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Short Message Service (SMS) Appointment Reminder Project

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Practice Innovation Project: Text Message Appointment Reminder

This Doctor of Nursing Practice (DNP) Project is approved as a credible and independent investigation by a candidate for the DNP degree and is acceptable for meeting the project requirements for this degree. Acceptance of this DNP Project does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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Abstract

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The purpose of this quality improvement project was to decrease the appointment no-show rate at a mid-western primary care clinic by implementing short message service (SMS) appointment reminders. The project director analyzed the cost of the SMS appointment reminders and patient satisfaction with the intervention via telephone participant opinion surveys. The guiding theoretical framework was Nola Pender's Health Promotion model (HPM). The subjects involved were the primary care patients who had access to cellular phones with SMS capability. The project assistant received verbal consent to send the SMS appointment reminder for a participant. Then the participant's cellular phone number was entered in the online SMS appointment reminder program, Call-Em-All.com, which sent the personalized SMS appointment reminder 48 hours prior to scheduled appointment. The project implementation period was February 1 to May 1 of 2017. The comparison time frame was February 1 to May 1 of 2016. The project site's no-show rate decreased from 15.9% to 4.5% and patient satisfaction regarding the SMS appointment reminder was high. Costs associated with the SMS appointment reminder were minimal compared to the cost of a patient no-show.

Keywords: short message service (SMS) appointment reminder

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List of Abbreviations

1. SMS: short message service
2. CNP: certified nurse practitioner
3. JHNEBM: Johns Hopkins Nursing Evidence Based Practice Model
4. DNP: Doctorate of nursing practice
5. EBP: evidence-based practice
6. PET: practice questions, evidence, and translation

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Chapter 1: Introduction

Introduction

According to a recent study, 91% of American adults own a cellular phone (Rainee, 2013). Technology, such as cellular phones, is an important part of American society and the healthcare system. Technology has improved how medical providers diagnose and care for patients. However, a provider has no opportunity to help his or her patients unless they attend scheduled medical appointments. Patients who do not attend scheduled appointments hinder quality medical care, are more likely to experience poor health outcomes, and waste financial resources (Perron et al., 2013). Technology provides an opportunity to decrease patient no-show rates via short message service (SMS) and telephone appointment reminders.

Significance of the Problem

No-show appointments adversely affect the patient, provider, and medical facility. According to Daggy et al. (2010), no-show rates in primary care clinics vary from 14 to 50%. Patients forget and miss appointments for a variety of reasons. Kaplan-Lewis and Percac-Lima (2013) performed a study in which patients were interviewed to discover why medical appointments were missed. Reasons given included: did not remember, miscommunication, transportation difficulty, personal conflicts, too sick, wrong time, not in town, and other obligations. Demographics of the patients in the study who were likely to not attend appointments included: being a minority, younger age, and on Medicaid.

Significance to Patient. When patients do not attend medical appointments, there can be a delay in diagnosis and inadequate treatment of chronic health conditions (Gurol-Urganci, de Jongh, Vodopivec-Jamsek, Atun, & Car, 2013; Nguyen, DeJesus, &

Wieland, 2011; Nuti et al., 2012; Kaplan-Lewis & Percac-Lima, 2013). Chronic health conditions such as diabetes are poorly managed; Nguyen et al. (2011) and Nuti et al. (2012) collected data and showed that admission to a hospital for diabetic complications increased and hemoglobin A1C levels were higher for patient who did not routinely attend scheduled appointments. Patients were also less likely to have adequately controlled blood pressure and were not up-to-date on preventive services (Nguyen et al., 2011).

Significance to Provider and Facility. The author of an article on the American Congress of Obstetricians and Gynecologists website affirmed when patients miss appointments it not only affects the patient but also the provider (Fleischman, 2013). Financial data from this study revealed that no-shows can cost a provider between $50,000 and $150,000 in annual revenue. This loss of income can hurt other patients as a privately owned provider may have to increase costs or decrease clinic assets to make up for these losses. Daggy et al. (2010) reported patients who do not attend appointments in a family clinic can cause 25.4% of the provider's scheduled time and appointment slots to be left open and unused which decreases provider productivity and can cost a clinic 14% of daily income. It is estimated that no-shows to general practice appointments in England cost the National Health System 185 million pounds in one year (Gurol-Urganci et al., 2013). This amount is equivalent to $291,800,500.00 in the United States (US). If patients improve attendance at appointments, they could experience a higher quality of continuous care and proper management of chronic diseases.

Population of Interest

The population of interest is the group of people who a healthcare problem affects. The population of interest in this project are primary care patients across the nation. Each patient who schedules an appointment at his or her primary care provider's office is at risk of not attending that appointment.

Clinical Question

A well-defined evidence-based question is important as it helps the inquirer develop a search strategy (Melnyk & Fineout-Overholt, 2011). A useful format is the PICOT question: P is the population or problem, I is the intervention, C is the comparison of intervention with other interventions, O is measurable outcomes, and T is the time frame. The PICOT question for this project was:

P: Among primary care patients at a small, mid-western clinic who have access to a cellular phone with short message service (SMS),

I: are SMS appointment reminders sent two days prior to appointments,

C: compared to current practice of no appointment reminders sent,

O: more effective at decreasing the no-show appointment rate

T: over a three-month period

Purpose of the Project

The main purpose of this project was to increase appointment adherence by using SMS appointment reminders at a small, mid-western primary care clinic, the project site. The clinic did not send any appointment reminders prior to project implementation. A secondary goal is to decrease the costs associated with appointment reminders by using the cost-effective method of an automated SMS appointment reminder program. A long-

term goal for this project is to increase quality of care through increased patient attendance at appointments, decrease complications, and increase chronic disease management overall care by increasing appointment attendance and revenue for the clinic.

Definitions

Short message service (SMS) is a program used to send text messages to cellular phones (Tech Terms, 2014). SMS does not require a cellular phone to be on at the time the message is sent; the cellular phone will hold the message transmission until the phone's power is turned on. Many cellular phone companies allow customers to receive and send a limited number of messages per month at no charge.

Appointment no-show is when a patient does not reschedule or cancel a medical appointment and misses the appointment completely (Wagner, 2012).

Chapter 2: Literature Review

Introduction

The review of the literature supported SMS appointment reminders to decrease nonattendance rates at medical appointments. For this project, a review of the literature about SMS appointment reminders was conducted utilizing CINAHL, Cochrane Library, PubMed, National Guideline Clearing House, and Google Scholar databases. The search was limited to research articles published from 2009 to the present, English, and peer-reviewed. A review of bibliographies in the pertinent literature was also performed. Search terms included: *appointment reminder, text message appointment reminder, short message service appointment reminder, telephone appointment reminder,* and *missed appointments.* Inclusion criteria were studies that evaluated SMS reminders for appointments. Exclusion criteria were studies that used SMS reminders for other aspects of clinical care, such as medication adherence and written in language other than English. Studies from ten countries were included: United States of America, Ireland, Brazil, Finland, Australia, Malaysia, China, Norway, Switzerland, and Saudi Arabia. A total number of 86 articles were initially found; 14 articles contained evidence that addressed the PICOT question for this project.

The Johns Hopkins Evidence Appraisal Tool was utilized to appraise the evidence for strength and quality. Evidence is graded I-V for strength and A-C for quality (Dearholt, 2012). See Table 1 for description of strength and quality descriptions. The evidence was then synthesized, practice recommendations formed, and gaps in knowledge exposed.

Table 1. Johns Hopkins Evidence Level and Quality Guide

Evidence Levels	Quality Guides
Level I Experimental study, randomized controlled trial (RCT) Systematic review of RCTs, with or without meta-analysis	**A <u>High Quality:</u>** 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
Level II Quasi-experimental study Systematic review of a combination of RCTs and quasi-experimental, or quasi-experimental studies only, with or without meta-analysis	**B <u>Good Quality:</u>** Reasonably consistent results, sufficient sample size for the study design; some control, definitive conclusions; reasonably consistent recommendations based on comprehensive literature review that includes some reference to scientific evidence
Level III Non-experimental study Systematic review of a combination of RCTs, quasi-experimental and non-experimental studies, or non-experimental studies only, with or without meta-analysis Qualitative study or systematic review with or without a meta-synthesis	**C <u>Low quality or major flaws:</u>** Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn

(Dearholt, 2012)

Evidence Findings

The articles included in this literature review focus on the SMS appointment reminders and how its use helped patients remember their appointment so a complete miss of the appointment was avoided. A total of 15 articles were identified: nine level I, one level II, three level III, and two level IV. A table was created using the Johns Hopkins Evidence Appraisal Tool to outline the analysis of each evidence piece (See Appendix A). The following is a synthesis of these findings.

SMS Appointment Reminder. Research findings support that SMS appointment reminders are effective reminders compared to no reminders at decreasing the appointment no-show rate (Boksmati, Butler-Henderson, Anderson, & Sahama, 2016; Cincinnati Children's Hospital Medical Center, 2012; Chen, 2015; da Costa, Salamao, Martha, Pisa, & Sigulem, 2010; Guy et al., 2012; O'Connor, Bond, Regan, & Phelan, 2009; Taylor, Bottrell, Lawler, & Benjamin, 2012; Youssef et al., 2014). These findings include two randomized controlled trials that compared SMS appointment reminders to a control group with no reminders (Taylor et al., 2012; Youssef et al., 2014); the authors identified that SMS is effective. A best evidence statement from a renown children's hospital (Cincinnati Children's Hospital Medical Center, 2012) and a JoAnna Briggs Institute best practice recommendation (Chen, 2015) also urge the use of SMS reminders.

SMS Appointment Reminders compared to Telephone Appointment Reminder. SMS appointment reminders were also found to be as effective as phone call reminders (Bigna, Kouanfack, Noubiap, Plottel, & Koulla-Shiro, 2013; Chen, Fang, Chen & Dai, 2008; Gurol-Urganci, et al., 2013; Hasvold & Wootton, 2011; Perron et al., 2013). A Cochrane review (Gurol-Urganci et al., 2013) found that attendance rates for SMS appointment reminders and telephone appointment reminders are 78.6% and 80.3%, respectively. The appointment attendance rate difference was not statistically significant and showed that SMS appointment reminders are equally effective as telephone appointment reminders. This Cochrane review also discussed that SMS appointment reminders are more cost-effective than telephone appointment reminders (Gurol-Urganci et al., 2013).

Cost- Effectiveness of SMS Appointment Reminder. Numerous high-quality studies also discovered that SMS appointment reminders are more cost-effective than telephone appointment reminders (Boksmati, Butler-Henderson, Anderson, & Sahama, 2016; Bigna et al., 2013; Chen et al., 2008; Gurol-Urganci, 2013; Leong, 2006; Perron et al., 2013; Taylor et al., 2012). Two studies (Chen et al., 2008; Leong, 2006) reported the relative cost of SMS appointment reminder compared to telephone call reminder was 55% and 65%. These studies are older than five years, but the information is relevant to this project's scope and purpose. Overall, the literature review produced quality evidence that supported the trial of SMS appointment reminders to improve patient appointment adherence at the proposed primary care clinic.

Evidence Summary (Recommendations for Practice)

The path for this evidence was clear with positive results. Quality evidence with consistent results regarding SMS appointment reminders was found from a variety of settings and populations with results that can be generalized to other patient populations.

Based upon the evidence found, SMS appointment reminders have proven to be effective at reducing nonattendance rates in medical clinics. SMS appointment reminders have also been proven to be just as effective and cost less than phone call reminders. The recommendation for practice in a clinic with a high no-show rate is that SMS reminders can be an effective, cost-efficient tool to help increase patient appointment adherence.

Gaps in the Evidence

Substantial research has been done regarding SMS appointment reminders for patients and how it affects nonattendance rates. However, gaps in the evidence exist. Most studies compared SMS appointment reminders to no intervention at all. Two

randomized control trials (RCTs) and three systematic reviews, including the Cochrane review, compared SMS appointment reminders to telephone appointment reminders. Several studies addressed costs, but more information is needed to solidify this knowledge. Also, ten studies were performed in specialty clinics, not primary care settings. This project addressed the use of SMS appointment reminders in the primary care setting and looked further into its cost-effectiveness.

Evidence-Based Practice Model

The model for this project was the Johns Hopkins Nursing Evidence-Based Model (JHNEBM). This model is a three phase process used to identify, locate, appraise, and translate evidence-based practice research findings (Dearholt, 2012). Practice, education, and research are three critical aspects of professional nursing described by the JHNEBM. Practice is how nurses transform knowledge into action. Education is the attainment of information and skills required for nurses to gain expertise and maintain proficiency. Research produces fresh knowledge and guidelines for nurses to base their practice on and provide quality care to patients (Dearholt, 2012**)**.

PET Process: Practice Question Phase. The three phases of the JHNEBM are practice question, evidence, and translation (PET) (Dearholt, 2012**).** The first phase, practice question, consists of five steps. First step is to gather an evidence-based practice (EBP) team whose profession is pertinent to the chosen topic. This team consisted of the project director, project assistant (the clinic secretary), primary care clinic's CNP, and the project major advisor.

The second step is to develop the evidence-based question (Dearholt, 2012). It is important to determine the problem and identify what the current practice is and how the

team wants the practice to change. Refining and developing a specific, detailed question will help make the search and appraisal of evidence easier. The question formulated is presented in the clinical question section of this paper and follows the recommended PICOT format.

The third step is to define the scope of the question and identify stakeholders (Dearholt, 2012). Defining the scope helps the team decide who they should involve in the project and the stakeholders. A stakeholder is a person who would be affected by the project and personally or professionally interested. Stakeholders for the SMS appointment reminder project were the EBP team, patients, and other clinics and patients who may benefit in the future if the project is successful. The key stakeholder was the CNP at the project site.

The fourth step is to decide who should be in charge of the EBP team (Dearholt, 2012). The project director is responsible for keeping the team organized and focused. The project director of the SMS appointment reminder project was the DNP student as identification, attainment, translation, and dissemination of evidence- based research is within a DNP's field of expertise.

The fifth and final step of the first phase is to schedule the team meetings (Dearholt, 2012). This can be a difficult task due to all the team members' schedules and prior obligations. It is important to schedule meetings on a regular basis so all members can plan ahead and commit to attendance. An adequate space is vital and assigning team members responsibility for different aspects of the meeting to ensure positive progress is important. The team meetings for this project took place at the project site.

PET Process: Evidence Phase. The second phase of the PET process is the search and appraisal of the highest quality evidence (Dearholt, 2012). Depending on what the team finds, a practice change could occur. The evidence phase consists of five steps.

The first step of the second phase is searching for evidence (Dearholt, 2012). A team member should be assigned the task of searching for evidence; the project director was in an ideal position to perform this task. Asking a librarian or a subject matter expert (SME) for help ensured an appropriate and complete search is done. Sources of evidence included online database such as the Cochrane library, CINAHL, and PubMed. Other sources of evidence included position statements, clinical practice guidelines, and professional opinions.

The second step is to appraise the evidence (Dearholt, 2012). The Johns Hopkins model has two evidence appraisal tools; research and non-research. Each tool has specific questions to determine the strength, quality, and level of the evidence. There is a five-level scale, with I indicating the highest level. Then, based on the tool questions, the evidence is ranked low, good, or high quality. To keep the appraisal process organized, the Individual Evidence Summary tool can be used. Step eight, the third step in the second phase, is to summarize the evidence (Dearholt, 2012). The Synthesis and Recommendations Tool is used to sum the evidence that applies to the PICOT question.

Synthesizing the overall quality and strength of the evidence is the ninth step of the PET process (Dearholt, 2012). After an individual piece of evidence is appraised, the project director decides the overall quality. The level, quality, and applicability of the evidence is used to determine the overall strength.

The last step of the evidence phase is to decide if a practice change should occur based on the appraisal of the evidence (Dearholt, 2012). The team can go in four different directions with the results of the evidence summary. First, the evidence may be high-quality, compelling, and consistent enough to support a change in practice. Second, the evidence may be just good and consistent enough to support a change. Third, the evidence may be good but not consistent enough to support change. Fourth, the evidence is inconsistent and not good enough to support change. The evidence found in this project was high-quality and consistent enough to support a change in practice. The project director performed this second phase, with support from the team, and concluded the evidence supported a change in practice to start SMS appointment reminders.

PET Process: Translation Phase. The third and final phase of the PET process is the translation phase (Dearholt, 2012). The eleventh step is to decide if the proposed change is appropriate for the target population. The team presents the idea to stakeholders so they can help determine if the change is possible within the organization. Benefits should outweigh the risks and the resources for the change must be available. It was determined that this change was appropriate and feasible at the project site.

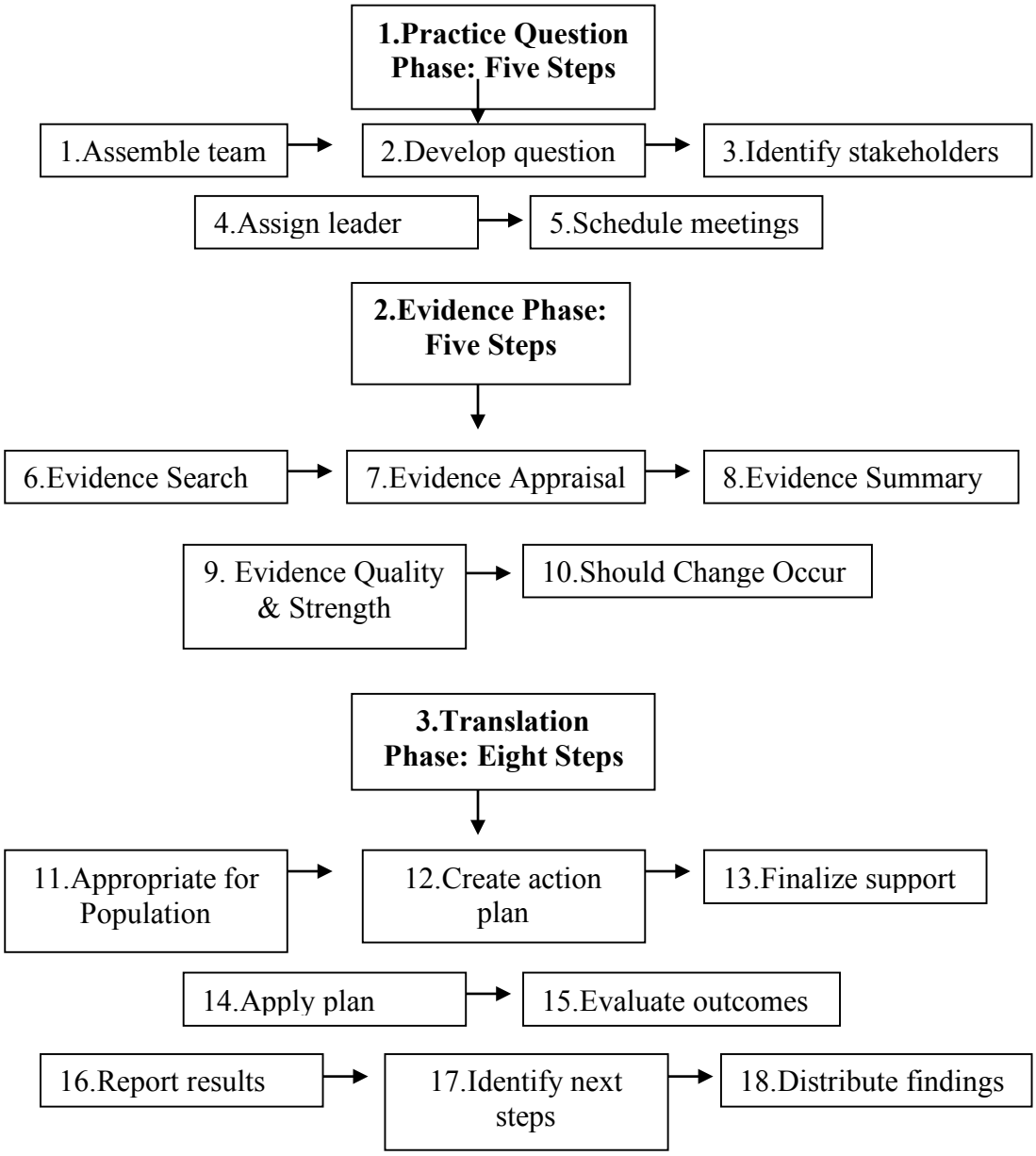
The second step in the translation phase is to create an action plan to execute the practice change (Dearholt, 2012). The plan should include an organized timeline, assignment of duties to team members, and the request of feedback from stakeholders and leaders. “Essentially, the team must consider the *who, what, when, where, how,* and *why* when developing the action plan for the proposed change” (Dearholt, 2012, p. 50). The project director assigned duties to the project assistant and key stakeholder to facilitate completion of the project.

Step thirteen is to finalize support and resources for the project, and step fourteen is to apply the action plan (Dearholt, 2012). Resources for the project to be considered include financial, human, and material items. Clear communication and a close relationship with the organization's leaders are vital to the process because they can help secure resources. Before the action plan is put into effect, every person involved in the project should receive clear instructions and education regarding exactly what will be changing and how it will be done. Financial resources were secured by the project director in the form of a research grant from a reputable nursing honor society.

Evaluation of outcomes is the fifteenth step and reporting the results is the sixteenth step (Dearholt, 2012). Negative or unexpected outcomes can provide learning opportunities. If the outcomes are not what the team expected, the practice change will need to be re-evaluated and altered. All stakeholders, leaders, and any person involved in the project are to be informed of the outcomes. Feedback from these people often provides insight and knowledge to overcome barriers. The project director informed the team and key stakeholders in person at the project site.

The last two steps of the PET process are to identify the next steps and to distribute the findings (Dearholt, 2012). The team members evaluate their project and outcomes and identify what they learned. Findings should be disseminated within the organization and distributed externally as well, such as publication in a professional journal. The project director will disseminate these results at a local research conference in the upcoming year.

Figure 1: PET Process: Three Phases and 18 Steps



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Theoretical Approach

The theory that guided the approach to this project is Pender's Health Promotion model (HPM). The HPM promotes increasing a person's overall well-being and striving towards a healthy lifestyle; not just being free from any disease process (Pender,

Murdaugh, & Parson, 2011). The theory states each person is unique and individual experiences affect his or her decisions and actions. Variables that affect a person's health knowledge can be manipulated by nursing action to achieve the desired behavioral outcome that promotes health. The model contains theoretical statements that provide guidance for a nurse to design and implement health promoting behaviors for patients (Pender et al., 2011).

Three of Pender's theoretical statements apply to the proposed SMS appointment reminder project: "Perceived barriers can constrain commitment to action", "Families, peers, and health care providers are important sources of interpersonal influence that can increase or decrease commitment to and engagement in health promoting behavior", and "The greater the commitments to a specific plan of action, the more likely health-promoting behaviors are to be maintained over time" (Pender, 2011, p.5).

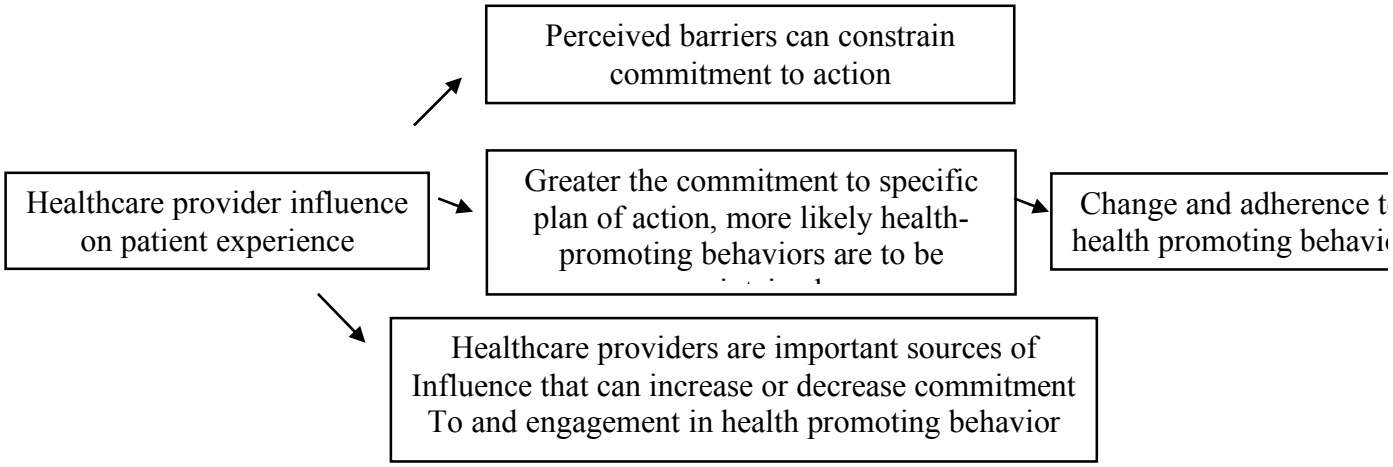
Barriers to patients attending their scheduled appointments include; simply forgot, too sick, personal issues, no access to transportation, wrong time, and had to work (Kaplan-Lewis & Percac-Lima, 2013). If the patient and medical provider have a committed plan of care and the patient does not attend the appointments, that plan of care cannot be executed and adverse effects can occur. SMS appointment reminders can help a patient overcome the barrier of forgetting his or her appointment and stay committed to his or her health care plan of action.

The second theoretical statement described above states how health care providers are a positive influence and can increase health promoting behaviors (Pender, 2011). By offering an alternative reminder for patients, this clinic positively influenced patients' behavior and increased the likelihood of attending the scheduled appointment.

The third theoretical statement pertains to the patient's and provider's commitment to the care plan (Pender, 2011). If the patient feels like the organization is doing everything to assist them in staying committed to the care plan, they may also feel more committed. If a SMS appointment reminder helps him or her attend the appointment, this strengthens the patient's commitment. The patient will also feel like the provider is more committed if he or she provides personalized reminders for that patient.

These theoretical statements from Nola Pender's HPM provided the theoretical basis for promoting the proposed change of SMS appointment reminders for patient appointments. The change theory described below also assisted the DNP project director to construct a plan to guide and motivate the employees at the project site who assisted the project director in implementation.

Figure 2. Project Application of Health Promotion Model



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Kotter and Cohen Model of Change

Kotter and Cohen (2002) developed a model of change based on information from over 100 business organizations undergoing significant change processes. The findings concluded that change happens when the proposed change appeals to a person's thoughts and feelings. An employee is more likely to support a business's change when truths are proposed that affect a person internally and truly motivates them. Kotter and Cohen outlined this process in eight steps (Kotter & Cohen, 2002).

The first step in the process was to create a sense of need to change (Kotter & Cohen, 2002). The project director needed to excite people about the proposal and encourage them to join the change effort. The project director reached out to independent primary care clinics in the community to discover which clinics had issues with appointment no-shows. The primary care clinic that agreed to allow the implementation of this project had problems with appointment no-shows and did not send any form of appointment reminder.

The next step was to "build the guiding team" (Kotter & Cohen, 2002). After the project director gained support from the CNP at the project site, the project was proposed to a committee at the project director's university that approved implementation. The committee members, the project director's major faculty advisor, the project site's CNP, and project assistant were the guiding team.

The third step was to form a strategic vision (Kotter & Cohen, 2002). The group worked together to form a vision for the proposal and steps to guide the process. The fourth step was to communicate the vision and recruit supporters (Kotter & Cohen,

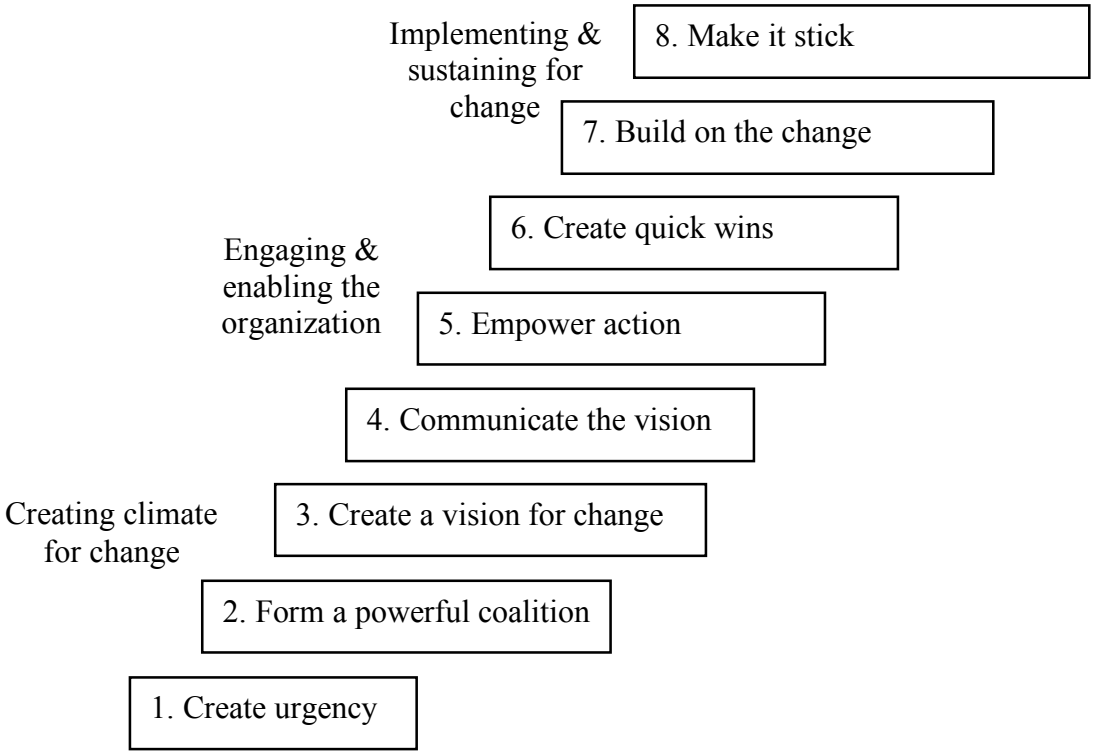
2002). This step was simple as support from the project site's staff had already been achieved.

Step five was to eliminate barriers and facilitate action (Kotter & Cohen, 2002). This step involved removing any barriers or threats to the proposed change. A possible barrier was financial support for the project. This barrier was overcome by the project director securing a research grant to financially support the project. Another barrier to this proposal was older patients not wanting to receive SMS appointment reminders. This barrier was difficult to overcome, but enough patients participated so this barrier was not detrimental to the project.

Generating short-term successes was the sixth step of this process and the seventh step was to sustain acceleration (Kotter & Cohen, 2002). This step involved keeping track of results and notifying the stakeholders of any success; this kept them motivated and the process moving forward. The project director met with the project assistant twice a month to discuss progress and incite motivation to continue implementation. The project assistant also informed the major faculty advisor of progress via email monthly.

The final step was to institute the change (Kotter & Cohen, 2002). This step was based on whether the DNP project was successful or not. The results were disseminated to the stakeholders at the end of the project and since there was a significant change to appointment attendance, the project site will continue to use SMS reminders.

Figure 3. Kotter and Cohen Model of Change



(Kotter & Cohen, 2002)

Chapter 3: Method and Procedures

Introduction

This project's PICOT question was investigated by utilizing JHNEBM's translation phase of the PET process. The project director collaborated with the project committee and stakeholders to implement the evidence-based proposal. The evidence supported the utilization of SMS appointment reminders to increase appointment attendance and decrease costs associated with utilizing patient appointment reminders. The outcome of this project was a positive reflection of the evidence.

Design/ Approach

A quality improvement project is an organization's plan that focuses on healthcare delivery improvement (Health Resources & Services Administration [HRSA], 2011). This DNP project was a quality improvement project based on current research evidence. It used a nonrandomized convenience sample. Participants gave permission to receive an SMS appointment reminder when they scheduled an appointment. SMS appointment reminders were sent 48 hours prior to the scheduled appointment. This time frame was chosen based on evidence in the literature and in collaboration with the project site's CNP and project director. Various studies sent the SMS appointment reminder 24-72 hours in advance (Chen, Fang, Chen & Dai, 2008; da Costa, Salamao, Martha, Pisa, & Sigulem, 2010; Guy et al., 2012; Leong, 2006; Perron et al., 2013). A meta-analysis performed by Boksmati, Butler-Henderson, Anderson, and Sahama (2016) concluded that the timing of the SMS appointment reminder being sent did not significantly impact the no-show rate. Also, half of the studies in this meta-analysis sent the reminder 48 hours prior to scheduled appointment. Based on this evidence, 48 hours was chosen as the time

to send the SMS appointment reminder. The DNP project was carried out for three months. A survey was also utilized to discover participants' opinions about the SMS appointment reminder.

Setting

The project setting was a small, independent Midwest primary care clinic. It was in a community of approximately 60,000 people. The sole provider is a CNP who is assisted by the clinic secretary. No appointment reminders were sent to patients at the project site prior to implementation of the project. The only other staff member is the clinic secretary who is responsible for managing the day-to-day operations. The majority of the clinic's patients are insured by Medicare and Medicaid (P.Wright, personal communication, May 4, 2017). The clinic's CNP provides care to all ages and races, most commonly elderly adults and adolescents who are Caucasian and Native American. Common medical problems the CNP addresses are diet and lifestyle modifications, allergies, gastrointestinal disorders, and chronic pain. Lab and radiology services are not available at the project site but the CNP is contracted with a local lab and radiology clinic to provide these services. The CNP sees an average of six to ten patients daily (P.Wright, personal communication, May 4, 2017).

Sample

The project sample was a convenience sample from the project site's patient population. Every patient who had access to a cellular phone with SMS capability was included in the prospective sample population. The project site's community is largely Caucasian, 79.9%. The major minority in this community is Native American, 10.7%. Community members who claim Hispanic origin is 5.0% and biracial is 3.6% (United

States Census Bureau, 2015). The total sample size was 30 participants, the desired sample size was 30.

Development of Intervention/Tools

This project's intervention was an SMS appointment reminder (see Appendix D). The project director developed the SMS appointment reminder message based on examples from studies in the literature review (Bigna, Kouanfack, Noubiap, Plottel, & Koulla-Shiro, 2013; Perron et al., 2013; Taylor, Bottrell, Lawler, & Benjamin, 2012). The automated SMS appointment reminder program Call-Em-All.com was utilized. Each SMS appointment reminder cost $0.09 and this program offered the first 25 SMS appointment reminders at no charge. A survey was also developed by the project director to assess participants' opinion regarding the SMS appointment reminder (see Appendix E). The Flesch-Kincaid grade level test determines the U.S. school grade reading level of a document (Microsoft Office, 2016). According to this test, the survey was graded at 6.6. This number indicates a U.S. sixth grade student could understand the survey.

Project Procedure

This part of the project followed the JHNEBM's translation phase of the PET process, steps 11-14 (Dearholt, 2012). The project director received approval from the project committee on November 16, 2016. The project director met with the key stakeholder, the project site's CNP, in early January 2017 to discuss the procedure for project implementation. One week prior to implementation the project director met with the project assistant to explain the automated SMS program and finalize the action plan and project timeline. The project director met with the project assistant weekly for the first month of implementation and then biweekly until project completion.

The recruitment process and the delivery of SMS appointment reminders began February 1 and ended May 1 of 2017. Starting February 1, any patient who called to schedule an appointment was asked if he or she was willing to participate in the project and receive an SMS appointment reminder prior to his or her next scheduled appointment. The project assistant explained the project to the patient and if the patient verbalized consent over the phone, the project assistant signed the consent form indicating participation (see Appendix E). After consent, the participant's phone number was entered into the automated SMS appointment reminder program, Call-Em-All.com, by the project director's assistant. This program allows names and phone numbers to be entered in the system on the computer and a specific date set to send the SMS appointment reminder, which was two days prior to each scheduled appointment. This system allowed the SMS appointment reminder to be customized by the project director (see Appendix A). The project assistant called each participant after his or her scheduled appointment and asked the survey questions over the phone.

Ethical Considerations

The project director submitted the proposal to the Human Subjects Committee at South Dakota State University after project committee approval. It was imperative that no protected health information (PHI) is sent in the message as this could violate the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and patient's privacy rights. Health information shared via electronic means such as SMS appointment reminders must follow the Security Rule portion of HIPPA (Karasz, Eiden, & Bogan, 2013). The Security Act describes how a patient's private health information can be shared electronically. No identifying information was included in the SMS appointment

reminder. It only stated the clinic name and location and it could not be implied from the name of the clinic exactly why the patient was seeking care since it was a primary care clinic that manages a variety of medical diagnoses. Since these guidelines were followed, there were no ethical or HIPPA violations.

Projected Analysis

Scheduled appointments were divided into attended appointments and not attended appointments so the no-show rate could be calculated. The appointment data gathered February 1-May 1 of 2017 was compared to the appointment data of February 1-May 1 of 2016. Fisher's exact test was used to analyze the no-show rates between the two time frames. Fischer's exact test is appropriate when calculation of exact probabilities from two independent variables is required (Munro, 2005). The participant opinion survey was administered to gather data regarding opinion and satisfaction with the SMS appointment reminder. The survey used close-ended questions, yes or no. The results were calculated and the information described as a percentage of patients who received the SMS reminder that either stated yes or no to the specific questions. Demographic information about the project participants and cost of the SMS appointment reminders was also gathered and analyzed.

Environmental and Organizational context

The project site is a privately owned primary care clinic. The sole provider is a CNP who has owned the clinic for 11 years. The CNP practices independently but collaborates with numerous healthcare organizations in the project site community to provide comprehensive healthcare to her patients.

Stakeholders/Facilitators

Key stakeholders are individuals who benefited the most from the completion and success of this DNP project. The key stakeholders in this project were the project site's CNP, project assistant, and patients. Project facilitators are individuals who assisted the project director in implementation and completion of this DNP project. Key facilitators were the project site's CNP, project assistant, project director, project committee, and faculty advisor.

Barriers

The largest barrier to project implementation was that the initial project site withdrew consent to allow implementation less than three months before the intended project proposal. The project director, with support from the major faculty advisor, contacted an independent local clinic and successfully proposed the project idea.

Impact on:

Organization. This project supported the project site's mission and vision by increasing access to care in a cost-effective manner. A long-term impact could be the project site's goal of increasing attendance rates which would increase revenue for the project site and results in higher quality, cost-effective care. The patient-provider relationship could be strengthened by the patient feeling that the provider is assisting him or her to get to the scheduled appointment.

Finances. As stated in the literature review, SMS appointment reminders are a cost-efficient option. Not using an employee to make the phone calls decreases administrative costs. If more patients attend appointments, then more revenue is

generated for the project site. If the project site is profitable, then it stays operational which ensures jobs and keeps open the doors to provide care to community members.

Policy decisions. The project was successful and met the expected outcomes, this may influence the project site to change to this appointment reminder process. Also, the project has potential to influence other medical clinics in the community or region to adopt the same SMS appointment reminder process.

Quality of health care. Patients must attend appointments to receive preventive care and education regarding ongoing medical issues. If patients attend their appointments then continuity of care is ensured which equates to increased quality of healthcare; trust is gained, the provider-patient relationship is strengthened, and the continuity of care is continued.

When a patient does not attend his or her appointment, there is now an opening in the provider's schedule that cannot readily be filled. If a patient cancels or reschedule his or her appointment with adequate notice, the provider can fill that appointment time with another patient who is waiting to be seen (P. Kirby, personal communication, November 16, 2016). This ability to provide patients an opportunity to be seen increases access to care for those who would otherwise have to wait for the next available appointment.

Rural or underserved populations. Cellular phone service in rural areas can be sporadic, the calls are not transmitted 100% of the time, and not all wireless service providers are available in every state (Federal Communications Commission, 2015). A network's capacity is how many people can use the wireless service at one time on the same cell site. A cellular phone call uses more capacity on a cell site than a text message; at times when cellular phone calls cannot go through a text message can (Federal

Communications Commission, 2015). A text message may reach patients living in rural areas where cellular phone calls are not a 100% reliable mode of communication.

Summary

The project site was a small, Mid-western primary care clinic and the stakeholders were fully committed to the implementation of this project. The clinic's EMR did not have SMS capability so an accessory SMS program was utilized to send the SMS appointment reminder two days prior to scheduled appointment. An opinion survey regarding the SMS appointment reminder was also administered to patients. This project had the potential to decrease the no-show rate and overall clinic expenses while increasing revenue and quality of patient care.

Chapter 4: Findings

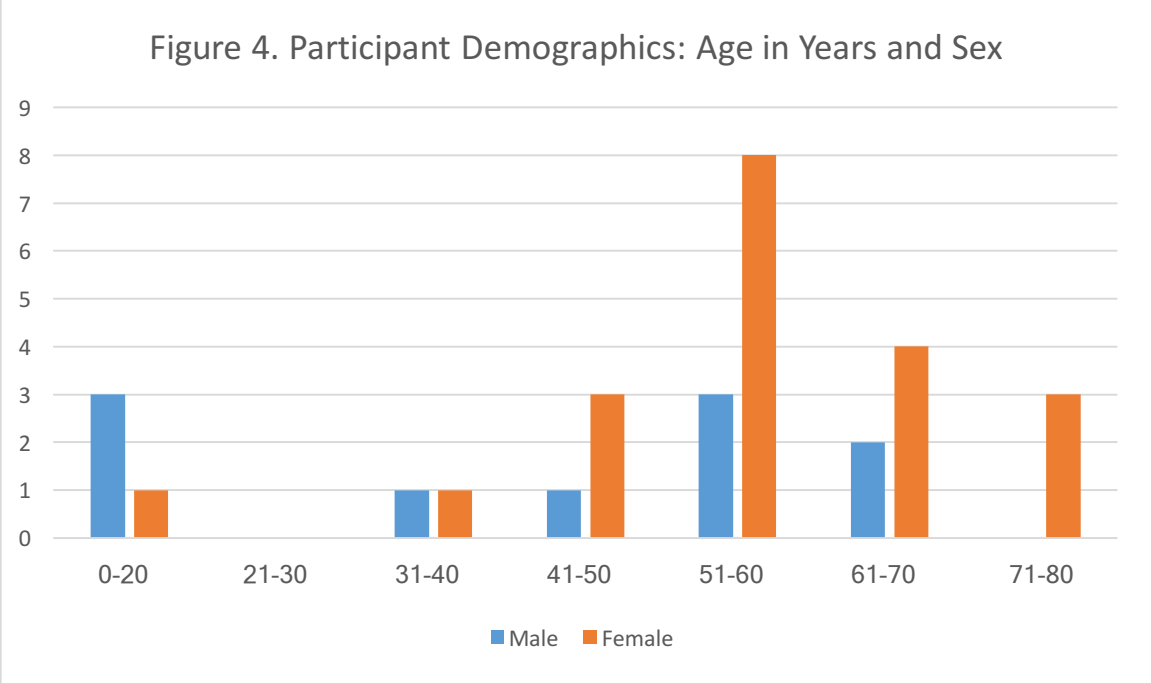
Introduction

This part of the project followed the last two steps of the JHNEBM's PET process, steps 15-16 (Dearholt, 2012). The participant demographic information, the statistical analysis of the no-show rate prior to and after implementation, and qualitative analysis of the participant opinion survey is reported.

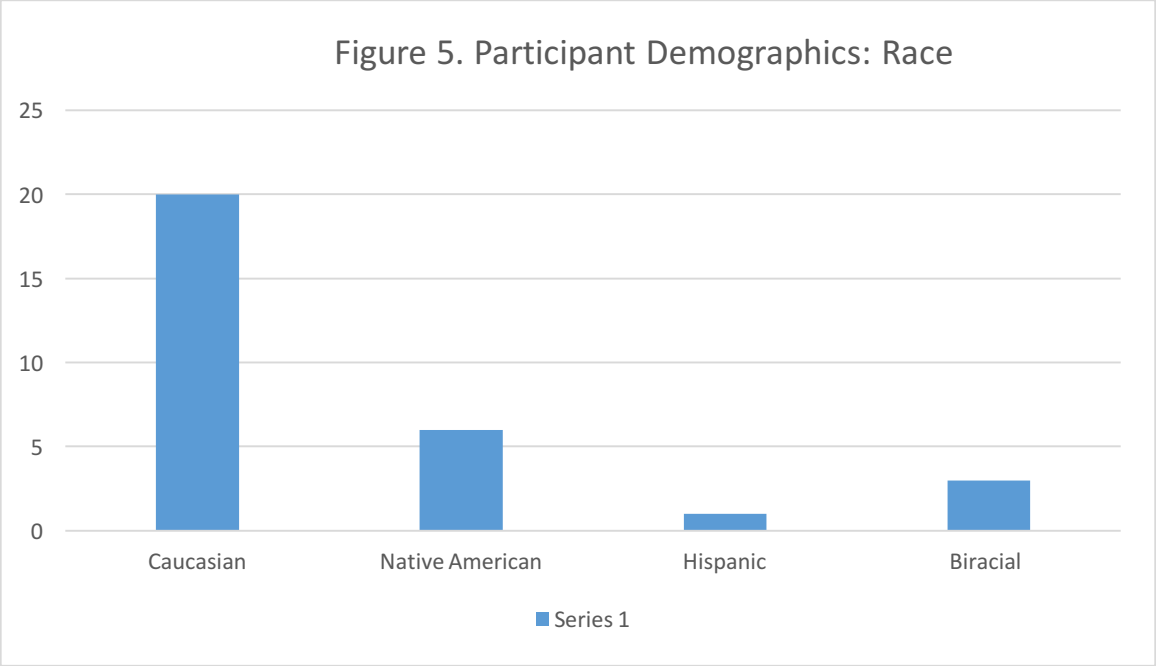
Demographics

The sample pool of project participants was heterogeneous and provide results that are generalizable to the community. The following project participant demographic information was collected: age, sex, race, and insurance. The total number of project participants was 30.

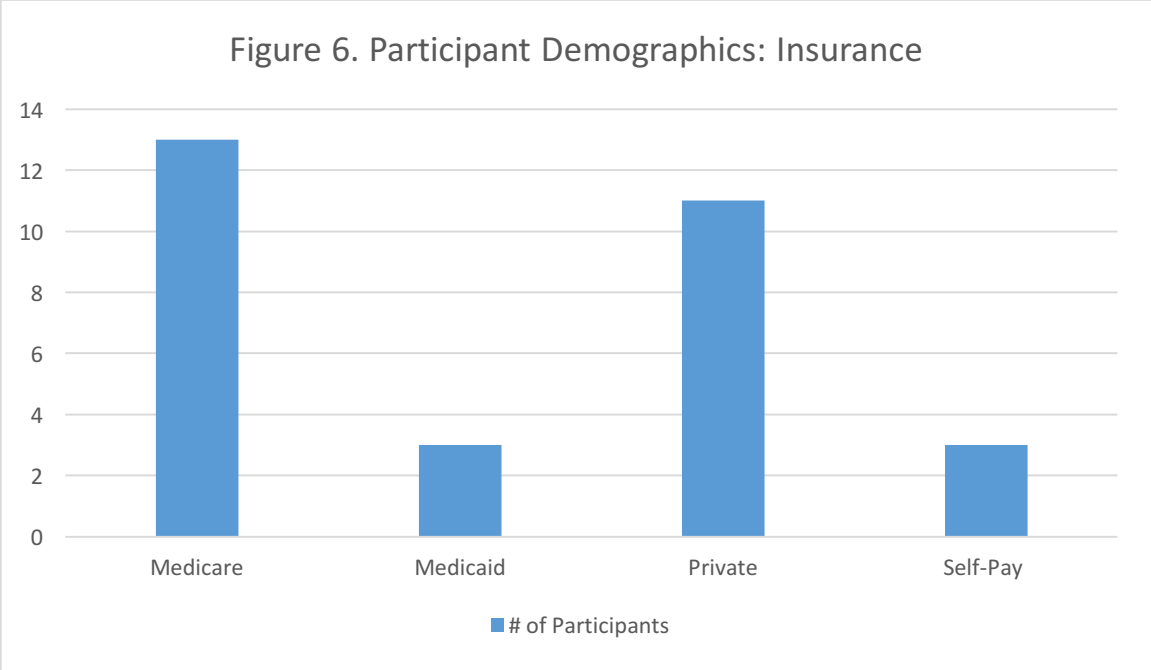
The age range of project participants was 7 to 77 years of age with a mean age of 51.5 years. Total number of female participants was 20 and male participants was 10; 67% female and 33% male. See Figure 2.



There were 20 total Caucasian project participants, 6 Native Americans, 3 biracial, and 1 Hispanic. Percentages of each race for total project participants are as follows: 67% Caucasian, 20% Native American, 10% biracial, and 0.3% Hispanic. See Figure 3.



The major insurance coverage for project participants were Medicare and private, followed by Medicaid and self-pay. There were 13 participants covered by Medicare, 11 by private insurance, 3 by Medicaid, and 3 were self-pay. Percentages of each insurance provider are as follows: 43% Medicare, 36% private, 0.1% Medicaid, and 0.1% self-pay. See Figure 4.



Results

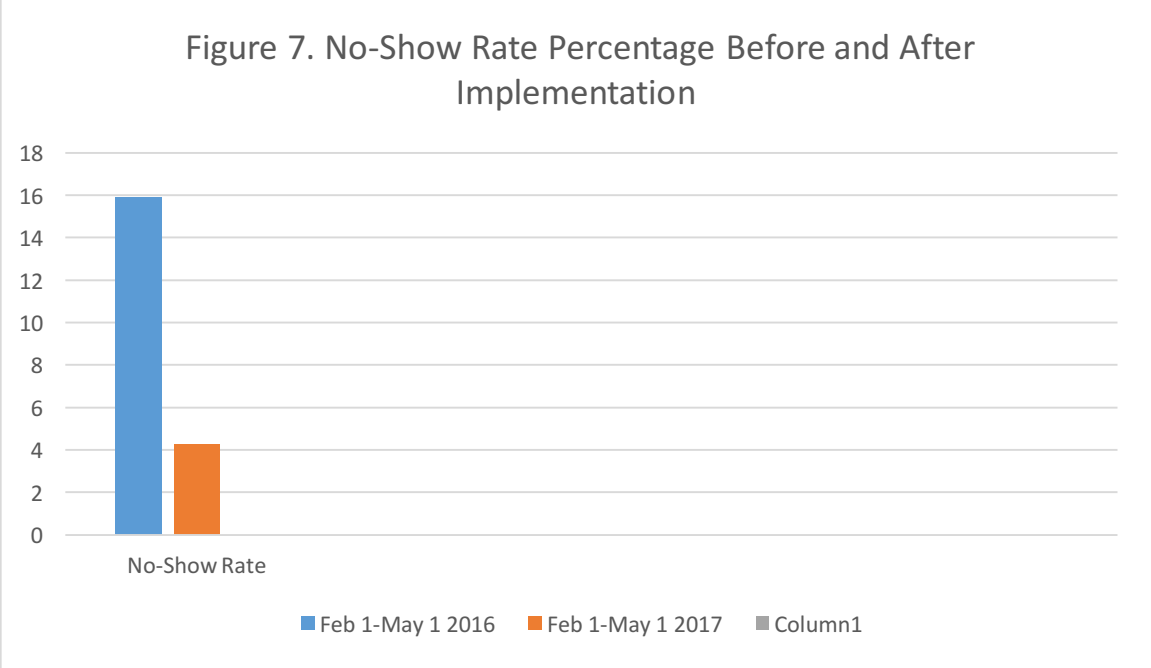
What barriers were identified and how were these overcome.

A barrier to the commencement of this project was the project site's current electronic medical record (EMR) did not have SMS capability; the project director needed to utilize an adjunct automated SMS appointment reminder program. The initial automated SMS appointment reminder program that the project director wanted to use did not work as first thought. The project director attempted to contact the website for assistance but did not receive a response so an alternative program had to be found. There were numerous programs available online and the project director found a program that was affordable and user-friendly, Call-Em-All.com.

An additional barrier was finding a project assistant. This barrier was overcome when the project site hired a clinic secretary who managed the day-to-day operations. This employee was asked to be the project assistant due to the convenience of already

working in the clinic and being able to recruit project participants and input the information into the SMS automated reminder program.

Statistical significance At the project site, 24 out of 151 appointments were no-shows from February 1-May 1, 2016. During project implementation, 8 out of 178 appointments were no-shows from February 1-May 1, 2017. This calculates to a decrease in the no-show rate from 15.9% to 4.5% during the project implementation period in 2017 compared to the same period in 2016. Fischer's exact test rejected the null hypothesis of no difference between these two no-show rates (two-side p-value of 0.0025). This statistical calculation was verified by a biostatistician from the project director's university. This decrease is statistically significant and indicates the intervention effectively reduced the no-show rate. See Figure 5.



The patient opinion survey had a response rate of 30 participants, 100% of the project sample. Each question (see Table 2) had 100% response of YES. Two additional comments were made, “Don’t have a cellphone, but would like this if I had one” and “Text message really helps me”.

Table 2. Patient Opinion Survey Results

Questions	Yes	No
1. Did you like the text message appointment reminder?	100%	0%
2. Did it help you remember your appointment date and time?	100%	0%
3. After this research project, would you like to receive a text message reminder for future appointments?	100%	0%

Clinical significance The statistically significant decrease in the no-show rate reinforces the evidence that SMS appointment reminders are effective at improving appointment attendance. All the project participants like the SMS appointment reminder and want to receive it again in the future. Health-related outcomes were not measures, such as decreased hemoglobin A1c and improved hypertension control, but these findings are still clinically significant. Patients attended their appointments so adequate care could be provided which increases the likelihood that acute and chronic medical conditions are effectively managed.

Chapter 5: Conclusions

Discussion of Outcomes

The overall outcome of this project was a decrease in the no-show rate which was the intended result. The participant opinion survey provided positive qualitative data that supports the continuation of the SMS appointment reminder at this project site. Every project participant responded to the survey and every answer was in support of the SMS appointment reminder. This data alone provides evidence that SMS appointment reminders are a high-quality option for healthcare organizations.

Limitations

This project had several limitations. First, the SMS appointment reminder was not the only factor in this positive outcome. The project site's CNP, the sole provider and owner of the clinic, began to discuss charging patients the full price of the visit if they did not attend the scheduled appointment. This was discussed with the project assistant and patients during the project implementation period, beginning April 24, 2017. This financial burden could be a large deterrent to not attending appointments for many patients. The project site patients were not notified of this policy change via a letter from the CNP until May 28, 2017. Although patients were not charged during the implementation period, the discussion of this practice change could have influenced project participant's decision to attend their scheduled appointments or not.

Also, there are numerous factors that affect a patient's decision to attend his or her appointment that are variable and unpredictable, such as the weather or personal emergencies. The same three-month time for two consecutive years was chosen to limit certain variables, such as the weather, for this reason. As this project was a not a

randomized controlled trial but a quality improvement project using convenience sampling, the variables and factors were not controlled and unforeseen, many not known to the project director. Therefore, the conclusion cannot be made that the SMS appointment reminder was the only reason the no-show rate decreased, but it can be deducted that it had a positive influence.

Second, a non-randomized convenience sample in a small Midwestern clinic. The sample size was greater than anticipated but small due to the limited number of patients the project site provides care to compared to larger healthcare organizations. Second, the demographics in the sample were representative of the surrounding community's population but may not be generalizable to the national population. Third, the survey questions were verbally asked by the project assistant over the phone which may have influenced the participant's response. Fourth, several reasons were given by project participants to not be included in this project. These included: do not own cellular phone, prefers a telephone call, and writes appointment in planner.

Clinical Implications

The CNP has verbalized that the SMS appointment reminder will be continued after this project is complete (P. Wright, personal communication, May 4, 2017). The project director purchased an additional 100 SMS appointment reminders for $9.00 after the first 25 were used, which were free of charge, that the project site will use after the project implementation is complete.

Impact on:

Organization A long-term impact of this project could be increased attendance rates which would increase revenue for the project site and result in higher quality, cost-

effective care. Every project participant liked the SMS appointment reminder which is evidence to the organization to continue this method and continue to assist patients in getting to their appointments resulting in improved care for them and job assurance for the clinic employees.

The implementation of the SMS appointment reminder minimally impacted the project assistant's workflow at the project site. "It took very little time to enter the patient's information into the program to send the text message reminder; way less time than calling a patient," (P. Wright, personal communication, May 4, 2017).

Finances The total number of no-shows for the 2016 comparison period was 24, depending on the insurance coverage this was a loss of $1,920-$2,880, not including additional labs and diagnostics, for the project site. This loss is significant for a small, independent clinic such as the project site. The no-shows decreased to only eight for the 2017 project implementation period. This is a loss of $640-$960, depending on patient insurance coverage. This is a cost savings of $1,280-$1,920. The SMS appointment reminder cost $0.09 each. With 43 total SMS appointment reminders sent, total cost of $3.87, the SMS appointment reminder is a cost-effective appointment reminder method for this project site.

Policy decisions This project has influenced the project site to implement appointment reminders for patients due to the positive results. The project director will disseminate the results at a local research conference which may also influence other healthcare organizations to consider changing their appointment reminder method.

Quality of health care This project site serves a variety of patients with differing healthcare needs. Many of these patients are seen multiple times a month for chronic

health issues. The project site CNP stated to the project assistant regarding a long-term patient of the project site who had multiple no-shows in the past, “This patient received the SMS appointment reminder and I know that’s a big reason why she made it here today”. This project positively impacted the clinic in assisting its wide variety of patients to remember their scheduled appointments.

The project assistant stated, “I feel like people cancelled or rescheduled more because of the text message reminder” (P. Wright, personal communication, May 4, 2017). The cancellations for the 2016 comparison period was nine while during the 2017 implementation period there were 15. The project director was unable to find data that corroborated the statement that the SMS appointment reminder was the reason the patient cancelled or rescheduled. The data did show that every project participant who received an SMS appointment reminder did attend his or her scheduled appointment.

Rural or underserved populations As discussed in Chapter 3, at times when cellular phone calls cannot go through a text message can, which is important for rural populations (Federal Communications Commission, 2015). One project participant stated, “I do not live in town, and my phone was not working right; I could only receive text messages, so I am glad I got the text to remind me” (P Wright, personal communication May 4, 2017).

New Evidence Generated for Practice

This project filled the gap of limited number of primary care practices trialing SMS appointment reminders. Although there were additional factors that affected the no-show rate, this project’s results were consistent with the current evidence for SMS appointment reminders being a cost-effective option for healthcare organizations.

Recommendations for Future Projects

The recommendation is to trial SMS appointment reminders in other primary practice clinics. This would allow a larger sample pool which would result in increased number of project participants and more data to yield high quality results.

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Appendix A: SDSU IRB Approval Form

Office of Research Assurance
and Sponsored Programs

Box 2201, SAD 200
SDSU
Brookings, SD 57007-1998
Phone: 605-688-6696
FAX: 605-688-5530

Dianne.Nagy@sdstate.edu

To: Kathryn Wermers, College of Nursing

Date: December 15, 2016

Project Title: Short Message Service (SMS) Appointment Reminder DNP Project

Approval #: IRB-1612008-EXP

The Human Subjects Committee approved your project using expedited procedures as described in 45 CFR 46.110. The activity was deemed to pose no greater than minimal risk, and the following expedited categories from 63 FR 60364-60367 were found to be applicable:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

One-year approval of your project will be dated starting 12/15/16. If you require additional time to complete your project, please submit a request for extension before 12/14/17. Protocol changes must be approved by the Committee prior to implementation. Forms may be found on the Human Subjects web page. If there are any unanticipated problems involving risks to subjects or others, please contact the SDSU Research Compliance Coordinator. At the end of the project please inform the committee that your project is complete.

If I can be of any further assistance, don't hesitate to let me know.

Sincerely,

Dianne Nagy
Acting IRB Coordinator

Appendix B: Facility Approval Letter

DNP Project Site Agreement

Date: November 1, 2016

This letter is in support of Katie Wermers' DNP Project Short Message Service (SMS) Appointment Reminder project at Kirby Healthcare, P.C. This project will help reduce appointment no-shows by reminding patients about their appointment time and date.

We look forward to the results of the project.

Paulette Kirby, CNP

Appendix C: Stakeholder Agreement

DNP Project Stakeholder Agreement

I agree to serve as the DNP Project Stakeholder to the DNP student named in this agreement.

Name of Stakeholder:

Signature of Stakeholder:

Name of DNP student:

Katie Wermers

Signature of DNP student:

Date:

Appendix D: Evidence Table

Citation	Level of Evidence	Sample/Setting	Participants (n)	Study Design/ Purpose	Intervention	Results	Comments; strengths and limitations
Bigna, Kouanfack, Noubiap, Plottel, & Koulla-Shiro, 2013	IB	Convenience sampling from pediatric HIV clinic in Cameroon, Africa	242 adult-child pairs	2x2 factorial, multicenter randomized controlled trial, single-blind	SMS appointment reminder, telephone appointment reminder, combo of both	SMS: p=0.012 Telephone: p=0.0002 SMS+Telephone = p<0.0001 -SMS most efficient in direct costs & staff time	Due to geographic location, SMS not always delivered Strengths: study design, discussion of cost, adequate sample size Limitations: pediatric population, geographic location, may be hard to generalize results
Boksmati, Butler-Henderson, Anderson, Sahama, 2016	IA	28 studies including 13 RCTs	>74,270 particpants	Systematic review with meta-analysis investigating SMS appointment reminder effectiveness	SMS appointment reminder sent at various times before scheduled appointment	Pooled odds ratio of RCTs was 1.62 (1.35-1.94). SMS appointment remidners are effective and this has	Meta-analysis with large number of RCTs. Also compared demographics of study participants. Limitations: did not contact study authors directly to

						improved over the last 5 years	clarify missing data
Chen, 2015	IVB	Two cochrane systematic reviews	11,269 participants	JoAnna Briggs Best practice recommendation	SMS and telephone appointment reminders	Use of SMS appointment reminders should be incorporated into clinical practice (Grade A)	JoAnna Briggs Institute is highly regarded Strengths: brief and to the point Limitations: did not discuss any methods of review
Chen, Fang, Chen, & Dai, 2008	IA	Convenience sampling from health promotion center in China	1,859 participants	Randomized controlled trial; comparing telephone appointment reminders vs SMS appointment reminders vs no reminders	Telephone or SMS appointment reminder 72 hours prior to appointment, or no reminder at all	Telephone reminder attendance rate=88.3%, SMS attendance rate=87.4%, no reminder attendance rate=80.5% No statistical difference between telephone and SMS reminder groups=as equally effective and SMS more cost-effective	Discussed cost analysis, great study but >5 years old Strengths: study design, adequate randomization with appropriate sample size, extensive literature review, tables and charts appropriately used Limitations: did not evaluate patient preference, outdated telephone

							numbers were an issue
Cincinnati Children's Hospital Medical Center, 2012	IVB	Cincinatti Children's Hospital	NA	Best Evidence Statement	SMS appointment reminder	Recommends using SMS appointment reminders	Scored 66% on Agree II Strengths: clearly explains scope & purpose, recommendations are easily identified Limitations: target population opinion not sought, did not describe facilitators or barriers to application
da Costa, Salomao, Martha, Pisa, & Sigulem, 2010	IIIA	Convenience sampling from four outpatient general medicine clinics in Brazil	7,890 participants	Quasi experimental , retrospective case-control study to compare nonattendance rates of patients who received SMS reminder and those who did not	SMS appointment reminder was sent to patients 24 hours before appointment	Mean nonattendance rate decreased from 25.57% to 19.42% in the four clinics	Strengths: discussed cost-effectiveness, strong literature review, large sample size, addressed ethical limitations Limitations: Study design, did not address patient opinion

Gurol-Urganci, de Jongh,Vodopivec-Jamsek, Atun, & Car, 2013	IA	Eight RCTs	6,615 patients	Cochrane review meta-analysis to investigate effectiveness of SMS and telephone reminders	SMS and telephone appointment reminders before scheduled appointments	SMS reminders: moderate quality, 78.6% attendance rate Telephone reminders: moderate quality, 80.3% attendance rate Costs: 55%-65% lower for SMS than telephone	Cochrane reviews are considered gold standard for evidence-based practice review Strengths: Cochrane review, study design, large study population Limitations: only eight studies
Guy et al., 2012	IIB	10 controlled observational studies and eight RCTs	22,658 participants	Systematic review with meta-analysis investigating SMS appointment reminder effectiveness	SMS appointment reminder 24-72 hours prior to scheduled appointment	Summary effect of SMS reminder: 1.48 (95% CI: 1.23-1.72) (meta-analysis of RCTs only); increased attendance by 50%	Strengths: strong discussion of literature review, meta-analysis Limitations: searched gray literature but may not have found all possible studies
Hasvold & Wootton, 2011	IIIB	33 papers, 9 RCTs and 24 non-RCTs	>100,000 participants	Narrative systematic review, no meta-analysis;	Telephone appointment reminders,	Pooled estimates: manual reminders	This review did not differentiate SMS automated reminders versus

				comparing different appointment reminder methods	manual or automated	decreased DNA rate by 39% and automated reminders decreased it by 29%	automated telephone reminders when comparing to manual reminders so difficult to assess true SMS effectiveness Strengths: strong discussion of literature and search methods, appropriate use of charts, described method of appraising evidence Limitations: only searched one database, in studies that compared telephone versus SMS they treated it as two independent studies, may have

							been interdependence
Leong et al., 2006	IB	Five private and two public health primary clinics in Malaysia	933 participants	Multicentre three-arm randomized controlled trial	Two intervention arms: SMS reminder and telephone reminder sent 24-48 hours prior to appointment Control group: no reminder	Attendance rate: Control-48.1% SMS-59% Telephone-59.6% Cost analysis: SMS cost less than half of telephone reminder	Strengths: study design, cost analysis, adequate sample size Limitations: likely underestimated effectiveness of SMS, economic evaluations may be different in other countries
Lin & Wu, 2014	IB	21 RCTs	12,783 participants	Systematic review with meta-analysis investigating impact of SMS and telephone reminders on appointment attendance rate	10 RCTs looking at SMS reminders and 5 RCTs looking at telephone reminders, and 3 looking at both	-Telephone reminders more effective with pooled OR 2.09 (95% CI [1.85,2.36], $p<0.01$) but had more bias risk -SMS reminders pooled OR 1.76 (95% CI [1.37,2.26], $p<0.01$)	Strengths: study design, all RCTs Limitations: selection bias exists, results may not be applicable worldwide

O'Connor, Bond, Regan, & Phelan, 2009	IIIC	Convenience sampling from rheumatology clinic in Ireland	166 patients	Cross-sectional study investigating preference of appointment reminders	Self-administered anonymous questionnaire	SMS preferred reminder (47%, $p<0.0005$), telephone call (26%), postal letter (25%) Mean age preferring SMS 46.11 years	Strength: strong discussion of methods and statistical analysis Limitations: study design, small sample size, limited population
Perron et al., 2013	IB	Convenience sampling from primary care clinic at a teaching hospital in Switzerland	6,450 participants	Randomized controlled non-inferiority trial to compare telephone versus SMS appointment reminders	Text message (SMS) or telephone reminder 24 hours before appointment	SMS reminder as effective as telephone reminder and more cost-effective	Good study but a lot of limitations that make it not very easy to generalize the results Strength: study design, sample size, included cost comparison of interventions Limitations: only sent SMS in French while phone call was in 4 languages, results may not be generalizable but consistent with

							other studies, did not collect info about how many people actually received SMS, satisfaction survey had limits
Taylor, Bottrell, Lawler, & Benjamin, 2012	IB	Convenience sampling from two outpatient physical therapy clinics in Australia	679 participants	Single-blind randomized controlled trial to compare effectiveness of SMS appointment reminders to no reminder	Text message (SMS) reminder before appointment	SMS group: 11% non attendance rate, control group: 16% nonattendance rate	Strength: study design, statistical analysis method Limitations: not target sample size, did not keep data for ineligible pts
Youssef et al., 2014	IB	Convenience sampling from three outpatient clinics (general medicine, OB/GYN, neurology) at King Fahad teaching hospital in Saudi Arabia	2,184 participants	A double –blind randomized controlled trial to compare effectiveness of SMS appointment reminders to no reminder	Text message (SMS) reminder before appointment	General medicine: control group nonattendance rate 39.8%, intervention group 26.3%, p>0.001 Neurology clinic: control group 43.9%, intervention	Strengths: study design, adequate sample size, statistical analysis methods Limitations: conducted in free clinics, sociodemographic information not available, unaware of how many people could not

						group 29.3%, p=0.02 OG/GYN: control group 29.7%, intervention group 26.6%, p=0.36 *Overall high pt satisfaction and 100% of people said to keep the service	read SMS, did not include non-Arabic patients (represented <10% of clinic population though), length of study only 3 months

Appendix E: SMS Message

Good Morning! You have an appointment with
(provider's name) on (date) at (time) at (location).
Please call (phone number) to cancel or reschedule
if you are unable to attend. Thank you!

Appendix F: Participant Opinion Survey

This is a survey about the text message appointment reminder you received. Please circle YES or NO.

1. Did you like the text message appointment reminder? YES or NO
2. Did it help you remember your appointment date and time? YES or NO
3. After this research project, would you like to receive a text message reminder for future appointments? YES or NO

Additional comments: