

Implementing Mobile Text-messaging to Improve Attendance at Well Visits in Primary Care

Pediatrics

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Abstract

Background: Missed appointments are a long-standing problem encountered both in the United States and abroad with rates ranging anywhere from 5% to 55%. It is a major cause of inefficiency in the medical system and consequences include poor health outcomes, wasted health care dollars, waste of provider time and adverse effect on patient-provider relationship.

Local Problem: No-shows are a significant problem in primary care especially in underserved populations. The implementation site for this quality improvement project provides care to an underserved population with a no-show rate of 35%. The purpose of the DNP quality improvement project was to implement and evaluate the use of mobile text messaging to reduce the non-attendance rate to routine well visits in a primary care pediatric clinic in inner city Baltimore. There is evidence to support the use of text message reminders to improve both medication adherence and attendance rates when compared to other available appointment reminder systems.

Intervention: The project was implemented in a sample of patients by nurses, front office staff and providers. The intervention involved sending text message appointment reminders to patients. The attendance rate was later analyzed and compared to the attendance rate prior to the implementation period. Inclusion criteria for the patient population was patients aged 18 years and older or the legal parent or guardian of a patient who was under the age of 18 years. Staff attended a 4-hour training session, which was led by the project leader and I.T. personnel. A pre-implementation survey was conducted to determine patients' and parents' perception of the planned mobile text-messaging system. The questionnaire was quantified, averaged and the result was favorable. During the implementation period, data was collected that reflected the rate of attendance during the project. This information was aggregated and stored by the EHR system. Data was retrieved from the EHR and Run charts were used for data analysis.

Results: The attendance data from the intervention showed that there was no significant increase in attendance to well visits for October, November and December compared to the preceding months of July, August, and September 2019.

Conclusions: Though the result of the intervention did not reflect the expected impact, several lessons were learned. There were some positive unexpected findings, including an increase in portal registration, improvement in the update of patient phone numbers in the EHR database, and greater rapport among staff due to teamwork.

Overview and Background

Missed appointments are a significant cause of inefficiency in the medical system, and consequences include later presentation to care, wasted healthcare dollars, waste of provider time, and adverse effect on patient - provider relationship (Kaplan-Lewis & Percac-Lima, 2013). Samuels et al. (2015) noted that this is a long-standing problem encountered both in the United States and abroad, with rates ranging anywhere from 5% to 55%. According to DuMontier et al. (2015), patients living in a deprived area had a three-fold increase in no-show rates compared to those who did not. The study also noted that missed appointments were higher for patients on Medicaid than for those with other insurance. The problem of interest for this DNP project is non-attendance to routine well visits in a primary care pediatric clinic in inner city Baltimore. Non-attendance occurs when patients fail to show up for a pre-scheduled appointment without rescheduling or cancellation (Poorman, Gazmararian, Parker, Yang, & Elon, 2015). Failure to show up for primary care appointment results in disruption of the main purpose of primary care, which is to ensure continuity of quality care over time (Kaplan-Lewis & Percac-Lima, 2013). No-shows are a significant problem in primary care settings providing care to underserved populations and could be a major contributor to poorer health outcomes in these groups (Kaplan-Lewis & Percac-Lima, 2013). The project implementation site provides care to a population with health disparities. According to the medical director, the no - show rate for well visits was 35% in 2017.

In a study by Perron et al. (2013), a software product known as Easy Smart Care, developed by EasyMedical Services Incorporated, a Swiss firm specializing in the secure exchange of information and services between care providers and patients by mobile phone, was used to deliver an intervention. Patients' phone numbers were entered into a secured web

platform, which automatically sent text-message reminders 24 hours before the planned appointment, including on Sundays. The SMS software was programmed to request delivery notifications. The clinic's electronic health software kept track of attendance and non-attendance and generated a report of the pre- and post-intervention non-attendance rate. The study found that text message reminders were effective and equivalent to telephone reminders in reducing missed appointments, with the added advantage that text messages were more cost-effective (Perron et al. 2013). According to Jamisek, Jangh, & Urganci (2011), texting is widely accepted as a pro-active means of improving preventive care. Jamisek et al (2014) proceeded to state that text messages are delivered almost instantly to the recipient's mobile phone, and the text messages can then be read at a time that is convenient to the recipient.

The purpose of this DNP project was to implement and evaluate the use of mobile text messaging to reduce non-attendance to routine well visits in a primary care pediatric clinic in inner city Baltimore. Two short-term goals for this project were identified. The first goal was the establishment of a text messaging system to remind patients of appointments. The second goal identified was for 100% of all patients who presented during the implementation period be informed of the text-messaging system using prepared patient education designed specifically for this project. An additional goal was for 100% of patients that came in for either well or sick visits be informed of the new text message reminder system, and the prepared education materials given by second week of implementation. A 25% increase in attendance rate for well visits by the end of mobile text message implementation period was the measurement of success for this project. It was anticipated that there would be a 20-30% increase in immunization rates, lead screening, and developmental surveillance for the population by the end of implementation period, due to expected increase in attendance.

Theoretical Framework and Application

The Health Belief Model (HBM) was developed in the 1950s by a group of U.S. Public Health Service social psychologists who wanted to explain why so few people were participating in programs to prevent and detect disease (Rosenstock, 2005). The theory examines individuals' personal perception of health risk, the positive aspects of avoidance, and the factors that motivate them to act (Rosenstock, 2005). The HBM proposes that improved care-seeking results from increasing five of the six concepts (perceived severity, perceived susceptibility, perceived benefits, self-efficacy and "cues to action"), while decreasing perceived barriers (Carpenter, 2010). Based on the knowledge that people will not act to prevent a negative health outcome that is unlikely to afflict them (Carpenter, 2010), the clinical application to improving attendance was to enhance parental and patient perception of their risks of the consequences of non-attendance. Individuals and parents who have relatively high perceptions of their children's susceptibility to the consequences of missed appointments are more likely to attend their appointments (Gross & Bonwich, 2013).

The HBM states that before an individual takes a health-related action, they must believe in their personal vulnerability to the condition, that the consequence of the condition is severe, and that whatever action they can take to prevent the threat will be effective (Gross & Bonwich, 1982). The HBM has six concepts and five were utilized: perceived susceptibility, perceived severity, perceived barriers, "cues to action" and self-efficacy. In the context of non-attendance to routine well child visits, perceived susceptibility refers to the individual's assessment of his/her chances of getting a condition because of not attending (MiKhail, 1981). Based on this concept, it was important to help parents to understand the risk of their children getting a condition due to missed appointments. For instance, school attendance, travel, or other social

activities are potential risks of exposure to vaccine preventable diseases. Perceived barrier is the next concept, and it addresses “attendance” as it relates to the individual’s opinion of what things or circumstances would hinder them from showing up for appointments (Sharma, 2017). These barriers differ for individuals and include factors such as work, daycare or transportation. This concept emphasizes the need to assess patient barriers during routine visits, with the goal of reducing obstacles to attendance. The third concept is perceived seriousness or severity. It is the individual’s judgment of severity of the health conditions that can result from not attending appointments (Sharma, 2017). Some parents may not see the need to attend well check - ups because their child “is not sick.” This addresses the need to enable parents to understand the relative importance and seriousness of the well visits, even though the patient is apparently healthy. The fourth concept of the HBM is “cues to action” and refers to internal or external evidence or experiences, either personal, interpersonal, or environmental that motivate a person to action (Rosenstock, Strecher, & Becker, 1988). The receipt of mobile texts is a cue to action in application to the project. Self-efficacy is the final concept, and it is the strength of an individual’s belief in one’s own ability to respond to new or demanding situations and to deal with any associated obstacles or setbacks (Rosenstock et al, 1988). Self-efficacy applies to “attendance” because individuals are more likely to adopt the new text message reminder system if they feel they can use it. (Glanz et al., 1997).

Literature Review

Failure to show up for primary care appointment results in disruption of the main purpose of primary care, which is to ensure continuity of quality care over time (Kaplan-Lewis & Percac-Lima, 2013). Samuels et al (2015) noted that this is a long-standing problem encountered both in

the United States and abroad, with rates ranging anywhere from 5% to 55%. The focus of the evidence in this literature review was the use of mobile text messaging to improve attendance rate to pediatric well visits in an urban primary care setting. The review started broadly by presenting evidence supporting the purposes text message reminders have served in healthcare. The second section discussed patient and parental perceptions on the use of mobile text messaging. Finally, the review concluded with evidence that support the use of mobile text messaging in improving attendance rate compared to other available appointment reminder systems.

Literature Analysis and Synthesis for Use of Mobile-Text Messaging

A systemic review by Vodopivec-Jamsek et al. (2012) examined the use of mobile phone messaging interventions as a mode of delivery for preventive healthcare, on health status and health behavior outcomes. The review consisted of four randomized controlled trials (RCTs) involving 1933 participants. The review reported that women who received prenatal support through mobile phone messages had significantly higher satisfaction than those who did not receive the messages, and mobile phone message reminders to take vitamin C for preventive reasons resulted in higher adherence. In addition, participants receiving mobile phone messaging support had a significantly higher likelihood of quitting smoking than did those in a control group. Another study by Stockwell et al, (2012), evaluated the impact of text message immunization reminder calls in an urban, low-income pediatric population. The study found that text messaging for reminder calls improved immunization coverage. The sample consisted of 195 parents, randomized to the intervention group with 166 controls. The findings of these studies support the position that text message reminders have a positive role in healthcare. One common limitation of the studies reviewed was that none of them reported on the ethical or

privacy implications of cell phone use. Another limitation was that the Stockwell et al. (2012) study and some conclusions from Vodopivec-Jamsek et al. (2012) were from studies with small sample sizes; this warrants the need for more rigorous evaluation in larger follow - up studies due to impact on power and generalizability. In contrast to the Vodopivec-Jamsek study (2012), Stockwell et al, (2012) reported on the cost of text messaging. The later study is also applicable because it targets the population for this project and addresses the issue of immunization disparity in low-income populations.

Evidence on mobile access and patient acceptance of mobile text reminders was presented in Hall, Cole-Lewis, and Bernhardt (2015). The investigators conducted a systematic review of reviews, which included 15 reviews and meta-analyses. The review concluded that mobile phones have become the most accessible form of mediated communication in world history, and text messaging has become one of the most frequently used forms of mobile communication. In support, Kharbanda, Stockwell, Fox, and Rickert (2009) addressed parental readiness, interest, and acceptance of a text message reminder system for increasing immunization rates. Parents were recruited from two private medical practices and three urban community health centers. Participants were from diverse ethnic backgrounds (4 African Americans, 18 Hispanics, 4 Caucasians, 1 Asian, and 1 other), and children ranged in ages from 10-19 years. Results of the study confirmed that parents were willing to receive text messages for immunization reminders and preferred simple, short and personalized text messages. Finkelstein, Liu, Jani, Rosenthal & Poghosyan (2013) provided similar evidence to support the study by Kharbanda et al (2009). This cross-sectional survey assessed patient preferences for five different reminder systems; home phone call, cell phone call, SMS, e-mail, and direct mail systems. The study sample consisted of 161 adult patients from a primary-care clinic in New

York City. Together, the results indicated the key role parent and patient preference plays in implementation of mobile text messaging (Kharbanda et al., 2009; Finkelstein et al, 2013). These two studies were relevant to the intended project because they were conducted in primary care. A limitation of Finkelstein et al. (2013) study was the use of convenience sample in only one clinic serving low-income populations located in a large metropolitan area. This reduces application of findings to other settings. In contrast to this study, a larger and more generalizable study on the cost effectiveness of mobile text reminders was conducted by Ipek Gurol-Urganci et al (2013).

Ipek Gurol-Urganci et al. (2013) conducted a systematic review of eight RCTs involving 6615 participants. The review presented evidence in support of use of mobile text messaging as a cost - effective tool that improved attendance rates when compared to other available appointment reminder systems, including face-to-face, postal message, call to landline, call to mobile, via web-based electronic health records, email and SMS/MMS. Further evidence on the effective use of text message reminders on medication adherence and attendance to appointments were presented in four systematic reviews (Horvath et al, 2012; Mbuagbaw et al, 2015; Hall, Lewis & Bernhardt, 2015; Finkelstein et al, 2013), and two meta analyses (Jones & Kaewluang, 2014; Thakkar et al, 2016). In contrast to the others, Mbuagbaw et al. (2015) addressed the importance of securing the texts through encryption to prevent inadvertent disclosure related to the use of text messaging. A limitation common to these studies is that they were conducted on adults, so application may differ regarding care for their children rather than for themselves. Taken together, these reviews indicate that practices can use text messaging intervention to reduce forgetfulness and improve both adherence and attendance to clinic appointments. (See Appendix A, Newhouse, 2006).

DNP Project Implementation Plan

The purpose of this DNP project was to implement and evaluate the use of mobile messaging to reduce the rate of missed appointments to routine well visits in a pediatric primary care setting. The project was implemented in a sample of patients, nurses, front office staff, and providers. Inclusion criteria for the patient population were patients who were aged 18 years and older or the legal parent or guardian of a patient who was under the age of 18 years. Participants were excluded if they did not speak or write English. The estimated sample size ($n = 120$) was based on the average daily patient attendance of 15 patients per day over 8 weeks. The medical team was comprised of two medical assistants, a practice manager, two front office staff, a family nurse practitioner, the practice information technician, and a pediatrician. The DNP student provided the oversight and coordination of the project. The entire practice staff agreed to participate in the project. The staff size of ($n = 9$) was based on the team currently on staff in the practice at the time of the study.

This DNP project took place over a 14-week period, from August 2018 through December 2018. At the beginning of the first week, the DNP project leader trained staff members to execute the new mobile reminder system. Staff attended a 4-hour training session, which was led by the project leader and I.T. personnel. This training ensured that staff members were well-versed in the mobile reminder technology and were able to educate patients on its benefits. Training included EHR exercises to ensure staff members updated patient cell phone numbers with every patient interaction. Roleplay was used to simulate interactions between staff and parents/patients. Training was successful if staff could demonstrate this process on a test patient (See Appendix B).

The remainder of the first week was used to make necessary preparations for the launch of the mobile reminder system. The DNP project leader met with core team members to discuss the language of the text messages, delivery times, and response confirmation between practice and patients. This team created and finalized acceptable text messages that was sent during project implementation. Message was concise and personalized, without revealing confidential medical information (See Appendix C). The practice also prepared for patient/parent outreach. Signs and handouts that outlined the advantages of the new system were developed. Staff members placed signs in the office and informed patients about the upcoming change during phone and in-office encounters. Office policies and procedures were updated to reflect the changes to reminder protocol. Finally, the DNP project leader arranged for weekly progress monitoring.

Implementation of the mobile reminder system took place during weeks two through four. Because the EHR at the implementation site did not have the capability to encrypt text messages, patients, and parents were informed of the risks of privacy violation in plain language during signup either in-office or over the phone. Once they decided to participate, verbal consent was obtained (See Appendix D). In the office setting, a questionnaire was given to patients and parents who had agreed to participate in the mobile reminder system (See Appendix E). The purpose of the questionnaire was to assess the participants' perceptions of the intervention. Specific emphasis was placed on gauging whether patients believed that reminders would impact their attendance. Written permission to adapt and use the survey was requested (See Appendix F) and permission was obtained from the author, Dr. Victoria Champion (See Appendix G). For privacy purposes and to reduce distraction, parents and patients were taken to their exam room to complete the survey. Surveys were distributed on all clinic days during hours of operation.

The mobile reminder system was implemented during weeks five through twelve. During this time, data was collected that reflected the rate of attendance during the project. This information was aggregated and stored by the EHR system. Data analysis took place during weeks thirteen and fourteen. Patient attendance data was retrieved from the EHR and analyzed by the DNP project leader. Results of the questionnaire were quantified and averaged, to determine patients' perception of the efficacy of the system (See Appendix H). In addition, the data from the EHR was compared to patient attendance data from the period prior to the implementation.

To facilitate continued use of the mobile reminder system, a manual for system procedures and use was compiled for the practice. This enabled the practice manager and I.T. staff member to train inexperienced staff and externs. The practice EHR system was encrypted, and password protected, which ensured the privacy of patient and practice data. A project description was submitted to University of Maryland Baltimore (UMB) Institutional Review Board (IRB) for a Non - Human Subjects Research (NHSR) determination.

This DNP project started at the beginning of the first week of August 2018. As scheduled on the DNP implementation plan. DNP project leader utilized the first week to train staff members to execute the new mobile reminder system. Staff attended a 4-hour training session led by the project leader and I.T. personnel. The front desk staff were trained on the following objectives:

- **Mastery of registration process:** The goal was for the front staff to understand and demonstrate how to document and edit contact information, including name, gender, telephone numbers, addresses, and insurance information. Staff learned how to edit the contact preferences, including the "opt out" option for those who did not wish to receive these messages. This lasted for about an hour. A patient registration manual was used to

perform this training, and the method of evaluation was staff simulation of patient registration.

- Ability to process reminder text messages: Under this objective, staff learned how to access the schedule for a specified date of service, how to add the scheduled patients to the Message eXchange, how to select the appropriate reminder text to be sent, and how to cue the message for delivery. Training included EHR exercises to ensure staff members update patient cell phone numbers with every patient interaction. Roleplay was used to simulate interactions between staff and parents/patients. Training was evaluated by having staff demonstrate the process on a test patient.
- Successful tracking of text messages: The goal of this objective is for staff to be able to understand how to interpret the status of each message on the patient Message eXchange and trouble shoot the reason for any message failures.

For the remainder of the first week, the DNP project leader met with core team members to discuss the language of the text messages, delivery times, and response confirmation between practice and patients. The text messages that would be sent during the second week of implementation were finalized and accepted. Front office staff placed signs in the office to inform patients about the upcoming change during phone and in-office encounters. Office policies and procedures were updated to reflect the changes to reminder protocol. The DNP project leader also used the first week to arrange for weekly progress monitoring.

Implementation of the mobile reminder system commenced during weeks two through four. Because the EHR at the implementation site does not have the capability to encrypt text messages, patients and parents were informed of the risks of privacy violation in plain language during signup either in-office or over the phone. Once they decided to participate, verbal consent

was obtained. In the office setting, a questionnaire was given to patients and parents who have agreed to participate in the mobile reminder system. Surveys were distributed on all clinic days during hours of operation. The mobile reminder system was implemented from weeks 5 through twelve. Data that reflects the rate of attendance was collected and stored by the EHR system.

Results

Results of Survey

The survey consisted of 10 questions that were meant to assess patient/parent perceptions of text message reminders. The survey utilized the Likert Scale, with a score of 1 meaning “strongly disagree” and a score of 5 meaning “strongly agree.” The first 3 questions of the survey addressed the impact of missed appointments on the health of the patient and the patient-provider relationship. Fifty-seven percent of respondents agreed or strongly agreed that missed medical appointments are a genuine and severe problem. Sixty-one percent of respondents agreed or strongly agreed that missed appointments can negatively affect their health. Sixty-six percent of respondents agreed or strongly agreed that this can also have a negative impact on the relationship between them and their provider.

Questions 8 and 9 of the survey assessed patient/parent perceptions regarding the mobile reminder system. Eighty-three percent of patients/parents who completed the survey stated that they agreed or strongly agreed that text message reminders can effectively reduce missed appointments. Similarly, 80% stated that they have access to a mobile phone and would prefer text message reminders to phone call reminders (See Appendix H).

Result of Project

This quality improvement (QI) project included patients who were scheduled for appointments during the pre and post implementation period. The attendance rate for the implementation period of October, November and December 2018 was compared to the three months prior to the implementation of mobile text messaging when phone reminder system only was used for appointment reminder. The attendance rate was calculated by dividing the total number of attendances by the total number of appointments scheduled. The data for the pre and post implementation period is displayed (See Table 1).

Based on the trend analysis of the intervention outcome, there was no significant increase in attendance to well visits for October, November, and December compared to the three months of pre- implementation data. In fact, the attendance rate for October, November and December was less than the pre-implementation period. (See Figure 1).

Discussion

This QI project was aimed at using mobile-text messaging to increase the attendance rate to well visits for patients in a primary care pediatric clinic in inner city Baltimore. A 25% increase in attendance rate for well visits by end of mobile text message implementation period of fourteen weeks was the measurement of success for this project.

Unfortunately, the result of the intervention did not reflect the expected impact from the outset. However, some lessons were learned and there were some positive unexpected findings. Some of the unexpected positive findings included an increase in portal participation and improvement in updated patient phone number database. Another unexpected benefit was the

improved rapport and communication among staff as a result of working as a team on this project.

Findings from the literature shows that parents and patients prefer the convenience of mobile text-reminders to other forms of reminder systems (Kharbanda et al., 2009; Finkelstein et al, 2013). This is supported by this intervention because eighty percent of the survey results on parent and patient perceptions of the intervention indicated that mobile text messaging is the preferred method of appointment reminders for this population. A systematic review by Ipek Gurol-Urganci et al. (2013) also presented evidence in support of use of mobile text messaging as cost effective tool that improved attendance rates when compared to other available appointment reminder systems, including face-to-face, postal message, call to landline, call to mobile, via web-based electronic health records, email and SMS/MMS. The project supports the cost effectiveness of mobile text reminders because the parents did not incur any additional financial cost as a result of this intervention. In contrast, the short-term result of the project did not support the evidence in literature regarding improvement in attendance.

An alternative explanation for the finding of this project could be that the time line of the project is not long enough to determine the impact of this long-term intervention. In addition, the timing of the project implementation coincided with both the colder weather and the holiday season.

This is may have affected the parents' motivation to attend routine check-ups if the child is well.

According to the Health Belief Model, which is the theoretical framework for this project, parents are less likely to attend well appointments if the child is well.

Though this finding is surprising, a possible explanation for this could be because the practice has further relaxed its no-show policy over the years to accommodate more patients in the effort to recoup some of the financial burden from failure to attend. The significant drop in

attendance during the December period is a seasonal trend usually noted during the holiday season. It is also possible that the implementation period for this project did not provide an adequate period for a significant positive difference to be observed. It takes time for people to change their habits and this project has good prospects because it will be sustained for the long term. A review of the portal trend analysis indicates an overall increase in portal registration. In addition, there was a significant improvement in the update of patient phone numbers in the EHR database (See Figure 2).

Facilitators and Barriers to Implementation

One of the biggest facilitators to the implementation of this project was the medical director's enthusiastic support of this project. Implementation of a mobile text messaging system had been a long-term goal of the clinic administration. This DNP project was, therefore, a much-needed opportunity to realize this dream. The second facilitator was that the EHR was already equipped for this capability and there was no extra financial cost accruing from implementing this project. The presence of a project champion who shared the passion and determination of the project leader to ensure the success of the project was another great facilitator of this project. The support of the office staff who recognized that the success of the project would benefit the patients as well as the finances of the organization was another facilitator for this project. The rapport amongst staff at the site was also a significant facilitator.

A notable barrier to implementation was that patients needed to sign up to the patient portal for us to receive the feedback response to the text-messages that are sent. The sign up to the patient portal was not initially as robust as anticipated, and this was challenging. To help overcome this barrier, handheld tablets were used to sign up parents and adult patients to the portal during their office visit. This was effective in increasing portal sign-ups. A minor barrier is

that the text-messages were sent only in English. Some Spanish-speaking patients indicated interest in receiving the reminders, but we were unable to send it to them in Spanish during the implementation period. However, the Spanish population at this site is less than 1%. The site will continue to have Spanish-speaking staff members make telephone calls for appointment reminders to this population.

Problems, Failures, or Costs associated with the intervention

The cost of the messaging system used in this project is a potential burden for a primary care practice. No other notable problems or failures were associated with the intervention.

Strength of this project: A strength of this project is that the medical director is committed to sustaining the intervention in the long term. A recommendation for future intervention is to allow a longer period for evaluation of outcome of the intervention.

Limitations: A limitation for this project was that the EHR message exchange was set up to send reminder messages to patients for all appointments, except for those scheduled on the same day. As a result, parents and patient who schedule an appointment on a previous day still get a reminder. This resulted in redundancy. An action to minimize this problem is that those appointments are manually checked off as confirmed to prevent the system from generating reminder messages for the appointments. An additional limitation is that this QI project was conducted in a single medical practice in an urban area. The cultural and demographic characteristics of the population may have affected the outcome and limits generalization to other settings. It is important to point out the human aspect of the project and the possibility of error with data input, including phone numbers, indicating preferences and initiating daily message exchange. The presence of any human error in these processes could have affected the validity of the result.

Conclusion

This QI project is useful although the outcome was not as expected. The project has resulted in increased portal participation for parent and patients in the practice. Portal participation is very important because it is an indicator that the patients are well engaged with their care. It also significantly improves communication between the patients and the providers. The project has good prospects for sustainability because of the strong buy-in from the medical director and other stakeholders. The potential for this project to spread to other contexts is excellent because of the current proliferation of mobile cell phones and the convenience. Cell phones are accessible, convenient and affordable, and current literature supports using them for appointment reminders. The implication of this for practice and for future QI projects is that future interventions may need to be conducted over a longer period before success is evaluated. It would also be important to evaluate the characteristics and demographics of this population in inner city Baltimore, which may affect their ability to attend. There is need to educate parents and patients on the importance of preventive care because they may not see the need to attend their well visits if the child is well. The next step for this project is that it is sustained and on-going. Dissemination is in process to increase awareness of poor attendance rate with hopes of finding a lasting solution to the problem.

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Table 1. Pediatric Well Visit Attendance Rate from July to November 2018 (N=1,071)

	JUL	AUG	SEP	OCT	NOV	DEC
Total Attendance (N)	151	288	142	129	86	52
Total Appointments Scheduled (N)	178	358	178	164	114	79
Total Attendance Rate	84.8%	80.4%	79..8%	78.7%	75.4%	65.8%

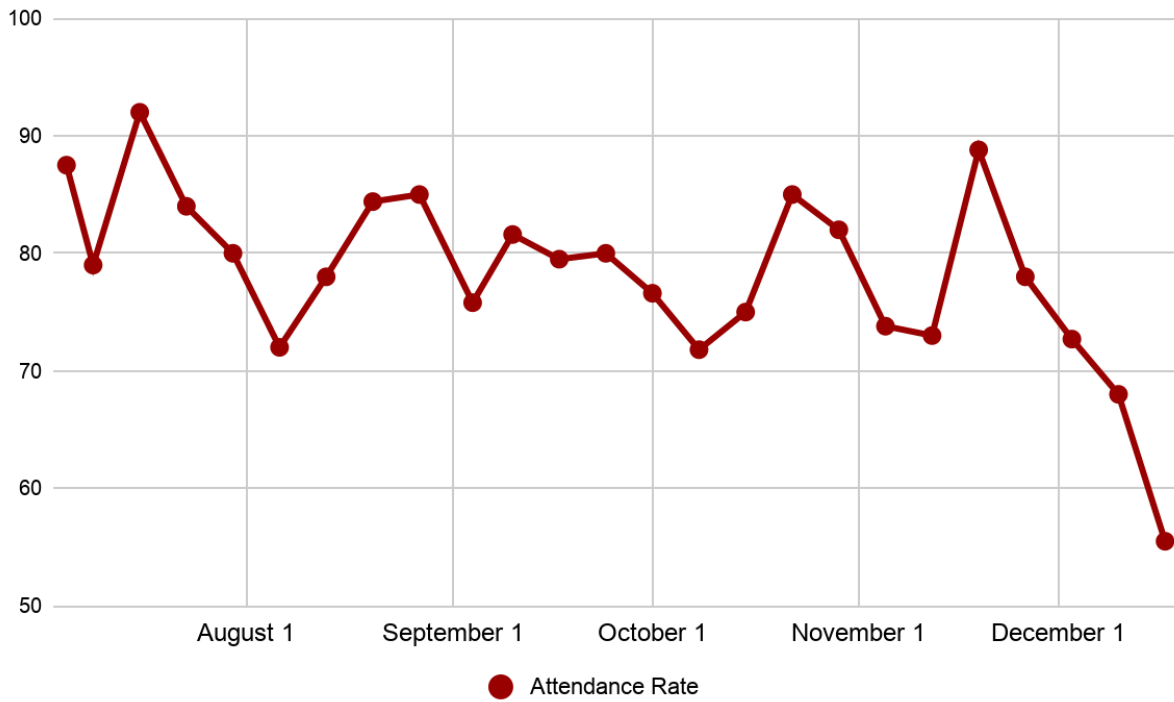


Figure 1. Primary Care Pediatric Clinic Well Visit Attendance Rate Trend Analysis

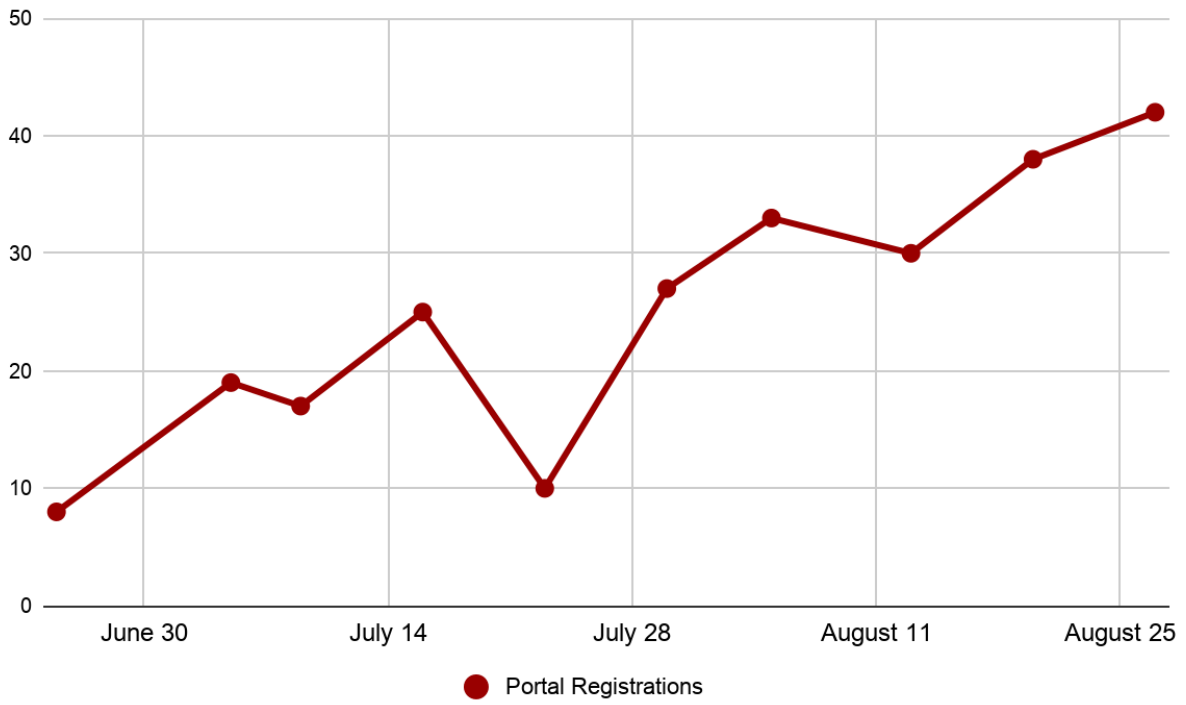


Figure 2. Portal Registration Trend Analysis

Appendix A - Evidence Review Table

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	Level and Quality Rating
(Stockwell et al, 2012)	To determine the impact of text message immunization reminder–recalls in an urban, low-income population.	Randomized controlled trial.	A total of 195 parents were randomized to the intervention group, and there were 166 controls available.	Receipt of MCV4 or Tdap at 4, 12, and 24 weeks after randomization. A secondary outcome was receipt of any vaccine, which included MCV4 or Tdap along with all other vaccines.	Text messaging for reminder–recalls improved immunization coverage in a low-income, urban population.	IIB

<p>(Jones & Kaewluang, 2014).</p>	<p>To evaluate the current evidence on the use of mobile phones and SMS to deliver self-management interventions for chronic conditions.</p>	<p>A Meta Review.</p>	<p>11 systematic reviews (SRs) that were identified and retrieved after an extensive search of electronic databases covering the years 2000–2012. Number of research studies included in each review ranged from 2 to 25 and number of subjects ranged from 421 to 38,060. Four of the SRs included only randomized controlled trials (RCTs), three included RCTs and quasi-experimental studies, and the remaining four included RCTs, pre–post designs and descriptive studies.</p>	<p>Current evidence on the use of mobile phones and SMS to deliver self-management interventions. The AMSTAR tool and DARE reviews</p>	<p>Mobile phone text messaging was reported to significantly improve adherence to appointments and antiretroviral therapy, short-term smoking quit rates, and selected clinical and behavioral outcomes.</p>	<p>1A</p>
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<p>(Thakkar et al, 2016).</p>	<p>To assess the effect of mobile telephone text messaging on medication adherence in chronic disease.</p>	<p>A Meta-analysis</p>	<p>Sixteen randomized clinical trials were included, with 5 of 16 using personalization, 8 of 16 using 2-way communication, and 8 of 16 using a daily text message frequency. 2742 patients were involved.</p>	<p>Odds ratios and pooled data were calculated using random-effects models. Risk of bias and study quality were assessed as per Cochrane guidelines.</p>	<p>Mobile phone text messaging approximately doubles the odds of medication adherence. This increase translates into adherence rates improving from 50% (assuming this baseline rate in patients with chronic disease) to 67.8%</p>	<p>1 A</p>
<p>(Guy et al, 2011)</p>	<p>Assessed the effectiveness of SMS reminders at increasing the uptake of appointments in health care settings.</p>	<p>A Meta-analysis and systematic review</p>	<p>The review criteria were met by 18 reports, made up of eight randomized controlled trials (RCTs) and 10 controlled observational studies.</p>	<p>The electronic bibliographic databases Medline and Embase were searched; in addition, the Cochrane Controlled Trials Register</p>	<p>SMS reminders have value in reducing nonattendance rates in a wide variety of settings and thereby provide a simple and efficient option for health services to improve service delivery.</p>	<p>1A</p>

<p>(Gurol-Urganci et al, 2013)</p>	<p>To review and assess the effects of mobile phone messaging reminders for attendance at healthcare appointments. Face-to-face, postal message, call to landline, call to mobile, via web-based electronic health records, email and SMS/MMS were compared.</p>	<p>A systematic review</p>	<p>Eight randomized controlled trials involving 6615 participants. The Cochrane review included eight studies involving 6615 people.</p>	<p>Comparison of seven possible modes of communicating reminders for healthcare appointments to patients:</p>	<p>Mobile phone text messaging reminders increase attendance compared to no reminders. or postal reminders and have the same impact on attendance as phone call reminders. Two studies reported that the costs per attendance of mobile phone text message reminders are less than phone call reminders. While the attendance rates after text messages versus phone reminders were similar, the costs per text message per attendance were 55% and 65% lower than costs per phone call</p>	<p>1A</p>
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					reminder in two included studies.	
(Vodopivec-Jamsek et al, 2012).	To assess the effects of mobile phone messaging interventions as a mode of delivery for preventive health care, on health status and health behavior outcomes.	A Systematic review	Included four randomized controlled trials involving 1933 participants, quasi-randomized controlled trials (QRCTs), controlled before-after (CBA) studies, and interrupted time series (ITS) studies with at least three -time points before and after the intervention	SMS or MMS as a mode of delivery for any type of preventive health care.	Women who received prenatal support via mobile phone messages had significantly higher satisfaction than those who did not receive the messages. Also, mobile phone message reminders to take vitamin C for preventive reasons resulted in higher adherence - marginal reduction in the number of missed tablets in the last 7 days compared to those who did not receive any reminders (MD -0.80, 95% CI - 1.55 to -0.05).	2B

<p>(Horvath et al, 2012)</p>	<p>To determine whether mobile phone text-messaging is efficacious in enhancing adherence to (Antiretroviral Therapy) ART in patients with HIV infection.</p>	<p>Systematic reviews</p>	<p>Two Randomized controlled trials.</p>	<p>ART adherence at 48 weeks: Short weekly messages vs. long weekly messages</p>	<p>Weekly text-messaging was associated with a lower risk of non-adherence at 48-52 weeks</p>	<p>1A</p>
<p>(Mbuagbaw et al,2015)</p>	<p>To map the state of the evidence of text messaging interventions, identify knowledge gaps, and develop a framework for the transfer of evidence to other chronic diseases.</p>	<p>Systematic review of systematic reviews.</p>	<p>Nine systematic reviews comprised of parallel group RCTs, crossover RCTs, quasi- experimental designs (non-randomized comparisons and before-after studies), and observational studies.</p>	<p>AMSTAR was used to ensure methodological quality of the included systematic reviews.</p>	<p>Medical practices can use text messaging interventions to improve adherence to medication and attendance at clinical appointments, as long as the correct precautions relating to patient confidentiality are incorporated. Precautions include securing the texts through encryption to prevent inadvertent disclosure of status or road traffic accidents related to</p>	<p>3B</p>

					the use of text messaging.	
(Hall, Lewis & Bernhardt, 2015).	To identify mobile text-messaging interventions designed for health improvement and behavior change and to derive recommendations for practice	A Systematic review	In total, 15 systematic reviews and/or meta-analyses, representing multiple individual SMS-intervention studies, met all selection and quality criteria		Text-messaging interventions were effective when addressing diabetes self-management, weight loss, physical activity, smoking cessation, and medication adherence for antiretroviral therapy.	1A

<p>Kharbanda et al (2009).</p>	<p>To qualitatively explore preferences and readiness for text message immunization reminders.</p>	<p>Parent focus group and interviews</p>	<p>Parents (n = 28) ranged in age from 30 to 64 years and were racially/ethnically diverse (4 African American, 18 Hispanic, 4 White, 1Asian, 1other).</p>	<p>Content analysis was used to review and independently code transcripts</p>	<p>Parents were uniformly interested in receiving text message immunization reminders and many preferred them to mail or phone reminders. Parents suggested that reminders should be simple, short, and personalized.</p>	<p>6C</p>
<p>(Finkelstein,Liu, Jani, Rosenthal & Poghosyan, 2013)</p>	<p>To evaluate patient preferences for five different reminder systems, to measure patients’ usage and knowledge of other service providers contacting them by text message and email and to assess reported responsiveness to different reminders systems.</p>	<p>Cross-sectional survey design</p>	<p>Patients in a primary care clinic in New York City (N=161).</p>	<p>Friedman Nonparametric Test was used to assess patients’ ranked preferences and a Wilcoxon Signed Ranks test to assess significant differences between ranks</p>	<p>Different demographics of people had different preferences (such as different age groups and race) newer reminder systems may not be as effective as many providers believe- Shows that a one-size fits-</p>	<p>4C</p>

					all approach is not the answer to improving attendance.	
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Rating System for Hierarchy of Evidence

Level of the Evidence Type of the Evidence

- I (1) Evidence from systematic review, meta-analysis of randomized controlled trails (RCTs), or practice-guidelines based on systematic review of RCTs.
- II (2) Evidence obtained from well-designed RCT
- III (3) Evidence obtained from well-designed controlled trials without randomization
- IV (4) Evidence from well-designed case-control and cohort studies
- V (5) Evidence from systematic reviews of descriptive and qualitative studies
- VI (6) Evidence from a single descriptive or qualitative study
- VII (7) Evidence from the opinion of authorities and/or reports of expert committees

Melnyk, B.M. & Fineout-Overholt, E. (2014). *Evidence-based practice in nursing & healthcare: A guide to best practice* (3rd ed.). New York: Lippincott, Williams & Wilkins.

Rating Scale for Quality of Evidence

A: High – consistent results with sufficient sample, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific literature

B: Good – reasonably consistent results; sufficient sample, some control, with fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence

C: Low/major flaw – Little evidence with inconsistent results; insufficient sample size; conclusions cannot be drawn

Newhouse, R.P. (2006). Examining the support for evidence-based nursing practice. *Journal of Nursing Administration*, 36(7-8), 337-40

Appendix B

Staff Training for Mobile Text Reminder Implementation

Learning Objectives	Content Outline	Method of Instruction	Time Spent	Method of Evaluation
Mastery of Registration process	Understand and demonstrate how to document and edit contact information, including name, gender, telephone numbers, addresses and insurance information. Know how to edit the contact preferences including opt out option.	Patient registration manual.	1 hour	Simulation of patient registration.
Ability to process reminder text messages.	Learn how to access the schedule for a specified date of service. How to add the scheduled patients to the Message eXchange (the patient messaging module in "Office Practicum" - the software in use at the project setting). How to select the appropriate reminder text to send. How to cue the message for delivery.	The use of instruction manual and hand-on demo.	1 hour	Simulation of reminder text message processing.

<p>Tracking the text messages</p>	<p>Understand how to interpret the status of each message on the patient Message eXchange. Call patient with accessible telephone number to remind them of scheduled appointment and access reason for any message failures.</p>	<p>Verbal training</p>	<p>1 hour</p>	<p>Simulation.</p>
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Appendix C - Mobile Text Message Transcript

“Goodtime Peds appt: (Patient First Name), (Appointment Date) @ (Appointment Time).
Confirm: (Confirmation Link)”

Appendix D - Verbal Consent Transcript

“To authorize Goodtime Pediatrics to contact you via automated text messages for appointment reminders, please acknowledge the following:

- You may opt-out of receiving these communications at any time by calling Goodtime Pediatrics.
- There is some risk that personal information contained in these texts may be disclosed.
- By providing verbal consent, you agree to receive text messages from Goodtime Pediatrics to the phone number that you have provided.”

(Patient will then provide verbal consent.)

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Appendix E - Questionnaire

All items for the 5 scales were formatted with a 5-point Likert-type scale from strongly disagree (1) to strongly agree (5). The scales are scored so that a higher score means greater perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, health motivation, or confidence.

The following questions are related to your experiences attendance to appointments. There are no right or wrong answers. Please circle the number that best describes your feelings about each statement.

1= Strongly Disagree (SD)

2= Disagree (D)

3= Neutral (N)

4= Agree (A)

5= Strongly Agree (SA)

1. Missed medical appointments are a genuine and severe problem.

1 2 3 4 5

2. Missing appointments impacts me or my family member's health.

1 2 3 4 5

3. Missing appointments is inconvenient for my healthcare provider and negatively affects my relationship with my provider.

1 2 3 4 5

4. I am more likely than the average person to miss my scheduled appointments.

1 2 3 4 5

5. I worry about the consequences of missing my appointments.

1 2 3 4 5

6. Attending my scheduled well examinations as scheduled will allow me to detect problems early.

1 2 3 4 5

7. My rate of attendance to appointments can be improved.

1 2 3 4 5

8. Mobile text message reminders can effectively reduce missed appointments.

1 2 3 4 5

9. I have access to a mobile phone, and text reminders will be convenient and preferable for me rather than phone calls.

1 2 3 4 5

10. I miss my appointments because of unexpected/unavoidable circumstances, not because I forgot I had an appointment.

1 2 3 4 5

This is the end of the survey. Please return the survey to the folder on your unit or to the nursing office. Thank you very much for your assistance.


Appendix F - Consent to use Questionnaire

May 14, 2018

Ngozi Osuagwu
University of Maryland
School of Nursing

Dear Ms. Osuagwu,

Thank you for your interest in my work. You have permission to view and modify the Health Belief Model for your use as long as you cite my work and send me an abstract of your completed projects.

Sincerely, 
Victoria Champion, PhD, RN, FAAN
Mary Margaret Walther Distinguished Professor
Edward W. and Sarah Stam Cullipher Endowed Chair
Assistant Director of Population Science
Indiana University Simon Cancer Center

Appendix G

