing to the initial and continued attendance include positive social interaction among patients and providers, family-centered care, and lifestyle-focused interventions. The use of a website can extend the therapeutic relationship beyond the clinic and direct patient care. Online modules or web-based interventions can reinforce clinic content and motivate patients and caregivers to increase their participation and adhere to provider recommendations.

Interventional Breakdown

Interventional breakdowns are multifaceted and include high attrition, low attendance rates, and demographics. The first breakdown is attrition, the gradual erosion of patient compliance, which is the number one cause of treatment failure among obese children and adolescents (Kelleher et al., 2017). Attrition rates can vary from 27% to 78% among pediatric patients in weight management (Kelleher et al., 2016; Pratt et al., 2015). The next breakdown is low appointment attendance, including forgotten appointments, appointments spaced too far apart, appointments not meeting patient expectations, and appointments lasting too long (Geer et al., 2014). Finally, recognized demographic risk factors related to higher attrition rates are

higher-income families, high maternal education, Caucasian ethnicity, and patients who were diagnosed as obese versus overweight. Another cause of an interventional breakdown is the stigma associated with the diagnosis of childhood obesity and parental denial of patient needs (Kelleher et al., 2017). Understanding these multifaceted barriers associated with an interventional breakdown is vital to successful weight management interventions, as it can be used to tailor treatment plans (Mariz et al., 2016).

Technology Use

Technology use to combat high attrition rates and increase compliance in pediatric weight management can be successful by incorporating phone calls to serve as appointment reminders for clinic and group appointments. Phone call reminders are a simple intervention to increase patients' and families' attendance rates (Geer et al., 2014). As with phone calls, text messages are another method of using technology to communicate with patients to increase compliance (Armstrong et al., 2018). Similar to phone calls, text messaging is a more accessible and less expensive method than traditional clinic appointments. Implementing daily text messages with techniques rooted in motivational interviewing can also increase patient compliance (Armstrong et al., 2018). Patients receiving daily text messages did not have a decreased BMI; however, clinic attendance was higher among patients who received text messages (Armstrong et al., 2018). Phone calls and text messages allow for more communication between practitioners and patients and increase patient compliance (Armstrong et al., 2018). Lastly, an internet-based curriculum paired with cell phone reminders in place of standard clinic appointments successfully lowered the attrition rate of pediatric patients in a weight management program (Abraham et al., 2015). The internet-based curriculum was successful in demonstrating the practicality of the program and maintained a high retention rate. However, the program did not

decrease the BMI (Abraham et al., 2015). Multiple other studies have also found no significant decrease in BMI with technology use (Abraham et al., 2015; Armstrong et al., 2018; García et al., 2017; Geer et al., 2014; Kelleher et al., 2016; Mariz et al., 2016; Pratt et al., 2015). However, these studies did observe an increase in patient attendance rates and compliance.

COVID-19

Unfortunately, the COVID-19 pandemic is exacerbating the current childhood obesity pandemic among American youth. In order to stop the spread of the virus, schools shut down and children were forced to engage in remote learning. School closings can exacerbate risk factors associated with childhood obesity including food insecurity and sedentary lifestyles. School closings lead to food insecurity due to the schools and community's inability to provide outside resources to children who receive free or reduced school meals (Rundle et al., 2020). Social distancing led to an increase in sedentary activities such as remote learning and screen time activities like gaming (Rundle et al., 2020). Therefore, time spent out of school can increase a child's weight gain, as seen in the summer months during a normal school year (Hippel & Workman, 2016).

In summary, many different interventions and barriers exist in pediatric weight management. One of the primary reasons for pediatric weight management failure has been high attrition. However, using technology as an intervention is promising for supporting patients in weight management. This project endeavors to employ quality improvement strategies to create a systemic change through technology use to improve attendance and mitigate the clinic attrition rate.

Methods

This was a three-month, mixed-method, quality improvement project that implemented technology in the context of a doctorate prepared nurse practitioner student designed and managed, outpatient pediatric specialty clinic.

Participation

Primary Investigator (PI) was introduced to the clinic staff through the stakeholder. Several meetings occurred between the PI and the clinic team to discuss ways to utilize quality improvement strategies to improve the clinic. A convenience sample of eight healthcare providers was recruited from the healthcare team at the outpatient clinic, including staff nurses, a medical doctor, a physical therapist, a dietician, and a pediatric psychologist. Inclusion in this study required healthcare workers to work in the outpatient clinic and provide direct patient care. A convenience sample of caregivers was also recruited for the project, and inclusion required involvement in patient care by attending clinic appointments.

Outcome and Measures

Retrospective Chart Review

Before implementation, charts were reviewed for all patients seen during the 12 weeks prior to implementing the quality improvement project. A postintervention chart review was performed for comparison. Charts were reviewed for provider compliance with the EHR templates.

Number of Module Views

The modules were modeled as patient-friendly narrated PowerPoint slides on Google Sites. The module views were measured at 6 weeks and 12 weeks using Google Analytics.

Caregiver and Provider Surveys

Caregivers of the patient and clinic providers were sent a qualitative survey to discuss their thoughts after visiting the website and using the online modules. The survey was created using Google Forms and was disseminated using a QR code. The survey was completely anonymous.

Distribution of informative material

An educational handout was created including information about the clinic's website, online modules, and a scannable QR code. Providers were interviewed to determine the compliance of handing out educational material to patients.

Procedures

The integration of technology included online, web-based modules with a multidisciplinary team approach to care. It employed the specialized quality improvement skills of a Nurse Practitioner student with additional DNP education and the clinicians and support staff at the specialized outpatient clinic. All providers used the same EHR to document using the templates. All patients received the same educational handout with the website QR code. Therefore all patients who attended the clinic during the implementation phase were able to access the website. All providers in the clinic were educated on the handout and how to educate patients on website use. After implementation providers and caregivers were provided a QR code for the postintervention survey.

The study was reviewed and approved by the Lenoir-Rhyne University Institutional Review Board (IRB) and the larger hospital system employing the specialty clinic. Implied consent was explained to the participating providers and caregivers. Participation was completely voluntary, and participants could remove themselves from the project at any time with no consequences.

After obtaining IRB approval, a retrospective chart review was performed to assess the provider's compliance with the documentation of the initial and subsequent visits. The preintervention retrospective chart review included 34 charts of patients cared for at the clinic in the previous 12 weeks before implementing the program. This chart review provided a comparison of patients without the program intervention. A second retrospective chart review of different charts was performed after completing the 12 weeks of implementation.

The quality improvement program employed a clinical multidisciplinary team comprising a pediatrician, physical therapist, dietician, pediatric psychologist, and support staff, such as nurses. The clinic providers were instrumental in developing the specific implemented interventions. For example, the dietician helped the primary investigator (PI) create nutrition modules. The physician met with the PI to discuss the handouts provided to clinic patients during their initial visit. These handouts were then put on the website. One module, "go, slow, woah foods," was based on the handouts provided to the patients.

The PI created and built specialized modules based on evidence based interventions. The PI researched specific areas such as dietary interventions, physical activity, and mindfulness in pediatric obesity. The CDC was the main source of information and influence. The modules were built with a focus on the clinical plan of care. The online content allowed the patients to access clinical interventions and reinforced the provider's interventions from the safety of the patient's home. The modules consisted of online narrated PowerPoint slides, which reviewed dietary interventions, physical activity, and psychosocial interventions for weight management. The dietary modules reviewed specific food groups, serving sizes, and how to incorporate the specific food group into daily dietary plans. The physical activity modules included YouTube videos of strength training, cardio training, and yoga. The mindfulness module reviewed mindfulness

practices to implement during mealtimes. The website and modules were available to the patients from the provider at the clinic visits via a handout containing a QR code linked to the website.

Twelve weeks after the website launch, clinical providers received a survey containing five open-ended questions. The survey was sent through a research email account affiliated with the larger hospital system to ensure anonymity and privacy. The survey was completely anonymous using Google Surveys. The providers disseminated a similar postintervention survey containing open-ended questions to patient caregivers via a handout with the website QR code.

Data Analysis

Data reflecting preintervention and postintervention EHR documentation compliance for each chart could not be analyzed due to a lack of data. Descriptive statistics were calculated for the patient's age and the provider's compliance with providing the patient handout. Quantitative data were entered and analyzed using Intellectus Statistics (2021) electronic software. A content analysis was performed on the qualitative data provided by the provider's postintervention survey responses. However, no caregivers completed the postintervention survey, resulting in inconclusive data.

Results

Descriptive Statistics

Descriptive statistics were calculated for the patients' ages. The average age of patients from the preintervention and postintervention groups was 11.20 years ($SD = 3.62$, $SE_M = 0.46$, $Min = 5.00$, $Max = 17.00$, $skewness = -0.06$, $kurtosis = -1.01$).

Table 1

Summary Statistics Table for Interval and Ratio Variables

Variable	M	SD	n	SE_M	Min	Max	Skewness	Kurtosis
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Age	11.20	3.62	61	0.46	5.00	17.00	-0.06	-1.01
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One unanticipated but productive outcome was regarding the provider's compliance of providing the patients with the educational handout containing the website QR code. The clinic nurses, who print and provide the discharge packet, were interviewed to determine compliance with handing out educational material. The nurses verbalized the handout was placed with every discharge packet automatically. The discharge packet was provided and reviewed with each patient and caregiver at the end of the clinic visit. The providers demonstrated 100% compliance with including the handout in the patient discharge packet. Therefore, 100% of patients who visited the clinic during the project implementation received the handout containing the website QR code, confirmed by two nurses who prepared the packets and showed the PI the packet handout.

Due to the small volume of data and nature of the variables, limited statistical analyses could be performed on the chart review data, preintervention and postintervention. Thirty-four charts were reviewed from the 12 weeks prior to the implementation of the quality improvement project. Of the 34 charts, 32 were completed correctly; thus, chart compliance prior to the intervention was 94.1%. After implementing the quality improvement strategies, 27 charts were reviewed, resulting in 100% compliance after project implementation.

Due to the low module views, no statistical tests were performed. Six module views occurred from the beginning of the quality improvement project to 6 weeks of implementation. Between Weeks 6 and 12, there were zero module views. During the 12 weeks of implementation, 27 patients received the handout containing the website QR code and education. Five website hits were attributed to the 27 patients, which yielded a 22% compliance rate among

patients who received the QR code. However, due to HIPAA, the module views were untraceable to the patients. Therefore, it is unclear whether five different patients visited the website or only a few patients visited the website multiple times.

Content Analysis

Only two providers answered the postintervention survey. Due to the lack of response, themes could not be identified and analyzed. However, the survey results are summarized and shared. The providers discussed how accessible the online platform was for patients, especially using a QR code. When discussing the modules, the PowerPoint slides were described as helpful, well written, creatively designed, visually appealing, and filled with good information. The third question asked the providers to discuss whether the virtual program enhanced the clinic's programming. Both providers shared their excitement regarding having an online component to the clinical program. One provider expressed how the providers should have promoted the website more to patients. The last question asked the provider to discuss ways to improve patient compliance with technology use. The providers provided helpful ideas, such as presenting the website to patients during visits and turning the website into a phone application.

Discussion

The project aimed to employ quality improvement strategies to improve patient compliance and decrease patient attrition in a pediatric weight loss clinic. Childhood obesity can lead to obesity in adulthood. Thus, it is essential to intervene early with children (Seburg et al., 2015). However, time constraints restrict addressing pediatric obesity in primary care (Seburg et al., 2015). The pediatric weight management clinic offers a specialized, multidisciplinary team approach, lengthy visits, and consistent follow-up to help pediatric patients and their families.

However, lack of success could be attributed to the already high attrition rates and COVID-19 (Seburg et al., 2015).

The original aim of the project, decreasing patient attrition and improving patient compliance, was not achieved. However, the quality improvement project was successful in creating a system change involving the providers. Providers demonstrated 100 percent compliance with distributing the website information to the patients, which is an important system change and reveals their readiness for change. Providers supplying an educational patient hand out appears small, but it is a large communicative part in the therapeutic relationship between clinician and patient. However, providers could have capitalized on this communication by using follow up communication. For example, instead of simply providing the educational hand out, the providers could have stated, “please use the QR code on the handout to visit the online resources. At your next clinic visit I would like for you to share with me one recipe you explored from the website” or “please use the QR code on the handout to visit the online resources and at your next clinic visit I would like you to educate me on three things you learned from one of the modules.” Follow up communication could have encouraged the patients to visit the website and the providers to promote the online education.

An analysis of the website views indicates the quality improvement project was unsuccessful. As stated, patients and caregivers were provided the handout with the website education. According to Heinberg et al. (2010), parental involvement helps improve childhood obesity outcomes. Therefore, identifying ways to motivate parents and caregivers to participate in initiatives, such as that attempted in this project, is imperative for successful outcomes. Most research related to childhood obesity focuses on interventions involving children, creating a lack

of information about parental involvement and quality interventions to improve parental involvement (Bean et al., 2020).

When COVID-19 led to a global pandemic and national shutdown, it greatly affected outpatient healthcare practices, including at the clinic where the project was performed. To stay safe, slow the spread, and flatten the curve, patients stayed home from outpatient appointments (Mehrotra et al., n.d.). Providers also canceled elective visits and routine physicals and transitioned to telemedicine, which led to a sharp decline in outpatient visits (Mehrotra et al., n.d.). One response to the provider postintervention survey discussed the importance of in-person office visits to ensure the website's success. The provider requested teaching patients how to access and navigate the website during the appointment. However, in-person office visits declined by the time of the project implementation due to COVID-19. In addition, due to strict COVID-19 precautions, students were not allowed in the clinic. Another suggestion was to turn the website into a mobile application. The provider stated that some patients might not have access to a computer at home, but most have access to a mobile phone. When the county schools shut down in March 2020, the county's lack of internet accessibility was exposed because the county school system was unable to transition to a virtual school due to the lack of internet and computer accessibility at home (Kast, 2020).

Moreover, COVID-19 has made it difficult for families to develop and maintain the healthy lifestyle needed to combat childhood obesity (American Academy of Pediatrics, 2020b). According to the American Academy of Pediatrics, children miss out on the food security brought by schools and physical activity through recess and after-school programs. Additionally, they experience increased screen time due to online learning and stress from living through a global pandemic (American Academy of Pediatrics, 2020b). Lastly, it is assumed childhood

obesity will increase during and after COVID-19 (American Academy of Pediatrics, 2020a). The lack of success of the program is multifaceted. Factors involving COVID-19 include missed appointments due to stay-at-home orders to protect people from spreading the virus, increased stress during unprecedented times, decreased physical activity, and decreased access to nutritious foods (American Academy of Pediatrics, 2020a).

Age could have played a substantial factor in the low number of website interactions. The average age of the patients was 11.20 years. However, the youngest patient was 5 years old, and the oldest patient was 17 years old. According to Piaget, children at the ages of 5 and 17 are in two different developmental stages (Scott & Cogburn, 2021). Children at age 5 often engage in pretend play, drawing, and imitation. Adolescents at age 17 are at the stage of formal operations (Scott & Cogburn, 2021). Teenagers learn through logical rules, abstract thinking, and environmental analysis (Scott & Cogburn, 2021). Additionally, a 17-year-old can problem-solve instead of accepting concrete ideas (Scott & Cogburn, 2021). Thus, it is important to create modules that appeal to different age groups. For example, a five-year-old might enjoy imitating a YouTube dance on a website. However, a teenager might enjoy creating a dance based on provided examples.

Employing quality improvement strategies to create an online learning environment for patients was intended to increase patient compliance. This idea revolved around the knowledge that childhood obesity requires many different types of interventions. Studies have revealed that successful pediatric weight management includes specialty care, multidisciplinary teams, increased physical activity, increased nutritionally dense foods, family-centered care, and interventions in multiple settings of care (Abraham et al., 2015; Armstrong et al., 2018; García et al., 2017; Geer et al., 2014; Kelleher et al., 2016; Mariz et al., 2016; Pratt et al., 2015; Wang et

al., 2015). However, due to the limited data via the surveys and module views, the program was unsuccessful.

Conclusion

Approximately 1 in 5 American youth aged 2-19 years, are affected by childhood obesity (CDC, 2021). Obese children suffer from chronic health problems, such as cardiovascular disease and metabolic disorders (Kelly et al., 2013). Effective treatment interventions for childhood obesity are multifaceted and require several different interventions employed at one time (Geer et al., 2014). Quality improvement strategies were employed to create an online educational website to display the clinic's weight management interventions. The aim was to improve compliance and reduce attrition at a pediatric weight management clinic. The quality improvement project was unsuccessful.

This project highlighted recommendations for future research include implementing online interventions in a post-pandemic world, increased access to internet-based learning, and increased provider education. The first recommendation is to implement virtual or online interventions after the COVID-19 pandemic ends. According to the U.S. Census Bureau, approximately 65 percent of American youth are participating in virtual or remote educational learning (Bureau, n.d.). Remote learning can reduce COVID-19 exposure and transmission. However, remote learning can lead to virtual fatigue (Paul, 2020). Suggestions to combat virtual fatigue include limiting screen time outside of remote learning, increase physical activity, maintain healthy diets, and good sleep hygiene (Paul, 2020). Implementing an online program for clinic patients can contribute to virtual fatigue and increase screen time. Thus, a quality improvement project encompassing technology or virtual learning should be attempted after a pandemic and a decrease in necessary screen time. The second recommendation is to have a

computer or tablet available to the patients and caregivers to increase access to online resources. According to the U.S. census Bureau, 1 in 10 children did not have access to any form of technology for virtual learning among the COVID-19 pandemic (Bureau, n.d.). This includes computers, tablets, televisions and radios (Bureau, n.d.). Thus, it is a recommendation to provide a means of technology to clinic patients through tablets. The last recommendation is to perform educational sessions for providers about the website or phone application. Formal education could increase the providers' resource knowledge and increase their engagement with quality improvement strategies (Pannick et al., 2016). This quality improvement project showed one hundred percent provider compliance with providing the patient hand out. However, the provider survey content analysis emphasized the provider's lack of promotion of the website. Future studies could include EHR documentation to track provider's compliance of educating patients on the online resources.

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Appendix A



