

Southern California CSU DNP Consortium

California State University, Fullerton  
California State University, Long Beach  
California State University, Los Angeles

IMPACT OF A SEVEN-DAY REMINDER ON APPOINTMENT  
NON-ATTENDANCE

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By

Vi H. Nguyen

Doctoral Project Committee Approval:

Beth Keely, PhD, RN, Project Chair  
Joy Goebel, PhD, RN, FPCN, Committee Member  
Margaret Brady, PhD, RN, CPNP, Committee Member

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## ABSTRACT

Appointment non-attendance, a patient's failure to show up for an appointment or failure to cancel 24 hours in advance, has a negative impact on medical office revenue. Late cancellations also make it difficult to fill in vacant time slot. The aim of this project was to reduce non-attendance rate, using a seven-day automated appointment reminder system at an endocrine clinic in southern California. The Plan-Do-Study-Act model provided the framework used to examine the change in the non-attendance rate over a two distinct timeframes. A pre-post evaluation design was used: pre-intervention, data gathered from the two-day reminder system, and post-intervention data gathered from the seven-day reminder system.

Overall, the post-intervention resulted in a 2.3% reduction in non-attendance, a 0.6% increase in appointment attendance, and a 1.2% reduction of scheduled patients who chronically missed three to five scheduled appointments. The same result did not occur among the Vietnamese-speaking patients. Improvements in appointment attendance resulted in an estimated gain of six to nine thousand dollars in revenue. Post-intervention data suggested language used for the automated reminder might be an important factor to consider. Three recommendations were proposed: 1) review McLean et al. (2016) strategies to optimize a reminder system, 2) flag individuals who chronically miss appointments, and 3) select an automated appointment-reminder system that includes the Vietnamese language.

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## BACKGROUND

Missed appointments with health care providers are costly in terms of both health outcomes and finances. Non-attendance at scheduled medical appointments has a significant impact upon health outcomes and may result in the misuse of administrative and medical resources (Karter et al., 2004; Kheirkhah, Feng, Travis, Tavakoli-Tabasi, & Sharafkhaneh, 2016). Non-attendance is defined as a patient's failure to show up for an appointment or failure to notify a healthcare provider within 24 hours about the need to cancel an appointment. Late cancellations make it difficult for the office to schedule other appointments in that time slot. Many factors are associated with non-attendance, such as demographic factors, prior appointment keeping behavior, forgetting, misunderstandings and mistakes, lead-time effects, and appointment day(s) (e.g., Monday, Friday) (Ellis & Jenkins, 2012; Miller, Chae, Peterson, & Ko, 2015; Neal, Hussain-Gambles, Allgar, Lawlor, & Dempsey, 2005; Norris et al., 2014; Shimotsu et al., 2016). Lead-time is defined as the call-appointment interval or the time from when the appointment is made to the date of the appointment (Norris et al., 2014). The shorter the wait for the appointment, the more likely the patient is to keep the appointment. Appointment-day attendance refers to the rate of appointment attendance differences during specific days of the week. It is imperative to identify the reasons for non-attendance at a particular medical practice in order to plan and implement an effective intervention to address this problem.

In a study that examined the predictors of missed appointments, Norris et al. (2014) found there were four factors that had the greatest association with attendance. Those factors were lead-time, financial payer, patient age, and patient's prior attendance

history. Lead-time was the variable that most affected patient attendance. In addition, Norris et al. (2014) noted that patients who were self-pay, uninsured, or Medicaid beneficiaries had a higher no-show rate compared to patients who had Medicare or private insurances. These researchers also found a relationship with age and the numbers of missed appointments. The older the patient, the more likely the patient was to keep the appointment; however, above the age of 75, cancellation rates increased. It is possible that patients in the over 75 age group depend on others for transportation or need to seek immediate care rather than wait for scheduled appointments (Norris et al., 2014).

Miller et al. (2015) reported findings similar to those of Norris et al. (2014). Their research team compared a control group of individuals who kept appointment with a no-show group. They found the no-show group had a lower mean age and represented a higher percentage of Medicaid payers. Neal et al. (2015) found that misunderstandings/mistakes and forgetting were the two most common of the five categories (misunderstandings/mistakes, illness/personal circumstances, forgetting, other commitments, and others) that patients reported for missed appointments. In addition, Ellis and Jenkins (2012) found that specific days of the week for appointments affected attendance rate. Attendance increased towards the end of the week, i.e., Fridays had the highest attendance rate, whereas, Mondays had the highest number of no-shows.

In intervention studies to decrease non-attendance rates, researchers demonstrated that an appointment reminder was effective in improving appointment attendance (Callinan et al., 2015; Liew et al., 2009; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2013; Taylor, Bottrell, Lawler, & Benjamin, 2012). Specific technological advances, such as automated appointment reminder systems, for example, text-message

reminders, had significantly reduced the missed appointment rate in a number of studies (Boksmati, Butler-Henderson, Anderson, and Sahama, 2016; Perron et al, 2013). There is some debate, however, whether automated-reminder systems or office staff should deliver the patient-reminders. Parikh and colleagues (2010) documented that clinic staff reminders were more effective in lowering the no-show rate compared with an automated appointment reminder system (Parikh et al., 2010). In contrast, a more recent, randomized controlled trial (RCT) conducted by Perron and colleagues (2013) concluded that text-message reminders were as effective as live person telephone reminders and were more cost-effective as well. In a systematic review of strategies to decrease missed appointments, McLean et al. (2016) found that all types of appointment-reminder systems, including text messages, phone calls, and email/mail reminders, were effective in improving appointment attendance in a variety of health care settings and patient populations.

Other researchers studied whether timing of reminders would have an effect on non-attendance rates (Hashim, Franks, & Fiscella, 2001; Hasvold & Wootton, 2011; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2010). Hasvold and Wootton (2011) and McLean et al. (2016) conducted systematic reviews and concluded there was no difference in patient attendance behavior with one and seven-day appointment reminders. However, data showed that sending reminders early allowed patients to rearrange their commitments, which may increase the chances of a patient attending, cancelling or rescheduling their appointments (Hashim, Franks, & Fiscella, 2001; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2010). Overall, all appointment reminder systems were effective; if forgetfulness was the primary reason that patients

missed appointments (McLean et al., 2016; Neal et al., 2015). There are other reasons that patients miss appointments, and it is important to assess and then intervene accordingly.

### **Problem Statement**

Missed appointments had been identified as an on-going problem in a private endocrine practice in Orange County, California. Although the practice used two types of reminder systems (i.e., a two-day automated appointment reminder and a one-day live person telephone reminder to those patients who did not confirm their appointment via the automated reminder), the practice still experienced an approximate 25% no-show rate. The author verified this percentage by examining eight days of appointments during the month of June 2016 and compared the number of patients expected to the actual number of patients seen. In order to improve patient care and clinic efficiency, as well as to reduce unnecessary clinic costs, identifying factors associated with missed appointments and developing appropriate intervention strategies for this practice population were needed.

### **Community Context**

The private endocrine practice for this project had two healthcare providers, an endocrinologist and a nurse practitioner, to manage adult patients with endocrine diseases, such as diabetes mellitus and disorders of thyroid, pituitary, gonad, and adrenal glands. At the time of the project, the practice had over 2000 active patients and provided patient care in three different locations, Garden Grove, Anaheim Hills, and Laguna Hills. Active patients were defined as those who had returned to the practice for care in the time interval from January 1, 2015 until January 31, 2017. The patient population of the

practice was comprised of various ethnic groups: 51% Caucasian, 24% Hispanic, 17% Vietnamese, and 8% other Asian. Among this group, 55% had commercial health insurances (HMO/PPO), 30% had Medicaid, 11% had Medicare, and 4% were self-pay/cash patients. All these demographic factors may have an impact on appointment attendance.

### **Purpose Statement**

According to the literature review, many factors were associated with missed appointments. The purpose of this Doctor of Nursing Practice (DNP) project was to implement a seven-day automated appointment-reminder system and evaluate this new reminder system for improvements in appointment attendance at an endocrine practice in Orange County, California. Due to time constraints and ease of implementation, the author chose to focus on the timing of the appointment reminder as a target to potentially improve appointment attendance.

### **Theoretical Framework**

A theoretical framework provides a guide to develop a project or a study (Polit & Beck, 2012). In this project, the Model for Improvement (MI) was used as the theoretical framework. This model was applied to this quality improvement (QI) project to reduce the number of missed appointments in an endocrine practice in Orange County. The Associates in Process Improvement (API) organization developed this model to serve as a framework for learning and improvement (API, 2016). The model combines two components: three fundamental questions and the Plan-Do-Study-Act (PDSA) cycle (AHRQ, 2016; API, 2016; IHI, 2016).

The three-question component focuses on a needed improvement. These questions

are: 1) What is the aim of the project? 2) How can we measure the outcomes of the change? and 3) What changes are necessary to improve the problem? (IHI, 2016). The PDSA cycle is the second component of the model, which was developed by W. E. Deming (2000) for learning, testing, and implementing a change in a real working environment (API, 2016; Deming, 2000; IHI, 2016). The cycle included the following four constructs (see Figure 1): 1) Plan – Develop a plan to test the change, 2) Do – Carry out the plan, document and collect relevant data, 3) Study – Analyze/compare the data before and after the change and summarize/reflect what was learned, and 4) Act – Act on the information that was learned and prepare the next plan. According to Donnelly and Kirk (2015), the PDSA is an effective and explicit framework for managing a change. It is an often-used model to improve the quality of healthcare in term of safety, efficiency, and patient-centered care (Donnelly & Kirk, 2015).

The two organizations, the Agency for Healthcare Research and Quality (AHRQ) and the Institute of Health Improvement (IHI), support the use of the PDSA cycle for quality improvement projects (AHRQ, 2016; IHI, 2016). The AHRQ is an agency that works within the U.S. Department of Health and Human Services (HHS) and concentrates on producing evidence to ensure the safety, quality, accessibility, equality, and affordability of healthcare (AHRQ, 2016). The IHI is an agency dedicated to improving healthcare (IHI, 2016). According to the IHI, the PDSA cycle is an efficient method for testing a change. The information to be collected, from testing a change on a small scale, learning from each test, and refining the change through several PDSA cycles, may lead to implementing a change to a broader scale (IHI, 2016). Donnelly and Kirk (2015) suggested that small changes from the repeated use of the PDSA cycle would

lead to cumulative and sustained improvements. Thus, the PDSA model was appropriate for this project to reduce missed appointments in an endocrine practice in Orange County.

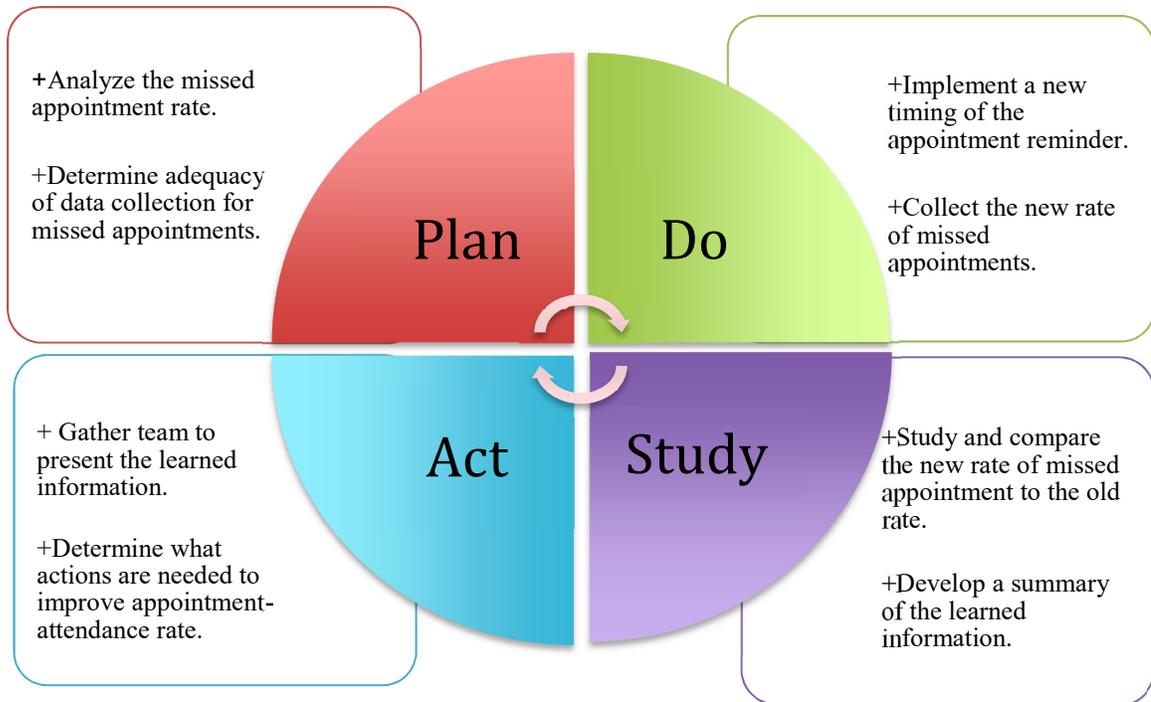
### **Application of PDSA Model**

**P- Plan.** The plan is to assess the impact of a revised reminder system on appointment attendance for an endocrine practice in Orange County. In order to develop a changed reminder system, the team outlined a plan to address the current attendance issues facing the practice. The plan included the following steps: 1) involve key players in the process of development of the changes, 2) determine the incidence of missed appointments over a three-month period using the existing reminder system, and 3) recommend changes to the current reminder system based on evidence about the appointment-reminder system in the literature and the current reminder system of the practice.

**D- Do.** The second phase of the PDSA cycle is *Do*. In this phase, a new method of appointment reminders was implemented and evaluated by collecting the rate of missed appointments post implementation.

**S- Study.** In this phase, the collected rate of missed appointments following an implementation of the modified reminder system was studied and compared to the previous missed appointment rate. A summary of the data was generated to proceed the next phase.

**A- Act.** The last phase of the cycle is *Act*. The clinic team involved in the change cycle determined what, if any, changes were still required, and if needed, to prepare for the next phase of change.



*Figure 1.* The Plan-Do-Study-Act (PDSA) model for this QI appointment attendance project. Adapted from “The Plan, Do, Study, Act cycle,” by W.E. Deming, 2000, *The New Economics for Industry, Government, and Education*. Cambridge, MA: The MIT Press.

## **REVIEW OF LITERATURE**

Non-attendance has a substantial impact on the health of patients and the efficiency and revenue for a medical practice. Many studies have been conducted to understand the reasons for this problem, as well as to propose various methods to mitigate the rate of missed appointments. For the purpose of this project, a comprehensive review of the literature was conducted and included three subtopics focusing on the health and financial impacts from missed appointments, reasons for missed appointments, and effective interventions demonstrated to reduce the number of missed appointments. The three subtopics are presented in this section.

To gather evidence for the review of the literature for the three subtopics, PubMed, CINAHL, and EBSCO were searched using key terms, such as missed appointments, non-attendance, patient appointments, appointment-reminders, outcomes of missed appointments, automated reminder system, short-message-services (SMS), telephone reminders, and efficacy of appointment reminders. The articles included in this literature review had publication dates from 1981 to 2016 and were limited to English only. Because the endocrine practice was located in an outpatient clinic and only managed adult patients, publications excluded from the search were those studies related to children, patients seen for psychiatric or mental health problems, and missed appointments related to inpatient settings.

### **Health and Financial Impacts**

In general, missed appointments affect patient health and reduce clinic revenue (Karter et al., 2004; Kheirkhah et al., 2016; Weinger, McMurrich, Yi, Lin, & Rodriguez, 2005). Karter et al. (2004) followed 84,040 Kaiser Permanente patients with a diagnosis

of diabetes during a one-year study period. The patient sample was divided into three different groups: those who did not miss appointments, those who missed 1% to 30% of their appointments, and a third group of patients who missed more than 30% of their appointments. The latter group, compared to the other two groups, was found to have poorer glycemic control, less frequent self-monitoring of blood glucose, and poorer diabetes oral medication refill adherence. Guay et al. (2014) and Nwabuo, Dy, Weeks and Young (2014) also concluded that missing medical appointments had negatively affected patients' health. Interventions, such as appointment reminders, were studied with findings that demonstrated they could positively improve patients' clinical and behavioral outcomes (Nutti et al., 2015).

Financial loss is another effect of missed appointments (Kheirhah et al., 2016; Weinger et al., 2005). Weinger et al. (2005) prospectively followed 134 diabetes patients for one year and reported 118 no-shows for the appointments that were scheduled with physicians or nurse practitioners (MD/NP) and health educators. They calculated a loss of \$ 7,040 from the 64 missed appointments with the MD/NP and \$4,050 from the 54 missed appointments with the health-educators. In the Kheirhah et al. (2016) retrospective study, the researchers found an estimate of 14.58 million dollars in expenditures for marginal costs associated with patient non-attendance among ten Veterans Affairs (VA) clinics in Texas; the average cost of each no-show per patient was \$196. Consequently, failure to attend medical appointments can be detrimental for patients and have a financial impact on a healthcare facility. Hence, it is imperative to identify the reasons for missed appointments to effectively reduce attendance-failure rate.

## **Reasons for Missed Appointments**

Many factors contribute to non-attendance, such as demographic factors, prior appointment keeping behavior, forgetting, misunderstandings and mistakes, lead-time effects, appointment day(s) (e.g., Monday, Friday), and suboptimal appointment reminder systems (Ellis & Jenkins, 2012; Miller et al., 2015; Neal et al., 2005; Norris et al., 2014; Shimotsu et al., 2016). The following subsections focus on studies that assessed reasons for missed appointments.

### **Demographics**

Age, primary insurance, and ethnicity are some of the demographic factors that are associated with missed appointments (George & Rubin, 2003; Kheirhah et al., 2016; Miller et al., 2015; Norris et al., 2014). George and Rubin (2003) conducted a systematic review and reported that the non-attendance rate was higher in younger compared to older patients. Similarly, in a one-year retrospective chart review, Miller et al. (2015) reported patients who missed three or more clinic appointments had a lower mean age than those patients who showed up for their appointments. It is possible that younger patients had more challenges in re-arranging their daily commitments, such as work and family duties, compared to the elderly and retired patients. In addition, Kheirhah et al. (2016) reported the no-show rate was lower for seniors (age 65 or higher) than younger patients receiving care at ten Veteran Administration (VA) clinics in Houston. Likewise, Norris et al. (2014) examined 88,345 patients from nine outpatient facilities and reported a decrease in no-shows as patient age increased; however, above the age of 75, cancellation rates increased. These researchers postulated that transportation might be an issue for those over 75 who may have to depend on others for transportation or need to

seek immediate care rather than wait for scheduled appointments.

In addition, form of payment significantly affected attendance rate (Miller et al., 2015; Norris et al., 2014). Norris et al. (2014) reported that the data from 88,345 patients indicated that Medicaid and self-pay/cash patients had a higher no-show and cancellation rate compared to the privately insured and Medicare beneficiaries. A similar result was found in the Miller et al. (2015) study. The no-show group had a higher percentage of Medicaid beneficiaries than the control group (45.2% versus 31.8%). It is possible that self-pay patients had insufficient funds at the time of the appointments. Thus, they decided to cancel or not to keep their appointments. As for the Medicaid patients, whose socioeconomic status typically is low and qualifies them for government-sponsored health insurance, they may not own a car or feel safe to take public transportation to their appointments.

Ethnicity is another factor that has been associated with missed appointments (Miller et al., 2015; Shimotsu et al., 2016). In the Miller et al. (2015) study, it was reported that there were more African Americans in the no-show group compared to those African Americans who attended their appointments (73.1% versus 34.2%) with a *p*-value of 0.001. In a cross-sectional study of 161,350 patients, Shimotsu et al. (2016) compared White non-Hispanic patients to other ethnic groups and found that Hispanic/Latino, American Indian/Alaskan Native, and African American patients had a higher percentage of missed appointments. Some possible reasons for the ethnic differences found among patient groups who did not keep their appointments may have been due to limited English proficiency, difficulty navigating the scheduling systems, and attitudes and beliefs regarding their medical treatment plans (Nwabuo, Dy, Weeks, &

Young, 2014; Shimotsu et al., 2016). Therefore, it is important to assist patients in developing connections between their providers and office staff by providing appointment reminders in the patient's primary language. This may increase the probability of keeping their appointments.

### **Prior Appointment Keeping Behavior, Forgetting, and Misunderstandings/Mistakes**

Prior no-show behavior increases the likelihood of future missed appointments.

Norris et al. (2014) examined patients' prior attendance history and concluded that patient attendance history has a significant effect on attendance rate. Likewise, Dove and Schneider (1981) studied a sample of VA outpatients and concluded that paying attention to patient's previous appointment-keeping pattern can improve the efficiency of appointment scheduling. Thus, the clinic scheduling teams need to emphasize to patients who frequently miss appointments about the importance of notifying the office at least 24 hours in advance, if there is a need to cancel or reschedule an appointment.

In addition, Maxwell et al. (2001) conducted 530 phone interviews and documented that forgetting and misunderstandings/mistakes are among the ten most commonly reported reasons by patients for missed appointments. Similarly, in a postal questionnaire survey that was conducted by Neal et al. (2005), 44 of the 89 participants responded they forgot about their appointments, and 20 of the 36 participants stated that the reasons for their missed appointments was due to misunderstandings and mistakes of the providers and office staff and not by them. In addition, Pal, Taberner, Readman, and Jones (1998) conducted a survey of 2555 patients and found that forgetting was one of the reasons for missed appointments. Thus, it might be beneficial for medical offices to establish a clear scheduling protocol and to select a reminder system, which is suitable

for the needs of the population, to reduce missed appointments due to forgetting and misunderstandings/mistakes.

### **Lead-time Effects**

Lead-time, the call-appointment interval, was the most significant predictor associated with attendance rates (Bean & Talaga, 1995; Benjamin-Bauman, Reiss, & Bailey, 1984; Norris et al., 2014). Benjamin-Bauman et al. (1984) found that the attendance rate was 75% for those patients who only had to wait less than one week versus 57% for those who needed to wait three weeks for their appointments. In addition, Bean and Talaga (1995) examined 879 appointments and found that same-day appointments had a 24.1% no-show rate while waiting more than two weeks for an appointments had over a 50% no-show rate. Similarly, Norris et al. (2014) confirmed that among the reviewed appointments of all nine outpatient-facilities, there was a significant association between lead-time and patient attendance. In other words, the shorter the wait for an appointment, the more likely patients were to keep their appointment. Norris et al concluded that, perhaps, opening additional appointment slots or increasing the number of office staff would reduce appointment-waiting time for patients.

### **Day(s) of the Week Appointment Effects**

Norris et al. (2014) did not find a strong association between attendance rate and day(s) of week appointments. George and Rubin (2003) and Ellis and Jenkins (2012), however, determined that there is a strong association between the two. George and Rubin (2003) in a systematic review concluded that Monday appointments had higher failure-to-attend rates than Friday appointments. Similarly, Ellis and Jenkins (2012) examined appointment keeping using two databases: a large 4,538,294 appointment data

base from the national outpatient data of Scotland and a smaller 10,895 appointment database from a single practice in Scotland. These researchers noted that Monday appointments had the highest rate of appointment failures and Friday appointments had the lowest rate of no-shows. In addition, Kheirhah et al. (2016) examined no-show rates based on each of the five weekdays by sampling ten random weeks in one year. They found that the no-show rate was the highest on Mondays, lowest on Tuesdays, and that there was a steady increase of missed appointments from Wednesdays through Fridays. Perhaps, implementing an appropriate compressed appointment interval or overbooking strategy for Monday appointments would maintain the clinics' full booking capacity (Huang & Hanauer, 2014; La Ganga & Lawrence, 2016).

### **Suboptimal Appointment-reminder Systems**

In addition to the no-show reasons discussed above, McLean et al. (2016) identified six areas that may contribute to the ineffectiveness of appointment reminders. The six identified factors were: 1) the accuracy of patient records, 2) appointment reminders may not be received, 3) patient challenges of understanding the reminder messages, 4) timing of sending reminders, 5) patients did not make an effort to cancel or reschedule appointments even with a reminder, and 6) the lack of specific reminder systems tailored to high-risk population. Therefore, it is necessary for medical offices to identify effective interventions as well as to establish strategies to optimize their reminder systems to reduce missed appointments.

### **Effective Interventions to Reduce the Number of Missed Appointments**

Based on the studies that were reviewed by the author, all types of appointment-reminder systems were effective at improving appointment attendance. These

appointment-reminder systems included text messages, phone calls, and letters (Callinan et al., 2015; Liew et al., 2009; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2013; Taylor, Bottrell, Lawler, & Benjamin, 2012). The following sections focus on studies that evaluated the effectiveness of text messages, phone calls, automated and personal reminders, and letter reminder systems.

### **Text-message Reminders**

Short message service (SMS) reminder is an effective intervention that has reduced non-attendance (Boksmati, Butler-Henderson, Anderson, & Sahama, 2016; Gurol-Urganci, DeJongh, Vodopivec-Jamsek, Atun, & Car, 2013; Guy et al., 2012; Perron et al., 2013; Taylor, Bottrell, Lawler, & Benjamin, 2012). Boksmati et al. (2016) in a meta-analysis concluded that SMS reminder is an effective method to improve medical appointment attendance. A similar conclusion was found in a systematic review that was conducted by Guy et al. (2012); SMS reminders sent 24 to 72 hours before appointment time substantially increased appointment attendance. In a prospective single-blinded randomized controlled trial (RCT), Taylor et al. (2012) found that patients who received a SMS reminder, that was sent 48 hours prior to the appointment time, had a 5% higher attendance rate than the group that did not receive SMS reminders. In another RCT, Perron et al. (2013) documented that those SMS reminders, which were sent 24 hours before the appointments, were as effective as the personal telephone reminders and more cost-effective. Similarly, Gurol-Urganci et al. (2013) reported that SMS reminders, compared to no reminders and postal reminders, increase appointment attendance. They also concluded that SMS reminders had the same effect on attendance as personal phone reminders but were more cost-effective.

### **Phone Reminders**

Personal telephone reminders are another intervention that has successfully reduced non-attendance (Hashim et al., 2001; Liew et al., 2009). In a RTC study, Hashim et al. (2001) found that the group who received a telephone reminder 24 hours before appointment time had a 19% no-show rate and the group who did not receive a telephone reminder had a 26% no-show rate. In addition, they found the telephone group had a higher cancellation rate before the appointment than the group that did not (17% versus 9.9%); thus, more scheduling slots were available to schedule other patients. This was in contrast to studies conducted by Gurol-Urganci et al. (2013) and Perron et al. (2013), which concluded that SMS reminders have the same effect on attendance as personal phone reminders. Liew et al. (2009) found that the non-attendance rate was lowest for the telephone group (13.7%) compared to the rate in the text-message group (15.6%) and the group without any reminders (23%). Although slightly lower than the phone group, the increase in attendance of 7%, or nearly 3 more visits each day, in the text-message group over the no reminder group would have a positive revenue impact for a practice serving 32 to 40 patients a day.

### **Letter Reminders**

Sending a letter is another reminder system strategy. In the Kheirhah et al. (2016) study, the researchers retrospectively found that a letter reminder system reduced the no-show rate from 18.17% to 16.96% compared to no reminders. Other researchers also commented that letter reminders were effective in reducing missed appointments (Glynn et al., 2010; Henderson, 2008; Jacobson Vann & Szilagyi, 2005; Reda & Makhoul, 2001; Stubbs et al., 2012). However, this reminder system is not commonly used like the SMS

and telephone reminder systems; and recently email reminders instead of letter reminders have become a more popular type of appointment reminders.

### **Automated and Personal Reminder Systems**

Both automated appointment reminders (text-messages and automated voice recordings) and manual/personal phone reminders were associated with increased appointment attendance (Callinan et al., 2015; Hasvold & Wootton, 2011; Parikh et al., 2010). However, Parikh and colleagues (2010) reported a group that received a phone reminder from clinic staff had a lower rate of no shows (13.6%) compared to a group that received an automated reminder (17.3%). Similarly, Hasvold and Wootton (2011) documented that although both types of intervention achieved a reduction in non-attendance rate, the personal phone reminders were more effective than the automated reminders. Likewise, Callinan et al. (2015) found that the personal intervention group improved appointment scheduling (51%) over the automated intervention (36%) and usual care (32%). Thus, it might be worthwhile for a medical office, when necessary, to consider implementing a combination of these two types of reminders. For instance, all appointments should first be reminded by an automated reminder system, then, only those patients who did not confirm or cancel their appointments will be reminded for the second time via a phone call by a member of the office staff. In that case, the office would have appropriately considered and utilized a reminder method that is cost-effective and efficient. Furthermore, the telephone calls would help office staff to identify any last minute cancellation, and open those available slots to other patients.

### **Contents of a Reminder and Timing of Sending a Reminder**

In addition to the type of appointment reminders, appropriate reminder message-

contents, and timing of sending a reminder can improve the attendance rate (Hallsworth et al., 2015; Hashim et al., 2001; Hasvold & Wootton, 2011; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2010; Roberts, Meade, & Partridge, 2007). McLean et al. (2014) and McLean et al. (2016) conducted two separate systematic reviews and both reviews concluded “reminder plus” interventions might be more effective in improving attendance rate than “simple reminders.” The use of a “reminder plus” provides additional information, such as health information and cancellation fee, rather than just the date, time, and location, which are typically provided in the “simple reminders” (McLean et al., 2016). In addition, Hallsworth et al. (2015) stated that an implementation of a persuasive message to appointment reminders, in a one-year period, would reduce 5,800 missed appointments after an intervention of a newly worded-message reminder. Certain word choices for a reminder message might be successful for one group of patients more than another group; however, a reminder message that contains specific and relevant information would maximize its effectiveness. Thus, a medical office should examine the contents of its reminder message to ensure that all pertinent information is included.

The timing of sending an appointment reminder is another consideration for a medical office to study in order to reduce patients’ forgetting about their appointments. Lee and McCormick (2003) observed a reduction of a no-show rate from a 23% to a 5% after an intervention that involved a telephone reminder sent out seven days before the patient's’ appointments. Similarly, Roberts et al. (2007) reported that among patients who engaged in a telephone conversation within a week before their appointments, 86% of these patients kept their appointments, 9% re-scheduled their appointments, and only 5%

did not show up. Furthermore, Hasvold and Wootton (2011) and McLean et al. (2016) systematic reviews concluded there was no difference in patient attendance behavior between the one and seven-day appointment reminders. Data showed that sending reminders early allowed patients to re-arrange their commitments, which may increase the chance of a patient attending, cancelling or rescheduling their scheduled appointments (Hashim et al., 2001; McLean et al., 2016; Parikh et al., 2010; Perron et al., 2010). Therefore, it might be appropriate for a medical office to send an automated reminder one week before each patient's appointment time and subsequently follow with a personal telephone reminder that is one or two days before each patient's appointment time, in order to reduce non-attendance and patients forgetting about their appointments.

### **Conclusion**

An increase in appointment attendance can improve patient health, clinic efficiency, and total revenue. Therefore, providers and their administrative staff need to first identify unique factors that are appropriate to their practice setting and patients, and then select appropriate strategies to effectively reduce the number of missed appointments. Some strategies that were recommended by McLean et al. (2016) are shown in Table 1.

Table 1

*Summary of Strategies to Optimize Reminder Systems*

1. Maintain accurate patient contact details (with alternative contact routes whenever possible).
2. Select reminder technologies that are suitable for the needs of the population, if possibly, more than one.
3. Where appropriate use “Reminder plus” technologies to overcome common barriers to attendance.
4. Send reminder a minimum of 2-3 days in advance of the appointment.
5. Frame reminders to ask patients to cancel and reschedule unwanted appointments.
6. Employ multiple systems for cancelling appointments, which suit the needs of the patients and not the needs of the services e.g., automated SMS cancellation, answer-phone, email etc.
7. Have robust rescheduling procedures in place to allow easy rescheduling of appointments for patients, both within and out of normal working hours.
8. Monitor whether any specific groups of patients are being disadvantaged by the chosen reminder systems.
9. Employ personalized or intensive reminder strategies for groups of patients at high risk of non-attendance.
10. Build in administrative time for clinicians to manage tasks, which were previously routinely carried out when a patient missed an appointment.

*Note.* Adapted from “Appointment reminder systems are effective but not optimal: results of a systematic review and evidence synthesis employing realist principles,” by S. McLean, A. Booth, M. Gee, S. Salway, M. Cobb, S. Bhanbhro, and S. A. Nancarrow, 2016, *Patient Prefer Adherence*, 10, p. 495.

## METHODS

This section provides an overview of the procedures used to plan, develop, implement, and evaluate a revised reminder system to improve appointment attendance at an endocrine practice in Orange County, California. There were four procedural steps to this quality improvement (QI) project: 1) verification of the rate of missed appointments over a three-month period; 2) implementation of a new reminder system; 3) evaluation of the effectiveness of the intervention by the measured rate of missed appointments over a three-month period; and 4) if needed, suggestions for modification to the reminder system.

### Design, Setting and Sample

#### Design

This project used a pre-post evaluation of a QI intervention for appointment attendance. A missed appointment was defined as a patient's failure to show up for an appointment or notify a healthcare provider 24 hours before an appointment cancellation.

#### Setting

The endocrine practice for this project provided patient care in three different settings, Garden Grove, Anaheim Hills, and Laguna Hills. The practice had two healthcare providers, an endocrinologist and a nurse practitioner, who together managed over 2000 adult patients. The providers saw patients Mondays through Fridays from 9 AM to 5 PM. On average, each provider had 18 to 20 scheduled patients every day. Follow-up patients were routinely given a lab test order and were advised to complete a blood test five to seven days prior to their next scheduled appointment.

The practice used the electronic medical records (EMRs) system titled *Amazing*

*Charts* to document and send automated reminders to scheduled patients two days before their appointment date. Patients and caregivers had an option to receive either one or all three types of automated reminders: simple short message service (SMS), telephone call, and/or email. The reminders were available in only two languages: English and Spanish. The automated reminder system notified the office of the confirmed and cancelled patients. In addition to the automated reminder system, one day prior to an appointment date, a bilingual medical assistant (MAs) personally called those patients who did not confirm or cancel their appointments via the system. There were two bilingual MAs, one who spoke Spanish and English and another who spoke Vietnamese and English. When called, if the patient did not answer the phone, the MAs left a voice message in the patient's primary language to remind the patient of the appointment.

### **Sample**

All patients from three different office settings, Garden Grove, Anaheim Hills, and Laguna Hills, who were scheduled to receive care from either a physician or a nurse practitioner (MD/NP) during the August 2016 through January 2017 timeframe were included in the QI project. The patients, who failed to keep or cancelled appointments before 24 hours from their scheduled time, were considered "missed appointment patients." The non-active patients were not included in the project. Non-active patients were defined as those whose last office visit was prior to January 1, 2015. These patients were no longer receiving care from the providers of the practice.

### **Procedures**

The QI project began after the Institutional Review Board (IRB) at the California State University, Long Beach (CSULB) and the medical director of the clinic, who was

also the endocrinologist of the practice, approved the project and provided a note of written confirmation. In order to extract a list of missed or late cancelled appointments from the office EMR database, the author performed the following procedural steps. First, the author met with the endocrinologist and the MAs to request that they begin to document all missed appointments from the practice. The MAs were required to review the list of scheduled patients, send a notification to the providers of the no-show patients, and then remove those patients from the schedule at the end of each day. Once the providers received the notifications from the MAs, they then recorded those patients as missed or late cancelled appointments in each patient's chart. In order to assure continued vigilance in the documentation of missed/cancelled appointments, the author set up bi-monthly informal meetings with the endocrinologist and the MAs to determine any issues with data collection and then acted to resolve those issues with the staff.

Second, the author met with an IT team member from *Amazing Charts* and requested a report that was based on the following criteria:

1. A list of patients who scheduled, attended, and missed, as well as cancelled appointments from August 1, 2016 to October 31, 2016.
2. Number of missed appointments per individual patient from August 1, 2016 to October 31, 2016.
3. The language preference (i.e. English, Spanish, and Vietnamese) of the patients who missed and attended appointments, as well as who cancelled before a 24-hour notice during August 1 to October 31, 2016.

Third, a seven-day reminder system was implemented at the beginning of the second three-month cycle. The new reminder system was similar to the existing system

with an exception of one modified feature, which changed to a seven-day reminder from a two-day reminder. In this step, the author performed the following:

1. Sent 593 letters out prior to the second three-month period of data collection. The letters were written in three different languages and sent to the patients who were scheduled for appointments during the November 1, 2016 to January 31, 2017 study timeframe, to inform them of the change in the reminder system from a two-day to a seven-day reminder (see Appendix A).
2. Set up an automated voice-message in three languages (English, Spanish, and Vietnamese), which was included in the office telephone system to inform patients of the change in the reminder system from a two-day to a seven-day reminder (see Appendix B).
3. Contacted the IT department to request that the two-day reminder system be changed to a seven-day reminder system. Collaborated with the IT department to ensure that patients with appointments on the first day of the second three-month period would receive their reminder seven days prior to their appointment.
4. Requested the IT department to report the following data:
  - a. A list of patients who scheduled, attended, and missed, as well as cancelled appointments during the second three-month period.
  - b. The number of missed appointments per individual patient during the second three-month period.
  - c. The language preference of the patients who missed, attended, and cancelled appointments during the second three-month period.

## Analysis

The project will analyze the number of missed appointments, attended appointments, cancellations more than 24 hours prior to the scheduled appointment time, and rescheduled appointments during the first three-month period and compare this with a second three-month period after the implementation of a seven-day reminder system. Frequency metrics for the total sample as well as for each language preferences (English, Spanish, and Vietnamese) will be generated, with the exception of the rescheduled appointments for the three- month period:

- Numerator: there were four sets of numerators in this analysis:
  1. The total number of missed (no-show plus cancelled less than 24 hours) appointments.
  2. The total number of attended appointments.
  3. The total number of cancellations more than 24 hours prior to the scheduled appointment date.
  4. The total number of rescheduled appointments for each three-month period.
- Denominator: the total number of scheduled appointments for each three-month period.

In conclusion, the purpose of this project was to implement and evaluate a modified reminder system to mitigate an estimated 25% non-attendance rate previously reported at the practice. The effectiveness of the seven-day reminder system was evaluated for a decrease in the frequency of the missed appointments by obtaining data regarding the number of missed or late-cancelled appointments. The percentage of

preferred language was calculated to help determine if language preference was an influencing factor among patients who missed appointments. The next phase of the project involved the sharing of the results with the team to determine what changes were needed and suggestion for further modifications to the reminder system.

## RESULTS

The results section presents data on missed and attended appointments pre- and post-intervention. The pre-intervention period was August 1, 2016 to October 31, 2016, which was followed by a three-month post intervention period from November 1, 2016 to January 31, 2017. The total number of scheduled, missed, attended, and encountered appointments for both the pre- and post-intervention periods are presented in Table 2. The total number of encountered appointments for both the pre- and post-intervention periods was computed from the number of appointments attended, missed, and cancelled more than 24-hours prior to scheduled appointment time. In other words, the total number of rescheduled appointments was deducted from the total number of scheduled appointments to provide a total number of encountered appointments.

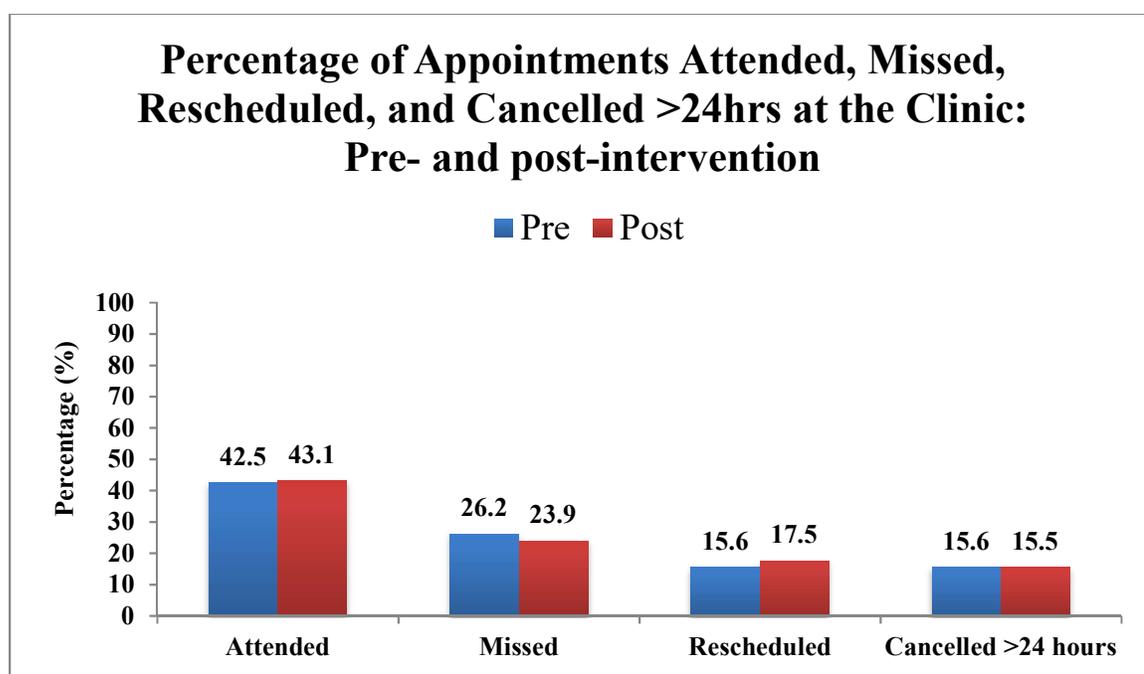
Table 2

*Number and Percentage of Appointments Attended, Missed, Rescheduled, and Cancelled >24hrs at the Clinic: Pre- and Post-Intervention*

	Appointments	
	Pre N (%)	Post N (%)
Scheduled Appointments		
Attended	699 (42.5)	643 (43.1)
Missed*	430 (26.2)	356 (23.9)
Rescheduled	257 (15.6)	262 (17.5)
Cancelled (>24hrs)	257 (15.6)	231 (15.5)
Total scheduled appointments	1,643 (100)	1,492 (100)
Total encountered appointments**	1,386	1,230

*Note.* \*Missed appointments are equal to the no-show and the cancelled <24 hours prior to scheduled time appointments; \*\*Total number of encountered appointments for both the pre- and post-intervention periods was calculated from a deduction of the total number of rescheduled appointments from the total number of scheduled appointments.

Table 2 and Figure 2 illustrate the percentage of appointments that were kept, missed (no-show and cancelled less than 24 hours prior to the scheduled time), rescheduled, and cancelled more than 24 hours prior to the scheduled appointment time, for both the pre- and post-intervention periods. Overall, the seven-day appointment reminder resulted an increase in the number of appointments attended and a decrease in both the number of missed appointments, and appointments cancelled more than 24 hours in advance. The intervention resulted in small improvements across outcomes.



*Figure 2.* The percentage of appointments attended, missed, rescheduled, and cancelled >24 hours at the clinic from August 1, 2016 to January 31, 2017.

Further analysis was conducted to determine the language preference among the patients in both the pre- and post-intervention groups who missed and kept their appointments, as well as, those who cancelled their appointments more than 24 hours prior to the scheduled appointment. The *Amazing Charts* system did not collect

information about the language preference of those patients who rescheduled their appointments during the pre- and post-intervention periods. Therefore, the total sample of language preferences for both the pre- and post-intervention periods was based on the total number of encountered appointments rather than the total number of scheduled appointments. The total number of patients with a reported language preference (i.e., the encountered patient sampling) was 1386 and 1230 for pre- and post-intervention periods, respectively (see Table 3). Table 3 also reports the percentage of the language preferences among the patients who missed and kept their appointments, as well as, cancelled their appointments more than 24 hours prior to scheduled appointment, for the pre- and post-intervention groups.

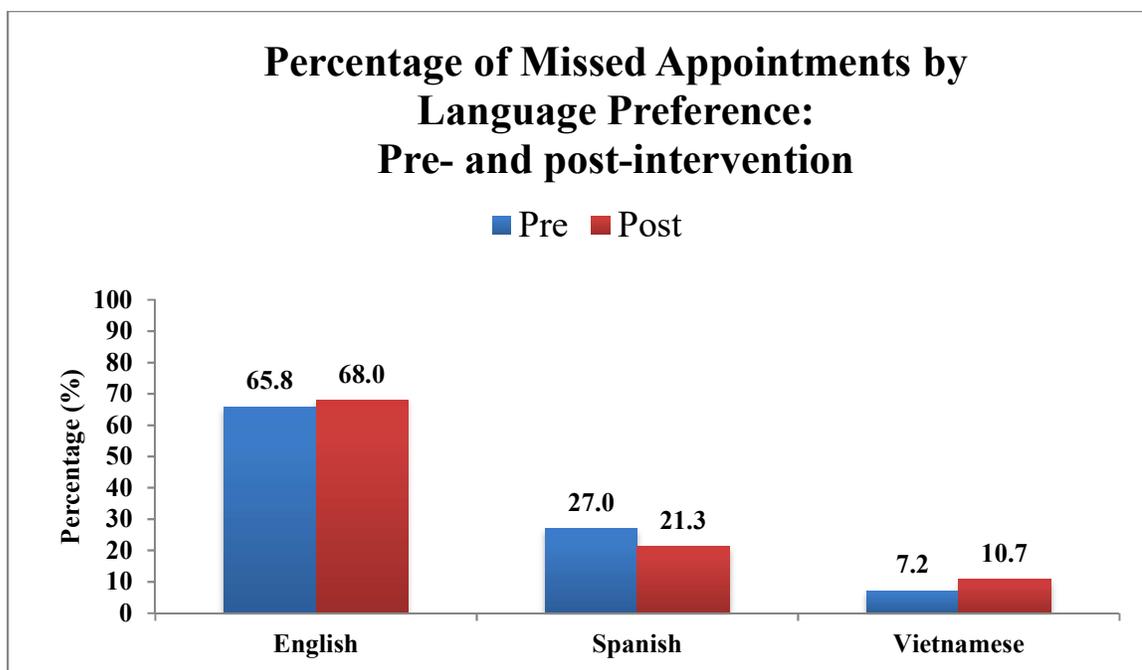
Table 3

*Number and Percentage of Encountered Appointments by Language Preference: Pre- and Post-Intervention by Missed, Attended, and Cancelled >24 Hours*

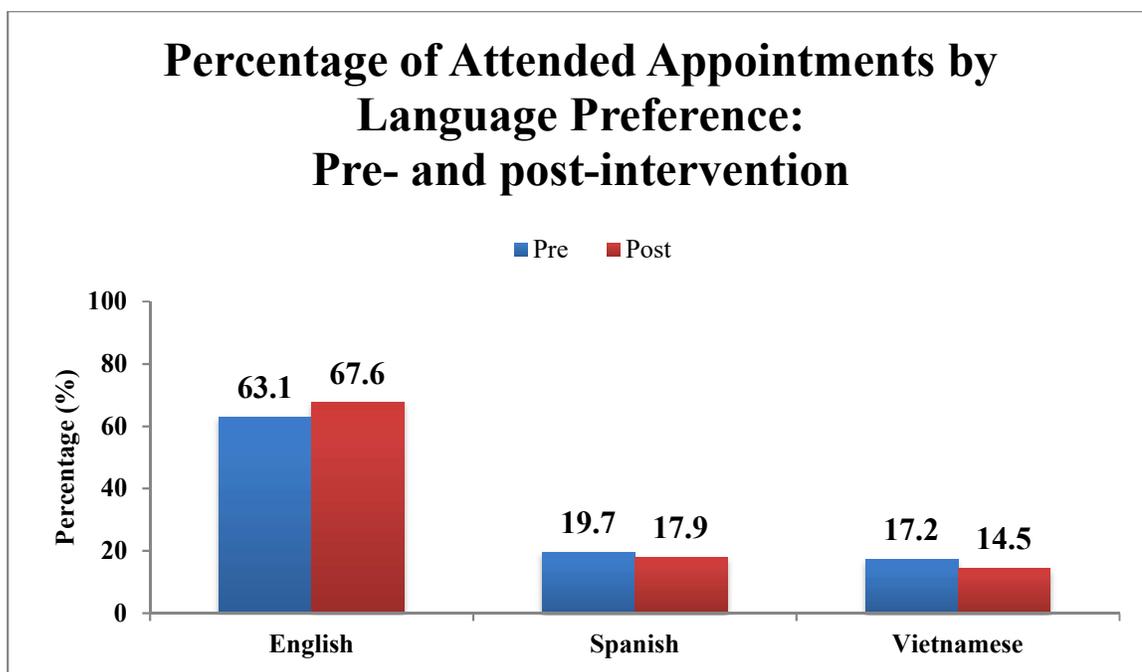
Language	Pre-Intervention N = 1,386			Post-Intervention N = 1,230		
	Missed N (%)	Attended N (%)	Cancelled >24hrs N (%)	Missed N (%)	Attended N (%)	Cancelled >24 hours N (%)
English	283 (65.8)	441 (63.1)	204 (79.4)	242 (68.0)	435 (67.6)	179 (77.5)
Spanish	116 (27.0)	138 (19.7)	36 (14.0)	76 (21.3)	115 (17.9)	29 (12.5)
Vietnamese	31 (7.2)	120 (17.2)	17 (6.6)	38 (10.7)	93 (14.5)	23 (10.0)
Total	430	699	257	356	643	231

*Note.* Encountered appointments were composed of the total number of appointments missed, attended, and cancelled more than 24 hours prior to scheduled time.

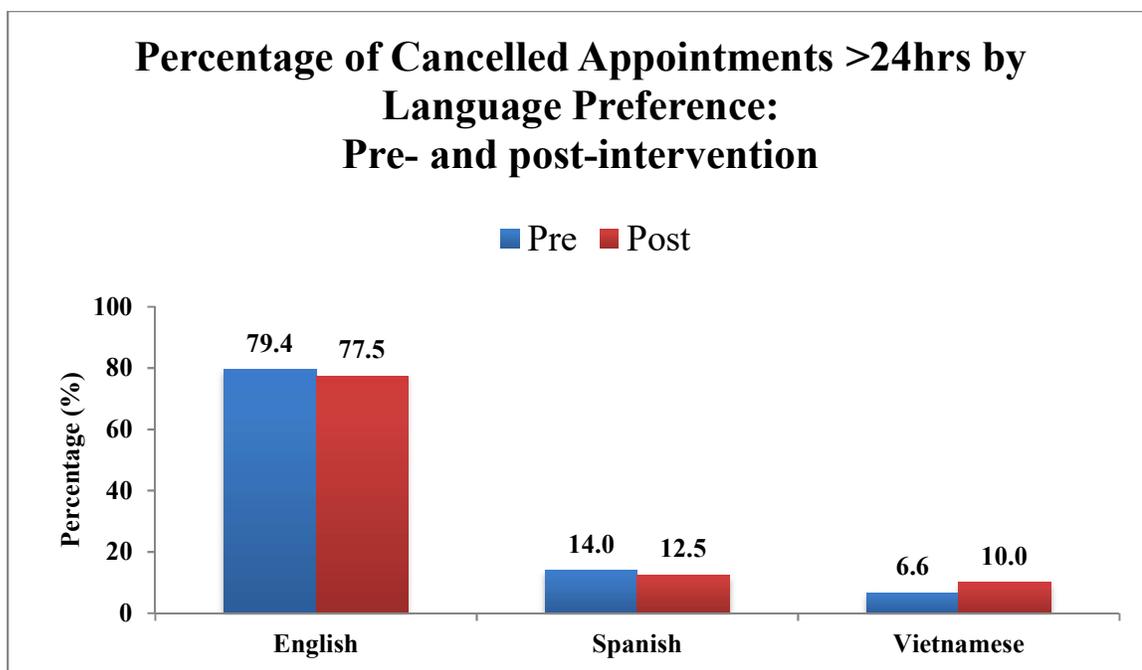
Figures 3, 4, and 5 provide an illustration for visual inspection of the pre- and post-interventions for the percentage of the English, Spanish, and Vietnamese language preferences among the patients who missed and kept their appointments, as well as those who cancelled their appointments more than 24 hours prior to their scheduled appointment. It appears that the language preference of the patients affected whether or not they attended, missed, rescheduled, or cancelled more than 24 hours prior to their appointment when using the seven-day reminder. For example, Spanish-speaking patients exhibited a decrease in missed appointments while English and Vietnamese-speaking patients demonstrated an increase in missed appointments. As another example, the seven-day reminder intervention increased attendance for English-speaking patients, but the same effect was not observed for the Spanish and Vietnamese patients. Furthermore, the seven-day appointment reminder did not increase appointment attendance, nor reduce missed appointments and appointment canceled more than 24 hours among Vietnamese-speaking patients. Overall, the results varied by the language spoken for each of the individual outcomes of interest (see Table 4).



*Figure 3.* The percentage of missed appointments by language preference for patients scheduled from August 1, 2016 to January 31, 2017.



*Figure 4.* The percentage of attended appointments by language preference for patients scheduled from August 1, 2016 to January 31, 2017.



*Figure 5.* The percentage of cancelled appointments >24 hours prior to the scheduled appointment time by language preference for patients scheduled from August 1, 2016 to January 31, 2017.

Table 4

*The Influence of Language on Intervention Effectiveness*

Language	Missed	Attended	Cancelled >24hrs
English	-	+	+
Spanish	+	-	+
Vietnamese	-	-	-

+ = Positive influence on outcome of interest

- = no influence or negative influence on outcome of interest.

During the pre-intervention period, 37 patients missed three to five scheduled appointments. During the post-intervention period, 16 patients missed three to five scheduled appointments. The majority of these patients were English speaking. Among those patients with a propensity to miss appointments, the percentage of patients

decreased from 2.3% pre-intervention to 1.1% post intervention. In other words, the seven-day reminder resulted in a 1.2% reduction of patients who chronically missed three to five scheduled appointments.

Overall, the seven-day appointment reminder system resulted in an increase in the rate of appointment attendance and appointment rescheduling. It also reported a reduction in non-attendance. In addition, the data showed a negligible decrease (from 15.6% to 15.5%) in the number of appointments cancelled more than 24 hours prior to the scheduled appointment time. Furthermore, it should be noted that there were no identified problems with the data collection process; thus, the collected data were not misrepresented.

## DISCUSSION

The purpose of this project was to implement a seven-day appointment reminder system to determine whether there was an improvement in the number of missed and attended appointments. Appointments scheduled from August 1 to October 31, 2016 (pre-intervention) and November 1, 2016 to January 31, 2017 (post-intervention) were examined for appointments missed, attended, rescheduled, and cancelled more than 24 hours in advance. A change from a two-day reminder to a seven-day reminder reduced the rate of missed appointments and increased the rate of appointment attendance.

There was a 2.3% reduction of missed appointments in the post-intervention period compared to the pre-intervention period. In addition, there was a 0.6% increase in appointment attendance in the post-intervention period. These minor improvements are consistent with the Griffin et al. (2011) study, which found that the patients who received a reminder seven days prior to their appointment had a 4.0% difference in non-attendance compare to those patients who received a three-day reminder. In addition, the group that received a seven-day reminder had more time to adequately prepare for their procedure than the group who received a three-day reminder, 44% versus 40%. The latter finding suggests that a seven-day reminder would provide sufficient time for the patients at the endocrine clinic to complete blood orders prior to their appointment.

In addition, there was a 1.9% increase in the number of rescheduled appointments in the post-intervention period compared to the pre-intervention period. Furthermore, overall there was a 0.1% reduction in the number of appointments cancelled more than 24 hours prior to scheduled appointment. These results were consistent with the Hasvold and Wootton (2011) and McLean et al. (2016) findings, which found that sending reminders

early allowed patients to have more time to reschedule, if needed, and increased the chance of the patient keeping their scheduled appointment. Likewise, early cancellations allowed office staff to fill available openings with other patients requesting appointments. During the post-intervention period, the attending physician at the clinic took a three-week vacation, which may have contributed to the rescheduled rate identified during this period.

During the post-intervention period, patients with a Vietnamese language preference exhibited an increase in both no-shows and cancellations more than 24 hours prior to appointment time and a reduction in appointment attendance. These outcomes may have been the result of cultural influences and/or the language used for the automated reminder system. During the last month of the post-data collection period, Vietnamese New Year occurred. Vietnamese New Year is a festive cultural event celebrated by many individuals who engage in traditional practices and rituals, which may have taken precedence over a doctor's appointment.

Moreover, the automated seven-day appointment reminder system had only two language options: English and Spanish. Thus, the Vietnamese-speaking patients did not receive a seven-day reminder in their primary language. They did, however, receive a seven-day reminder in English. In addition, all participants who did not confirm their appointments in both the pre- and post-intervention via the automated system received a one-day reminder in their primary language. This allowed the Vietnamese-speaking patients to receive a one-day reminder in their primary language. A concern regarding the Vietnamese-speaking patients is the one-day appointment reminder, which may not have provided sufficient time for these patients to rearrange their commitments to keep their

scheduled appointment, especially for those who had forgotten about their appointment. Thus, the language used for the seven-day automated reminder may be an important factor to consider.

Furthermore, the post-data showed a reduction in the number of appointments cancelled more than 24 hours prior to scheduled appointments for both the English and Spanish-speaking patients. The latter finding suggests that a seven-day appointment reminder provided sufficient time for these patients to rearrange their commitments to keep their scheduled appointment. However, the same effect did not occur in the rate of attendance and no-shows for these two groups. The post-data revealed that the Spanish-speaking patients had a lower rate of appointment attendance, while the English-speaking group had a higher rate of no-shows. Perhaps, this unanticipated outcome might be due to other confounding variables that were not examined during the post-intervention period. For instance, these patients may be the ones who confirmed their appointment via the automated reminder system; yet, they could not keep their appointment and were unable to notify the office due to other extenuating circumstances. Without knowing, the medical assistants did not call these patients one day prior to their scheduled appointment as the EMR reminder system indicated that these individuals were confirmed patients. Thus, these patients were categorized as the missed appointments rather than as the rescheduled or cancelled appointments.

### **Financial Impact**

Similar to Kheirhah et al. (2016) and Weinger et al. (2005) findings, non-attendance at scheduled appointments also contributed to lost revenue and poor use of medical resources at this endocrine clinic. The clinic received payments per patient visit

based on the type of health insurance. The fee for each office visit ranged from \$80 to \$250. The estimated loss of revenue per no-show was \$90 for follow-up patients and \$140 for new patients. On average, each provider had 18 to 20 scheduled appointments per day, a 2.3% reduction in appointment non-attendance translated into approximately one patient per day. In other words, there was an approximately two to three thousand dollar gain in revenue per month during the intervention period.

### **Limitations**

Due to time constraints to complete the Doctor of Nursing Practice (DNP) project, the collection of data regarding the rates of scheduled appointments was conducted over a six-month timeframe. Therefore, it was not possible to collect the pre and post data for scheduled appointments during the same three-month period of a calendar year (i.e. August 1 to October 31, 2016 versus August 1 to October 31, 2017). The data suggested that regardless of the months of implementation, a cost savings was experienced by the clinic through the changing of a two-day to a seven-day appointment reminder system.

### **Conclusion and Recommendations**

A high non-attendance rate has a negative impact on the revenue obtained from a medical office. Late cancellations make it difficult for an office staff member to fill the open time slot for other patients requesting appointments. Thus, it is imperative to identify an efficient appointment reminder system to improve appointment attendance. Often forgetfulness is the main reason for missed appointments and having a reminder system that allowed sufficient time to reschedule is fiscally responsible. The change from a two-day appointment reminder to a seven-day reminder resulted in an improvement in missed and attended appointments. An estimated six to nine thousand dollars was added

into the office revenue during the three-month intervention period supporting the efficacy of this simple practice change.

The PDSA framework was a valuable tool that allowed for the examination of the change in the non-attendance rate over a three-month period. In addition, the fourth construct of the PDSA cycle, “Act”, addressed the need to identify recommendations for the clinic team. The author’s three recommendations are: 1) reviewing the summary of strategies to optimize the reminder system listed in Table 1; 2) flagging individuals who missed three or more of their scheduled appointments; and 3) switching to an automated appointment-reminder system that includes the Vietnamese language. These three recommendations may further improve the appointment attendance rate at the clinic.

The first recommendation focuses on the need for the clinic team to carefully review and implement the strategies summarized by McLean et al. (2016) in Table 1. Specifically, three of the ten suggested strategies are applicable for this endocrine clinic. The first one is to maintain updated contact information for all patients. For instance, 23 out of the 593 letters, which were sent to notify the patients regarding the change from a two-day to a seven-day appointment reminder, were returned to the office due to incorrect mailing addresses. The second one notes the need to remind patients to cancel or reschedule unwanted appointments. For instance, 53 patients missed three to five scheduled appointments during the pre- and post-intervention periods. The third one relates to selecting an appointment- reminder system that does not exclude any group of patients. In this clinic setting, the patients who preferred a reminder in their native Vietnamese language did not receive an automated seven-day reminder in Vietnamese prior to their scheduled appointment. They received an appointment reminder in English.

In contrast, the English and Spanish patients received a reminder in their preferred language.

The second recommendation involves a suggestion to collaborate with an *Amazing Charts* representative to identify the names of the 53 individuals who missed three or more of their scheduled appointments during the pre and post-intervention periods. The team could use a flagging feature in the *Amazing Charts* EMR system to flag the identified individuals. When these flagged individuals call to schedule an appointment, the office staff would recognize and personally re-emphasize the importance of notifying the office at least 24 hours in advance about any future cancellations or reschedules. This second recommendation is consistent with the strategy listed as number five in Table 1, the importance of reminding patients to cancel or reschedule appointments that are inconvenient for them.

The third recommendation points out the need to use an automated seven-day appointment-reminder system that includes the Vietnamese language. A one-day telephone reminder may not provide enough time for patients who prefer the Vietnamese language, to rearrange their commitments and have blood orders completed and analyzed by the laboratory prior to their appointment. This third recommendation is similar to strategy number eight in Table 1, which suggests that a medical office should carefully choose an appointment-reminder system that would not be a disadvantage to a certain group of patients.

In summary, the seven-day automated appointment reminder resulted in a 2.3% reduction in non-attendance compared to the two-day automated appointment reminder system used prior to the implementation of this project. In a three-month period, this

quality improvement project generated an estimated six to nine thousand dollars in revenue for the endocrine clinic. In addition, based on the project findings, the author made three recommendations that may potentially increase the rate of appointment attendance for the clinic. A future project could include an investigation of the effect of multiple missed appointments on healthcare outcomes related to the control of endocrine metabolic diseases.

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## APPENDIX A

### LETTER TO THE PATIENTS

Five hundred and ninety three letters were sent out on October 20th to the patients who were scheduled for appointments from November 1, 2016 to January 31, 2017. The letters were written in three different languages to inform the patients of the change in the reminder system from a two-day to a seven-day reminder (see below).

#### English Version

**Ole Saetrum Opgaard, MD, Ph.D.**  
**Vi Nguyen, MSN, NP-C**

9191 Westminster Ave, Ste. 209  
 Ste. 24B Garden Grove, CA 92844  
 CA 92653

Tel: (714) 786-5794  
 Fax: (714) 786-5799

5475 E. La Palma Ave, Ste. 208  
 Anaheim Hills, CA 92807

Tel: (714) 786-5794  
 Fax: (714) 786-5799

24953 Paseo de Valencia,  
 Laguna Hills,

Tel: (714) 786-5794  
 Fax: (714) 786-5799

October 19, 2016

Dear patient,

The practice of Dr. Ole Saetrum Opgaard and Vi Nguyen would like to inform you that, starting on **November 1, 2016**, we will implement a change in our appointment reminder system. The automated reminder system will send out a notification 7 days prior to your scheduled appointment, either by telephone call, text message, or email.

The intention of this change is to give you enough time to re-arrange your schedule and have possible lab test or radiology studies completed prior to your appointment.

To ensure that you will receive an appointment reminder, please notify our office staff if you have a new phone number.

We would appreciate if you would confirm or cancel your appointment as prompted by the automated reminder system.

- For a telephone call reminder, press **1** to keep appointment, **2** to cancel appointment.
- For a text message reminder, select letter **C** to keep appointment, letter **N** to cancel appointment.
- For an email reminder, select either a **Confirm** or a **Cancel** tab.

If you missed the call from our automated reminder system, please call our office at (714) 786-5794 to confirm your appointment.

Your confirmation is important. It will assist us to properly reserve adequate time for your appointment with the providers. If you do not confirm your appointment, we might replace your appointment for another patient that is on our waiting list.

Thank you for your cooperation and support. We look forward to seeing you soon.

Warm regards,

The office staff of Dr. Opgaard and Vi Nguyen

### Spanish Version

**Ole Saetrum Opgaard, MD, Ph.D.  
Vi Nguyen, MSN, NP-C**

9191 Westminster Ave, Ste. 209 5475 E. La Palma Ave, Ste. 208 24953 Paseo de Valencia, Ste. 24B

Garden Grove, CA 92844

Anaheim Hills, CA 92807

Laguna Hills, CA 92653

Tel: (714) 786-5794

Tel: (714) 786-5794

Tel: (714) 786-5794

Fax: (714) 786-5799

Fax: (714) 786-5799

Fax: (714) 786-5799

19 de Octubre de 2016

Estimados pacientes,

La oficina del Dr. Ole Saetrum Opgaard y Vi Nguyen quisieran informarle, que a partir del **01 de Noviembre de 2016** implementaremos un cambio en nuestro sistema recordatorio de citas. Actualmente el sistema recordatorio envía un mensaje de texto, de voz o correo electrónico 2 días antes de su cita programada. El sistema automatizado de recordatorios cambiara de *2 días a 7 días* antes de su cita programada para recordarle acerca de su consulta.

La implementación de este cambio de recordatorios se usara para darle el tiempo suficiente para reorganizar la cita si no ha completado sus ordenes de Laboratorios o Radiología (Donde aplique.)

Para asegurar que usted reciba un recordatorio de su cita, por favor notifique a nuestro personal de oficina si usted tiene un nuevo número de teléfono.

También nos gustaría pedir su ayuda en asistir a la oficina para confirmar o cancelar su cita así como el sistema automatizado de recordatorio se le indique. Por ejemplo:

- Para la llamada de teléfono, pulse el **1** = para confirmar su cita, Pulse el **2** = para cancelar.
- Para mensajes de texto, seleccione la letra **C** = Confirmar cita, o **N** = para cancelar.
- Para correo electrónico, seleccione ya sea **Confirmar** o **Cancelar** la fecha.

Si pierde la llamada de nuestro sistema automatizado de recordatorio para confirmar o cancelar su cita nos puede llamar al (714) 786-5794.

Su confirmación ayudara a la oficina reservar el tiempo correcto para su cita con los proveedores. Si usted no confirma podríamos reemplazar su cita para otros pacientes que están en nuestra lista de espera.

Gracias por su cooperación y apoyo. Esperamos estar para servirle y administrar su salud.

Saludos afectuosos,

El personal de la oficina de Dr. Opgaard y Vi Nguyen.

### Vietnamese Version

**Ole Saetrum Opgaard, MD, Ph.D.**  
**Vi Nguyen, MSN, NP-C**

9191 Westminster Ave, Ste. 209 Ste. 24B Garden Grove, CA 92844 Tel: (714) 786-5794 Fax: (714) 786-5799	5475 E. La Palma Ave, Ste. 208 Anaheim Hills, CA 92807 Tel: (714) 786-5794 Fax: (714) 786-5799	24953 Paseo de Valencia, Laguna Hills, CA 92653 Tel: (714) 786-5794 Fax: (714) 786-5799
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Ngày 19 tháng 10 năm 2016

Kính Thưa Quý Bệnh Nhân Thân Mến,

Văn phòng của bác sĩ Ole Saetrum Opgaard và Vi Nguyễn muốn thông báo quý vị vào **ngày 01 tháng 11 năm 2016**, chúng tôi sẽ thực hiện một sự thay đổi trong hệ thống nhắc ngày hẹn. Hệ thống nhắc nhở tự động sẽ gọi điện thoại, gửi tin nhắn, hoặc email 7 ngày trước khi cuộc hẹn để nhắc quý vị về cuộc hẹn với văn phòng.

Mục đích của sự thay đổi này là để giúp quý vị có đủ thời gian sắp xếp lại công việc của mình và hoàn thành xét nghiệm máu hoặc chụp quang tuyến để chuẩn bị cho cuộc hẹn.

Để đảm bảo rằng quý vị sẽ nhận được tin nhắc về cuộc hẹn, xin vui lòng thông báo cho nhân viên văn phòng của chúng tôi nếu quý vị có thay đổi số điện thoại mới.

Chúng tôi chân thành cảm ơn nếu quý vị có thể xác nhận hoặc hủy bỏ cuộc hẹn theo hướng dẫn trong hệ thống nhắc nhở tự động.

- Đối với tin nhắn bằng cuộc gọi điện thoại, bấm số **1** để giữ hẹn, số **2** để hủy bỏ cuộc hẹn.
- Đối với tin nhắn, hay chọn chữ **C** để giữ hẹn, chữ **N** để hủy bỏ cuộc hẹn.

Nếu quý vị bỏ lỡ cuộc gọi từ hệ thống nhắc tự động của chúng tôi, xin vui lòng gọi cho văn phòng của chúng tôi tại (714) 786-5794 để xác nhận cuộc hẹn.

Xác nhận về cuộc hẹn của quý vị rất là quan trọng. Xác nhận về cuộc hẹn sẽ giúp chúng tôi để đúng thời gian thỏa đáng cho cuộc hẹn của quý vị với bác sĩ. Nếu quý vị không xác nhận cuộc hẹn, chúng tôi có thể thay thế cuộc hẹn của quý vị cho một bệnh nhân khác đang đợi trên danh sách chờ đợi của chúng tôi.

Cảm ơn sự hợp tác và hỗ trợ của quý vị. Chúng tôi mong gặp quý vị sớm.

Nhân viên văn phòng của bác sĩ Ole Opgaard và Vi Nguyễn.

**APPENDIX B**  
**AUTOMATED VOICE-MESSAGES**

An automated voice-message in three languages (English, Spanish, and Vietnamese) was included in the office telephone system to inform patients of the change in the appointment reminder system from a two-day to a seven-day reminder (see below).

**English Prompt**

Please note, effective **November 1, 2016** our office will implement a change in our appointment reminder system. The automated reminder system will send out a notification by phone, text or email 7 days prior to your scheduled appointment instead of 2 days prior. Your confirmation is important and will help reserve adequate time for your appointment. If you do not confirm your appointment, we may replace your appointment for another patient that is on our waiting list. Thank you for your cooperation and support.

**Spanish Prompt**

La oficina gustaría informarle, que a partir del **01 de Noviembre de 2016** implementaremos un cambio en nuestro sistema recordatorio de citas. Actualmente el sistema recordatorio envía un mensaje de texto, de voz o correo electrónico 2 días antes de su cita que cambiara a 7 días antes de su cita programada. Su confirmación ayudara a la oficina reservar el tiempo correcto para su cita. Si usted no confirma podríamos reemplazar su cita para otros pacientes que están en nuestra lista de espera. Gracias por su cooperación y apoyo.

**Vietnamese Prompt**

Vào *ngày 01 tháng 11 năm 2016*, hệ thống nhắc nhở tự động của văn phòng sẽ gọi điện thoại, gửi tin nhắn, hoặc email 7 ngày trước khi cuộc hẹn. Xác nhận về cuộc hẹn của quý vị rất là quan trọng. Nếu quý vị không xác nhận cuộc hẹn, chúng tôi có thể thay thế cuộc hẹn của quý vị cho một bệnh nhân khác đang trong danh sách chờ đợi. Cảm ơn sự hợp tác và hỗ trợ của quý vị.