

Using Electronic Daily Reminders to Improve Patient Adherence

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Abstract

On a Home Telehealth (HT) program, by doing a HT session daily, patients have the opportunity to receive education, learn mechanisms by which to manage their chronic diseases, and be monitored daily for the duration of the program by a nurse care coordinator. Many patients, however, do not adhere to doing a daily HT session. This paper describes a quality improvement project looking at 40 Veterans at the Phoenix Veterans Affairs Health Care System (PVAHCS) and applying an evidence-based practice (EBP) process where electronic daily reminders were implemented to see if that would increase the adherence of doing daily HT sessions. The following PICOT question was utilized: In Veterans participating in the Home Telehealth program at the Phoenix VA Health Care System will implementing electronic daily reminders to document health status improve adherence to the program requirements? After four weeks of the intervention, the average response rate significantly improved from 48.1% to 56.6%. The proportion of participants achieving a minimum of a 70% response rate Post-Intervention was 35.0% and 24 participants (60.0%) increased Home Telehealth response rate from Pre- to Post-Intervention. This cost-effective intervention of implementing electronic daily reminders to Veterans may be the answer to many HT departments struggling to increase the participation rates or adherence of their patients.

Proper management of chronic health conditions requires patient education and frequent monitoring. Through the Home Telehealth (HT) program of the Veterans Affairs (VA), Veterans have the opportunity to receive education, learn mechanisms by which to manage their chronic diseases, and be monitored daily for the duration of the program by a nurse care coordinator. Veterans are required to complete daily sessions on their VA-issued telehealth devices, but many Veterans at the Phoenix Veterans Affairs Health Care System (PVAHCS) do not adhere to the program requirements of completing daily HT sessions on their HT devices. The objective of this paper is to describe the, Doctorate of Nursing Practice level, scholarly project which aimed to improve the poor adherence, or nonresponsive, of Veterans in the HT program at the PVAHCS through the use of daily electronic reminder messages supported by existing evidence. This paper will (a) define the practice problem, (b) state the practice question in the evidence-based practice (EBP) project PICOT format, (c) define Davis' Technology Acceptance Model (TAM) (Davis, 1989) as the theoretical framework for this project, (d) synthesize the literature, and (e) describe the setting, mission, and values of the healthcare facility where this project will be implemented. Finally, this paper will describe the plan for implementation, evaluation, and dissemination of findings for this EBP project.

Significance of the Practice Problem

Chronic conditions continue to have a major impact on the lives of American adults year after year. According to the Centers for Disease Control and Prevention (CDC) (Ward, Schiller, & Goodman, 2014), approximately one half of all adults in the United States, 117 million people, have one or more chronic health conditions and one out of every four adults in the United States have two or more chronic health conditions. Additionally, the National Vital Statistics Report illustrates that seven out of the top ten causes of all deaths in the United States are caused by chronic diseases (Xu, Murphy, Kochanek, & Bastian, 2016). Chronic health conditions are having a drastic impact on the health economics of the nation by increasing health care costs by a substantial margin. In fact, in 2010, eighty-six percent of the nation's entire yearly healthcare spending was for adults who had one or more chronic medical conditions (Gerteis, Izrael, Deitz, LeRoy, Ricciardi, Miller, & Basu, 2014).

Veterans are enrolled into the HT program because they have one or more of the following chronic conditions including, but not limited to, (a) diabetes mellitus (DM), (b) heart failure (HF), (c) chronic obstructive pulmonary disorder (COPD), (d) hypertension (HTN), and (e) post-traumatic stress disorder (PTSD). Successful treatment and management of these chronic conditions is dependent on patients' adherence to prescribed treatment regimens and activities. Adherence is simply defined as the level to which patients continue the mode of treatment that was agreed upon by patient and clinician (Stedman, 1995). Patients enrolled in the VA HT program agree to the required completion of daily sessions on their VA-issued telehealth devices, but many of them do not comply with this requirement. Daily participation in a HT program is not a unique requirement. Other HT programs have the same requirement of their patients (Age Tech California, 2012; National Care Planning Council, 2016; Philips Enterprise Telehealth, 2016). There is a multi-fold benefit to address the significant issue of HT nonresponsive. First of all, the interventions and interactions of the HT program are aimed at improving patient self-management capability while preventing needless hospital admissions and emergency department (ED) visits. The successful model of care for using HT to support coordination of care and manage the multifaceted health needs for the Veterans on the HT program requires ongoing participation. The HT program requires a minimum participation rate of 70% or higher. Submitting answers to the disease management protocol (DMP) questions and providing associated physiological data, as required, is necessary in order for the nurse care coordinator to be able to determine improvement or decline in health status of the Veterans. By not completing HT sessions at least 70% of the time, it is equivalent to being enrolled in a three month class that meets daily and not attending the class every day. Naturally, the student will not be successful in the class and will not learn all that there is to learn to be successful the topic being taught.

During the HT sessions, Veterans are taught ways to monitor symptoms and deal with their chronic conditions. Additionally, by completing the daily session and transmitting their vital signs, weight, and symptoms, the nurse care coordinator on the receiving end of the transmission is able to track and trend the Veterans' status and offer appropriate interventions and resources to prevent dangerous exacerbations and to keep the primary care provider informed of events with the Veteran. With half of the potential responses received from the Veterans, the tracking and trending, is incomplete and the opportunity to identify exacerbations is lowered if daily HT responses do not occur. Additionally, the PVAHCS is in need of increasing access to the most appropriate level of care for Veterans identified in need of being seen by a healthcare professional in a timely manner. The HT monitoring of the daily session responses allows the nurse care coordinator to direct the patient to a clinic for follow-up non-acute care. Providing timely correction of non-acute care patient issues supports a higher quality of life and exacerbation of a chronic illness to an acute situation requiring a higher level of care (Steven ton et al., 2012). Therefore, ensuring timely access to the appropriate level of care prevents a backlog of patients in the emergency department which in turn slows the patient flow throughout the medical center. As patients participate in the HT program and daily session data review identifies access to care needs that can occur in a clinic setting, hospital admissions and emergency department visits can be decreased.

The HT program has been found to lower the rate of readmissions for patients with chronic medical conditions, open up intensive care beds for higher acuity opportunities, and optimize nursing resources (Cardiocom, 2014a). Other advantages of being involved daily in the HT program include (a) staying linked with the medical team daily, (b) alerting the health care team before problems occur, (c) avoiding hospitalization, (d) lower the utilization of emergency department services, (e) elevated patient confidence and independence in managing a chronic disease, and (f) improved quality of life (Cardiocom, 2014b).

Another reason why HT nonresponsive is a problem that needs to be corrected is because there is an initial and ongoing cost per month to have patients on the program. In the month of April, 2016, there were a total of 406 Veterans enrolled in the program on the device type that has the capability of sending daily session response alerts to the patient and corresponding data to the nurse care coordinator.

Of these 406 Veterans, 269 Veterans (66.25%) responded at a rate of $\geq 70\%$ in the month of April while the other 137 Veterans (33.74%) responded at a rate of $< 70\%$ during the same time period (Cardiocom, 2016). Over one third of the Veterans are not adhering to the program requirement of completing daily HT sessions. The ongoing monthly fee for each enrolled veteran is a fee that the VA pays the vendor, Cardiocom. This fee is for the use of the HT device and for ongoing transmission of questions and answers between nurse care coordinator and Veteran on the Cardiocom platform.

This monthly fee is charged by Cardiocom and paid by the VA whether the Veteran responded 100% of the time, 50% of the time, or 0% of the time. During the month of April of this year, the VA spent \$5,480 on recurring monthly costs for Veterans that are not responding at least at the required adherence rate of 70% of the time. This does not include the initial onetime cost per device which includes a blood pressure (BP) cuff). There are also additional fees per device for those requiring a glucometer and additional fees for a digital scale depending on which Diagnosis Management Protocols presented within the HT program. It is, therefore, not surprising that the VA Telehealth Services expects that HT programs achieve a minimum 70% response rate consistently from each patient in the program and that patients who do not respond at least 70% of the time over a three month period may be disenrolled from the program.

PICOT Question

Evidence-based practice projects use a clinical question format that identifies the population (P), the intervention or implementation (I), the comparison between two data components (C), the expected outcome with solution (O), and the time frame within which the EBP project question will be answered (T). This framework is abbreviated PICOT. The PICOT format is a preferred format in which clinical evidence-based project questions are to be framed (Guyatt, Drimmand, Meade, & Cook, 2008). Further definition of the PICOT terms is presented below:

- (P)** is for Population, and refers to the participants that will be included.
- (I)** is for Intervention, and refers to the treatment that the participants will receive.
- (C)** is for Comparison or control group, and refers to what will be used as a reference point to compare the intervention group to.
- (O)** is for Outcome, and refers to what will be measured to determine if the intervention that was applied had any effect.
- (T)** is for Timeframe, and refers to how long the intervention will be given to the participants.

The PICOT in a short manageable phrase is: In Veterans participating in the Home Telehealth program at the Phoenix VA Health Care System will implementing electronic daily reminders to document health status improve adherence to the program requirements? This scholarly DNP project is an application of an evidence-based practice (EBP) process improvement intervention to increase the adherence of doing daily HT sessions. The PICOT question components for this EBP project proposal are as follows:

- **(P):** Adult Veterans currently enrolled in the HT program at the PVAHCS whose daily response rate is less than 70%. Veterans whose response is in the desired range of $\geq 70\%$ will be excluded as well as Veterans who are not using a Commander Flex device (Cardiocom, 2013) because the Commander Flex device is the on device that the VA uses which has the functionality of electronic reminders as frequently as daily. Others that will be excluded are Veterans who are placed on a hold status due to known inability to respond daily such as hospitalization or vacations.
- **(I):** Participants gathered through convenience sampling who meet the above criteria will receive a daily electronic reminder to their Commander Flex HT devices with a generic alert stating "This is a gentle reminder to complete your daily HT session today. This will help improve your health status and may prevent unnoticed complications." The reminder will be set to alert daily in the evening. The device records if the Veteran has already completed a daily session prior to the electronic reminder being sent and if a session has been completed, the device will not send the reminder that day.
- **(C):** A pre-post intervention comparison will be made. The Veterans' adherence rates for four weeks prior to receiving the intervention will be compared to the Veterans' adherence rates during the 4 weeks of the intervention period.
- **(O):** Changes in the number of HT sessions completed will be measured using the Device Usage Report available in the Cardiocom platform.
- **(T):** The intervention will be administered for 4 weeks and the outcome will be measured weekly for four weeks.

Theoretical Framework

The topic of this project is Veterans using technology on a daily basis. The theoretical framework that has been chosen is Davis' Technology Acceptance Model (TAM) (1989). Davis' TAM evaluates the degree or level of acceptance of technology by end-users when it is needed for health communication purposes. The Veterans on the HT program receive the HT device delivered to their homes. The Veteran is expected to conduct HT sessions daily using this technology. They are to interact on the device on a daily basis to receive education and to answer questions about identified symptoms such as shortness of breath and will report weight, or blood sugar depending on the diagnosis for which they are enrolled. The information from the daily sessions is sent to the nurse care coordinator's computer at the VA, who then can plot trends and make necessary decisions and interventions based on a care delivery algorithm. The ultimate success of the HT program is to identify non-acute health changes and advise the Veteran on care options. The ability of the nurse care coordinator to identify changes and advise the Veteran requires daily use of technology that is dependent on the Veterans' willingness to use the technology daily for the intended purpose.

The TAM framework defines two main assumptions to predict peoples' acceptance of technology. The first assumption is perceived usefulness (PU). TAM postulates that patients tend to use technology at the degree at which they believe the technology will be useful to them. The second assumption is perceived ease of use (PEAOU). Even if patients believe that a piece of technology is useful, they will not use it if it is too hard to use and if the benefits of using the technology are outweighed by the effort of using the technology (Davis, 1989). The HT device is easy to install and requires a simple push button operation that is not difficult to use once education and instruction with the Veteran is completed at time of enrollment. The usefulness of the program is discussed with the Veteran at time of enrollment. A daily clinical reminder message advising the Veteran to complete the HT session and reminding the Veteran of the importance of completing the HT session is the focus of this project.

Synthesis of the Literature

There is sufficient scientific support for the use of text messages to increase patient adherence. The evidence table (see Appendix A) includes 10 articles that use text messages at varying intervals to help people to (a) remember to apply sunscreen (Armstrong et al., 2009), (b) take a daily vitamin C pill (Cocosila et al., 2009), (c) increase patients' adherence to Highly Active Anti-Retroviral Therapy (HAART) (Maduka, & Tobin-West, 2013), (d) improve self-management in patients with heart failure (Nundy, et al., 2013), (e) increase treatment adherence and self-care behaviors for adults and adolescents with atopic dermatitis (Pena-Robichaux, Kyedar, & Watson, 2010), (f) improve adherence to asthma treatment (Strand by gaard et al., 2010), (g) improve self-management and glycemic control of diabetic patients (Dobson et al., 2015), (h) improve outpatient clinic appointment attendance (Downer et al., 2006), (i) improve adherence to post-discharge antibiotic prescriptions (Suffoletto et al., 2012), and (j) increase adherence of doing breast self-exams (Khokhar, 2009). Furthermore, (see Appendix B) there are systematic literature reviews that showcase additional research that further support the use of clinical reminders to improve collaboration between research and clinical practice and support the feasibility of using text messaging to effect behavior change (Cole-Lewis, & Kershaw, 2010; Wei, Hollin, & Kachnowski, 2011).

The research-based outcomes on the topic of using daily electronic clinical reminder messages support the solution for the PICOT question for this project. The issue is that many Veterans enrolled in the HT program do not respond with completing the daily session as the program requirements state. The existing evidence has shown that sending reminder messages related to prompting healthcare-related actions has demonstrated to (a) be successful in changing a behavior or clinical outcome related to disease prevention and management, (b) increase clinical adherence to a required treatment plan, (c) assist with the issue of forgetting to perform a task, or (d) improve appointment attendance. There are randomized controlled trials, varying types of pilot studies, cohort studies, and systematic reviews (see Appendix A & Appendix B) that address the use of text messages as a reminder aid, educational tool, and as a tool for behavior change. What is not consistent in the current research is (a) the frequency of the reminders, (b) what time of day is best to send the reminder, and (c) the length of an ideal study. Another inconsistency in the research is the type of message to be sent. The following types of messages used were (a) as a reminder to do something, (b) educational information, (c) to help maintain participant interest, and (d) to reinforce an action. Since most messages were used as a reminder to do something and as a means of reminding participants of the importance or usefulness of an action or activity, this project will utilize daily messages both to remind Veterans to do their daily sessions and of the importance of daily sessions.

The message will reiterate the attainment of medical goal and the importance of giving the nurse care coordinators adequate information to establish trends and make appropriate healthcare-related recommendations. The frequency of the message reminders in the current literature was variable including (a) four per day, (b) one daily, (c) one every other day, (d) one twice per week, (e) one every three days, (f) monthly, or (g) allowing the individuals to choose their preferred frequency and timing. For the purposes of this project, one daily reminder will be sent for the duration of four weeks. One final aspect that the research illustrates is the use of unidirectional versus bidirectional messages. A unidirectional message is sent to the recipient but there is no acknowledgement or feedback from the recipient. A bidirectional message is one that is sent and an acknowledgement or other information is sent back to the sender. Because of the functionality of the HT devices, the ability of the Veteran to acknowledge the message to the sender does not exist, therefore unidirectional messages will be used in this project. The measure of the effectiveness of the message will be determined by the Veteran selecting to complete the daily HT session.

Practice Recommendations

Brown and Bus sell (2011) declare that if healthcare organizations could increase the effectiveness of adherence to prescribed interventions this would have a much higher impact on the health status of the United States' adult population than any other improvement efforts. This project's aim was to have an impact on the adherence or response rate of Veterans in the HT program to the program requirements. Based on the synthesis of the existing practice site evidence on the HT program and the current research, practice criteria have been formulated. Patients that are not responding at the program required minimum of 70% of the time will receive one dual purpose message daily to the Veterans' HT devices at 1900 hours. The purposes are to remind the Veterans to do a daily HT session, to stress the importance of daily sessions to the health status of the patient, and to support the ability for the nurse care coordinator to have enough data to make appropriate evaluations, establish trends, and provide healthcare-related recommendations. The duration of the intervention messages was for four weeks. The evening hour was chosen so that employed Veterans can be at home when the reminder message is alerted on their HT devices. Another reason for choosing the evening is that if the Veteran has completed the session that day already, the machine will not deliver the daily session that day. This is an advantage, because if a Veteran completes a session in the morning and then receives a reminder message in the evening, Veterans may see the message as an annoyance and would be dissatisfied with the HT program.

Project Setting

This EBP process improvement project was conducted at the Phoenix Veterans Affairs Health Care System (PVAHCS). This is a medical center located in downtown Phoenix and has seven community-based outpatient clinics located in the following cities: Surprise, Phoenix, Gilbert, Scottsdale, Globe, Payson, and Show Low, Arizona. This medical center is categorized as a Level 1 Clinical Referral Facility and serves nearly 82,000 Veterans (U.S. Department of Veterans Affairs, 2016b). The PVAHCS serves Veterans, providing acute medical, surgical, and psychiatric care on the inpatient sections and rehabilitative medicine, and neurological care on the outpatient sections with an annual operating budget of greater than \$450 million (U.S. Department of Veterans Affairs, 2016b). The PVAHCS has 129 acute inpatient medical beds, 48 inpatient psychiatric beds, 20 substance and alcohol abuse rehabilitation treatment beds, and 102 nursing home beds.

The core values of the PVAHCS are Integrity, Commitment, Advocacy, Respect, and Excellence spelling the acronym ICARE (U.S. Department of Veterans Affairs, 2016a). These core values define who the PVAHCS is, their culture, and how care is provided to Veterans. Additionally, the core characteristics that the PVAHCS upholds are trustworthiness, accessibility, quality, innovation, agility, and integration (U.S. Department of Veterans Affairs, 2016a). The organizational structure consists of a pentad leadership group. The pentad includes a medical center director, a deputy director, an associate director, a chief of staff, and an associate director of patient care services also known as a nurse executive. The culture of the organization is one of pride, because everyone employed there is giving back to the heroes of this nation, the United States. The PVAHCS was inaugurated and opened in 1951 and, at that time, served 1,000 outpatients per month (U.S. Department of Veterans Affairs, 2015b). The mission of the VA is to serve and honor the men and women who are this nation's Veterans and heroes and this is done by achieving President Lincoln's undertaking which says that the VA will take care of this nation's heroes who fought in the battles, and for their widows, and their orphans (U.S. Department of Veterans Affairs, 2015a). The stakeholders in this project include the Veteran, the nurse care coordinator, the facility telehealth coordinator, the vendor, and the PVAHCS. Each stakeholder will be described.

Veteran

The Veteran is the recipient of the HT program designed to support chronic disease management and quality of life. It is the Veterans' home where the HT device is located and it is the responsibility of the Veteran to partner with the HT program health care professional by responding daily with HT session information.

Nurse Care Coordinator

The nurse care coordinators coordinate the Veterans' care. They need the daily submissions in order to have sufficient data to formulate a plan of care and be able to coordinate the care based on data, symptoms, or trends. A nurse care coordinator, without daily HT session response submissions from the Veteran, does not have sufficient information on which to act on to help prevent or minimize an exacerbation of illness, prevent unnecessary ED visits or hospital admissions.

The Facility Telehealth Coordinator

The Facility Telehealth Coordinator (FTC) is a stakeholder that has organizational oversight and responsibility for the entire Telehealth program. The FTC is accountable to have processes in place so that the no response rate is as low as possible thereby achieving HT program outcomes expectations.

The Vendor

The Vendor (Cardiocom): is a stakeholder because the assignment of the product to the Veteran generates revenue each month whether a Veteran responds or not. The Vendor provides the devices to the Veterans and allows the Cardiocom computer platform to be used for receipt of data/information from Veterans to nurse care coordinators.

PVAHCS

The PVAHCS is a stakeholder as there is an initial and ongoing monthly cost for each Veteran on the program. This stakeholder also has the goal of maintaining the health of the Veteran population. Use of the HT as the program was established supports chronic health issues, prior to exacerbation thereby keeping patients out of the hospital and out of the ER.

In order for any EBP project to be successful, it necessitates organizational support. This project has received the valuable support needed to be successful from multiple layers of PVAHCS leadership. The HT Lead Nurse, as well as the nurse care coordinators, was in support of this EBP project. The FTC is the Nurse Manager overseeing all of the telehealth activities and is responsible for all of the telehealth metrics for the facility. This individual is responsible for the performance of the employees in telehealth and responds to the Executive Leadership members of the organization when there are poor outcomes or measures not being met, nonresponse rates being one of those measures. Furthermore, the Chief Nurse of Geriatrics and Extended Care (under whom telehealth is aligned organizationally) was also in full support of this DNP scholarly project. The Chief Nurse is a professional who is prepared at the doctoral level and understands the value of evidence based practice and translating evidence into practice to improve health outcomes. This individual's support was also strong and has offered to remove any barriers that may come up along the way.

One of the reasons that this DNP scholarly project does not have much opposition is because it does not cost anything. The implementation of the project itself did not cost the PVAHCS facility any money because the DNP student overseeing and implementing the project was a full-time employee and no added salary cost will be incurred. The devices for sending the electronic daily reminders were already in use and paid for, in fact, there is added support for reasons mentioned above where the money that it costs monthly for the devices will be money well spent if all Veterans will respond at the desired/expected 70% rate or higher. If this project yields the results that are anticipated, increased adherence in the completion of daily HT session, the medical center's standard operating procedure (SOP) for how the telehealth department is to handle nonresponding Veterans may be edited to include the use of electronic daily reminders, again, at no additional cost and requiring no addition expenditures of any kind. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis (Appendix C) is an important assessment which helps organizations of any kind to view their strategic advantages so that they can leverage these in the marketplace, while also looking at what threatens the organization compared to the competitors.

Some strengths include (a) no added or equipment are needed to implement this project, (b) the institutional review board (IRB) of the PVAHCS has already reviewed and approved this project, and (c) organizational support exists for this project. Some opportunities include smarter use of PVAHCS money, and publication opportunity. Weaknesses of this project are the fact that there is the ability to send only unidirectional messages and not every device type can receive incoming clinical reminder messages. Threats of this project are that daily reminders may seem as an annoyance to some Veterans and nurse care coordinators may feel like the project is invading their panel of patients and workflow. The completion of a successful and honest SWOT analysis, an organization should be in agreement on how much the organization has grown and accomplished thus far, what it wants to do for here on out, how it measures up with regards to structure, resources, and delivery of services, and meeting its expected goals/measures (Mind Tools, 2009).

Project Vision, Mission, and Objectives

The vision statement of this project was to use an evidence-based, cost-effective approach of sending daily reminder messages to increase HT adherence and utilization resulting in improved care and quality of life of the veterans in the HT program. The mission of the VA is to serve and honor the men and women who are this nation's Veterans and heroes and this is done by achieving President Lincoln's undertaking which says that the VA will care for him who fought in the battles, and for his widow, and for his orphan (U.S. Department of Veterans Affairs, 2015a). The mission of this project was serving the Veterans by sending them a free clinical reminder to do their HT session daily. This allowed the Veteran to receive the necessary knowledge required to deal with chronic diseases, and will allow the nurse care coordinators to gather sufficient data to formulate trends that will be valuable to the medical provider in implementing and adjusting the plan of care as needed to improve health outcomes for Veterans.

Every project has short-term and one long-term objectives. The short-term objectives of this project were (a) in the two weeks prior to the implementation of daily reminders, all enrolled Veterans were evaluated for their response rates, (b) all enrolled Veterans were evaluated using inclusion and exclusion criteria, and (c) 100% of the qualifying Veterans were scheduled to receive the intervention as evidenced by having their alert turned on in their Cardiocom profiles. The long-term objectives were at the completion of the four-week practice change project there will be a statistically significant increase in adherence to the completion of daily TH sessions as evidenced by an increase in daily responses.

There were no foreseeable risks with this project. One potential unintended consequence may have been Veterans feeling irritated or bothered by a daily reminder. However, this is unlikely because if a Veteran has completed a daily session, the reminder message would not have been sent. The reminder message was only sent if the Veteran had not completed the required daily session.

Project Description

All evidence-based projects are process improvement change projects that require use of a change plan through the use of a change model that aligns with the project needs. The change model that was used to guide this planned change process is Lewin's Three Stage Change Process (Lewin, 1958). The first stage of change in Lewin's model is *Unfreezing*. Unfreezing is where a determination is made of what needs to change, ensuring that leadership and management support exists, and understanding and managing the doubts or concerns related to the change. The second stage is *Changing*. This is where the new process was implemented and it was important to uphold strong communication during this stage while dispelling rumors and empowering people to stay involved. This is where the DNP student communicated to the HT nurse care coordinators that the implementation of daily reminders has begun and that if they receive calls inquiring about daily messages from the Veterans, to give the Veteran an answer that explains the need for improved adherence to daily HT sessions and explains that purpose for the change. The final stage is *Refreezing*. This is where the change is anchored and made part of the culture and part of the SOP. Additionally, providing support and training, and editing the current departmental SOP document will be vital to ensuring that the change lasts and does not revert back to old ways. Nurses in this department are guided by written guidelines and if it is not in the written guidelines, the change will likely not last. And finally, one more important aspect of the Refreezing stage is celebrating success. Taking time to acknowledge the expected increased HT response rates and showing the HT nurse care coordinators the numbers and graph comparisons with the before and after adherence rates is an important part of the refreezing stage.

The role of the DNP student, as the project coordinator, in the implementation of this project, was imperative as a Telehealth Specialist at the PVAHCS. The project coordinator was in a position where the organization allowed, as part of the tour of duty, to be heavily involved in this project. From the initial steps of unfreezing, to changing, and refreezing, the project coordinator was involved at each step in all aspects of the change process. In the project coordinator role, all of the steps of the project were performed and monitoring occurred to ensure that nurse care coordinators do not alter any part of the plan. Regarding the sample of participants, the project coordinator was in full control and ensured that the sample included the group of Veterans that were currently enrolled in the Home Telehealth program at the PVAHCS whose response rate were less than 70%. The VA refers to Veterans that are enrolled in the HT program whose response rate is less than 70% as nonresponders. The project coordinator had the organizational computer access to create a Device Usage Detailed Report to see all of the Veterans enrolled and each of their response rates.

Due to prior organizational roles of FTC and Chief Nurse of Geriatrics and Extended Care, the project coordinator has earned the credibility, knowledge, and respect from the HT staff to be able to be involved in every step of this project as a colleague and project facilitator. As part of the unfreezing stage the project coordinator provided effective communication with the HT staff, sharing the reasons for the needed change, the organizational financial ramification and Veteran health status implication of not doing this project to attempt to raise adherence. Computer access ensures that the project coordinator may view patient panels of each nurse care coordinator and create utilization reports for the Veterans on the program. The project coordinator was able to perform formative and summative evaluations throughout the duration of the intervention period. The data for this project was collected by obtaining the Cardiocom Device Usage Detailed Report. As Sylvia & Terhaar (2014) state, it is important to use a tool that is valid and reliable. The Cardiocom Device Usage Detailed Report measures exactly what it is designed to measure (how often a Veteran uses his VA-issued Telehealth device). Additionally, it is very reliable tool which means that it measures accurately no matter what the setting, project, or population is involved. This is the VA approved report from the vendor Cardiocom that all VA facilities in the nation use for assessing device usage and response rates. This tool is housed in the Cardiocom platform via computer which is accessible with username and password only by staff who have done training and have been authorized to have access.

During the four-week intervention time period the report was run at the end of weeks 1, 2, 3, and 4. The formative evaluation, throughout the duration of the intervention period was completed through intermittent checks of nurse care coordinators to ensure the integrity of the automatic daily reminders sent to the Commander Flex devices of the established patients. This was done at the end of weeks 1, 2, 3, and 4. Additionally, the project coordinator followed up on determination of the current treatment recommendations for the duration of the four-week intervention period. Overview of the process occurred to ensure that project processes for managing the HT Veterans remain intact. Planned data analysis, utilizing a statistician's input, will include the power of the sample size, and the power analysis of the effect of the intervention on the outcomes.

Study Design

This project used a Quasi-Experimental Pretest-Posttest design to assess impact of a daily reminder message on HT response rates. Participants, who had a response rate below 70% in the baseline four weeks prior to the intervention and were not currently utilizing the alerts, were targeted with an electronic daily clinical reminder message. The HT response rates were observed in the subsequent month and compared to the baseline period.

Statistical Methods

Univariate statistics (mean, standard deviation, count, and percentage) were used to summarize nominal and ratio demographic and clinical characteristics of participants as well as ratio HT response rates within the baseline and follow-up periods. The weekly and study period response rates were not normally distributed, so non-parametric tests were used when applicable. Primary diagnosis was recoded to combine COPD and Heart Failure to improve statistical power. A new variable utilized Daily Home Telehealth response rates recoded as 70% or higher adherence. Daily Home Telehealth responses were rolled up in a weekly measure as well as for the Pre- and Post-Intervention study periods. In the event a participant had planned to be unavailable on a given day, the score was marked with an exempt status. If a participant had more than two exemptions in a week or more than four in a study period, that score was excluded pairwise. As a result, some members were excluded from matched comparisons of Pre- and Post-Intervention. A Wilcoxon-Mann-Whitney test was used to compare participant age and whether a participant's Home Telehealth response rate increased from Pre- to Post-intervention in relation to their age.

To compare participant Pre-period Home Telehealth response rate by primary diagnosis did not have adequate sample size to conduct a Kruskal-Wallis test; instead, an analysis of variance (ANOVA) was conducted. To assess change from baseline to follow-up in Home Telehealth response rates, paired Wilcoxon signed-rank tests were used. The change in proportion of participants achieving 70% adherence was observed from 0% at Pre-, as designed by the inclusion criteria, to Post-Intervention.

The Alpha was preset at 5% for all testing of significance. Power analysis was conducted using G*Power 3.1. Statistical analyses were performed using IBM SPSS Statistics for Mac version 23.0 (IBM Corporation, 2016). Statistical analysis was conducted by Sansom Consulting LLC.

Sample Size

Sample size was determined by the maximum number of patients at the VA who have a Home Telehealth response rate below 70% in the baseline month prior to the intervention and are not currently utilizing the alerts were targeted with a daily clinical reminder message. While as many as 400 patients are in the home telehealth program, the anticipated number of participants meeting inclusion criteria was 70. The reason for this number is that the PVAHCS has been dis-enrolling Veterans whose response rates have been habitually low. A final sample of 40 participants completed the study.

Power Analysis

Power analysis of a paired *t*-test of Home Telehealth response rate indicates that an expected sample size of 100 participants can detect a statistically significant effect size of 25% using an alpha level of 5% and a power of 80%.

Project Evaluation Results

This planned project was submitted to, and reviewed by, the Chamberlain College of Nursing Institutional Review Board in addition to the Phoenix Veterans Health Administration Health Care System's Institutional Review Board. The evaluation of the planned change was done by running the Cardiocom Device Usage Detailed Report at the end of each week of the intervention period to gain primary data of Veterans' response rates. This tool shows each participant and under each day of the week it marks an R where there was a response, a NR where there was no response, or a S where the care coordinator placed the Veteran on Status, or exemption, for a known and pre-communicated situation causing the Veteran to not be able to answer such as being out of town, or hospitalized. Additionally, the tool shows the number of total reported, number of total not reported, total possible reported, % reported, and % not reported per week. See Appendix D for an example of a Cardiocom Device Usage Detailed Report. The reports were sterilized to remove the name of the Veterans or identifying element to protect Veteran identity. The privacy of the Veterans identification was maintained at all times. All information that is accessed for the purposes of this project was done on a VA computer which requires unique identification with a username and password of each user. Computer users are all trained in Health Insurance Portability and Accountability Act (HIPAA) and privacy security and are expected to maintain confidentiality of all Veterans. There was no need to take any documents or any reports away from the VA computer, therefore no risk existed in losing data or reports with Veterans' information on it.

Participants were recruited using a convenience sample. Veterans that were enrolled in the HT program at the PVAHCS were targeted using the inclusion and exclusion criteria stated below. Inclusion criteria included (a) all Veterans enrolled in the HT program at time of project, (b) must be enrolled in chronic care management (CCM) for a medical diagnosis (as opposed to being enrolled for a health promotion or disease prevention reason such as tobacco cessation), and (c) must be on Commander Flex device as only this device allows sending out messages. Exclusion criteria included (a) Veterans whose poor response rate is due to a known reason such as being out of town or hospitalized at a rate of more than two in a week or more than four in a four-week period, (b) Veterans enrolled in the HT program in health promotion or disease prevention (HP/DP) for things such as tobacco cessation and the MOVE weight loss program, (c) Veterans on devices other than Commander Flex, (d) Veterans enrolled whose response rate is $\geq 70\%$, (e) Veterans who are already receiving daily reminders, and (f) Veterans newly enrolled after the four weeks prior to intervention initiation or during the intervention period. In reviewing the report for the month of April of 2016, there were 100 Veterans who would have been in the study when applying the above inclusion and exclusion criteria. However, the PVAHCS has been actively disenrolling non-responding, or low-responding Veterans from the program, so the initial participant list began with 59 Veterans.

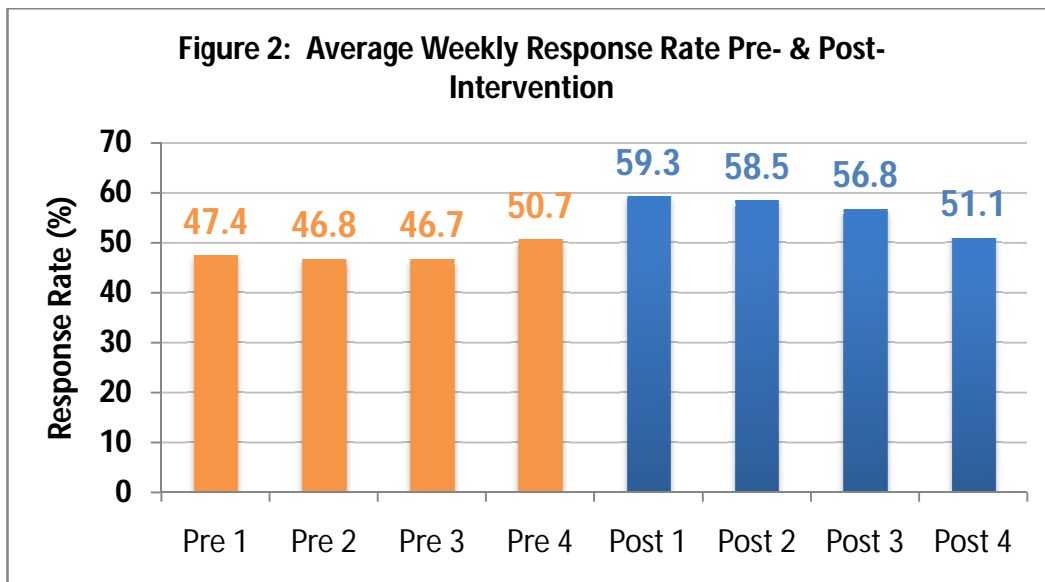
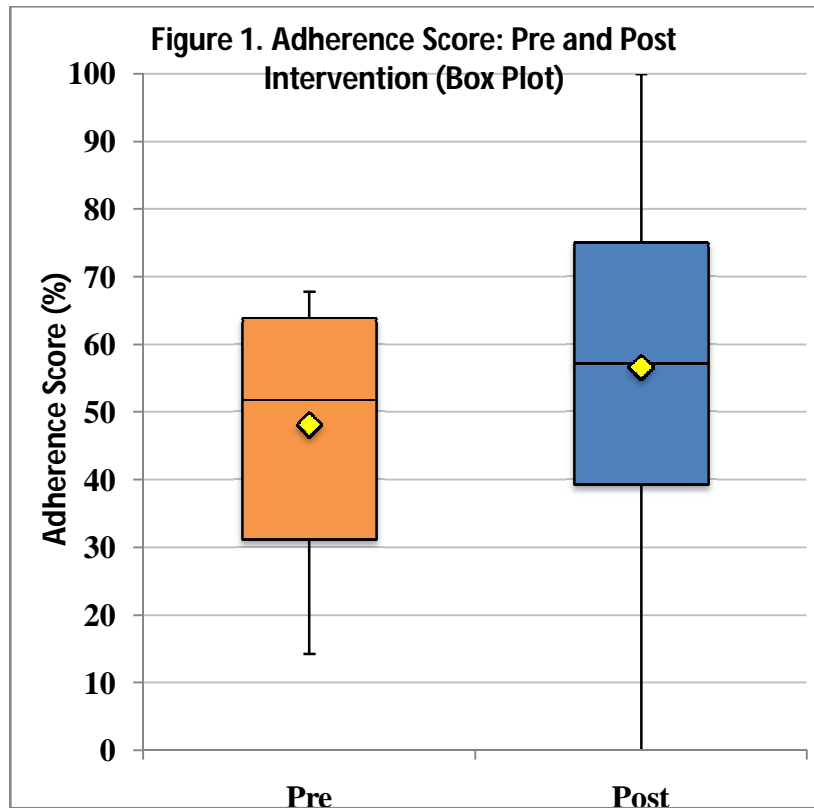
However, throughout the intervention period, several Veterans were taken off of the participant list for the following reasons: (a) death, (b) moving outside the service area, (c) discharge was already preplanned by the nurse care coordinator, (d) discharged from the program because the program goals were met, and (e) taken off of the participant list due to too many status (or exempt) days. The decision was made that if a participant had more than two status (or exempt) days in a week or more than four in a study period, that participant would be removed from the count. Forty participants completed the 4 week intervention period.

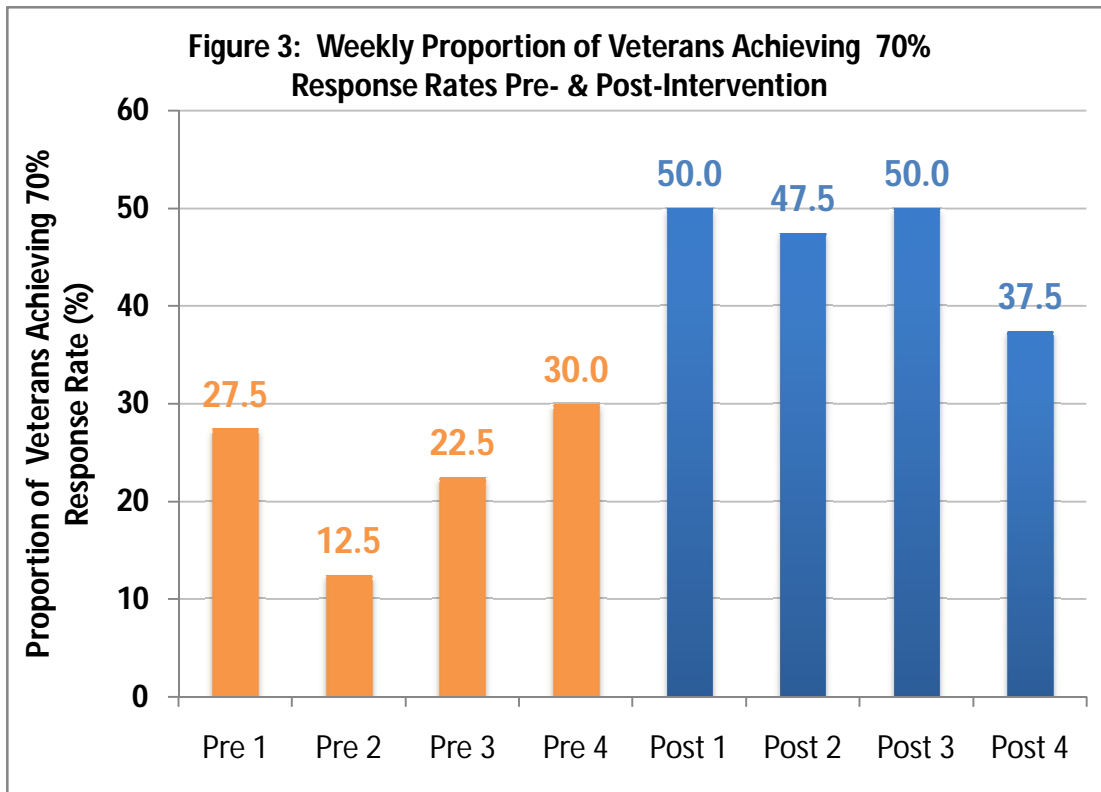
Evaluation using the Cardiocom Device Usage Detailed Report produces ratio measurement of the data. Ratio measurement has an absolute zero that is a meaningful data point. Some Veterans may not respond to messages any days at all and that is a meaningful measurement. In fact, the evaluation for the month of April of 2016 discovered that there were 17 Veterans who had a response rate of 0, which is a meaningful data point. Other Veterans may respond 15 out of 30 days which is equal to 50% of the time, while other Veterans may respond every day in a 30 day period which is equal to 100% of the time. A summary of demographic variables is reported in Table 1. Most participants had a primary diagnosis of Hypertension (42.5%) or Diabetes (42.5%), while far fewer had Heart Failure (10.0%) or COPD (5.0%). The average participant age was 63.7 years with a standard deviation of 11.1. A summary of study period Home Telehealth response rate is reported in Table 2. The average response rate significantly improved from 48.1% to 56.6% using a Wilcoxon-Mann-Whitney test ($Z=-2.113$, $p=0.035$). The proportion of participants achieving 70% response rate adherence Post-Intervention was 35.0%. A box plot depicting Home Telehealth response rate by study period is displayed in Figure 1. As reported in Table 3, 24 participants (60.0%) increased Home Telehealth response rate from Pre- to Post-Intervention; however, 3 (7.5%) remained unchanged and 13 (32.5%) decreased. Using a Wilcoxon-Mann-Whitney test, age was not statistically associated with change in Home Telehealth response rate between study periods ($Z=-0.967$, $p=0.333$). Using an ANOVA test, primary diagnosis was also not statistically associated with change in Home Telehealth response rate between study periods ($F=0.767$ $df=39$, $p=0.713$). This is important because it means that the intervention of electronic daily reminders will work no matter what age or diagnosis the patients have. A summary of weekly Home Telehealth response rate is displayed in Figure 2. The Post-Intervention weeks exceed the Pre-Intervention weeks with a slow decline as the weeks progress. A summary of weekly proportion of Home Telehealth response rate exceeding 70% adherent is displayed in Figure 3. The Post-Intervention weeks exceed the Pre-Intervention weeks also with a slow decline as the weeks progress.

Variable	n	%
Diagnosis		
Chronic Obstructive Pulmonary Disease	2	5.0
Diabetes	17	42.5
Heart Failure	4	10.0
Hypertension	17	42.5
Variable	Mean	S.D.
Age (years)	63.7	11.1
S.D.: Standard Deviation		

	Pre		Post		Improvement	
	Mean	SD	Mean	SD	%	p-value
Response Rate	48.1	16.0	56.6	26.7	8.5	0.035
	n	%	n	%	%	p-value
≥70% Adherent	0	0.0	14	35.0	35.0	N/A ¹
S.D.: Standard Deviation		¹ Not applicable when Pre is 0%.				

Table 3. Change in Home Telehealth Response Rate (N=40).		
	n	%
Increased	24	60.0
Unchanged	3	7.5
Decreased	13	32.5





Discussion and Implications for Nursing and Healthcare

Clinical non-adherence is a major cause of failure in self-management programs for chronic illnesses in outpatient settings (Gardetto, 2011; Rafii, et al., 2014). If patients were to adhere to the daily HT sessions, the management of their chronic diseases might improve. This project showed that a cost-effective and easy to implement intervention of electronic daily reminders to 40 Veterans at the PVAHCS resulted in an 8.5% increase in the HT response rate of the participating Veterans. The reminders utilized in this project did not cost the medical center any additional money and are a feature of the Cardiocom Commander Flex HT device.

The answer to the PICOT question that this project presented is yes, implementing electronic daily reminders to Veterans participating in the HT program at the PVAHCS will improve adherence to the program requirements. There were 24 participants (60%) in this study that displayed an increased telehealth response rate as a result of the intervention. Again, the program requires a minimum of 70% participation and through this project we see that 14 participants (35%) went from below this threshold to above as a result of the intervention. The limitations that this project has are the small sample size, the length of time of the intervention, and the need for using the Cardiocom Commander Flex device. In the four weeks of the intervention period we did see an increase in response rates but there was a steady slow decline from week to week. To further substantiate the effect of electronic daily reminders on patients' response rates over time, a longer study would be indicated. Something else to consider for healthcare organization looking at implementing this intervention into their HT programs is what devices they use and how will the reminder be sent if different devices are used other than the Cardiocom Commander Flex device. This device was chosen for this study as it is more widely used in the program at PVAHCS.

Some HT programs allow for web-based and cellphone-based HT sessions and will therefore require further exploration as to whether or not those methods of transmission have a built-in reminder capability. Reminders via text message on cell phones were readily discussed in the existing knowledge-base of this topic and can be considered as an option for those programs. In this project, several Veterans were excluded from the final count of participants, resulting in 40, due to having greater than two status (or exempt) days per week or more than four per intervention period. For clinicians looking to repeat this study, a recommendation would be for them to establish their threshold of allowable status days early and account for that when they plan on how many participants are intended for the project.

They will also need to decide if the status days are considered equivalent to days of nonresponse or are they truly exempt and decreases their total possible reporting days. Too many status days will cause the data to be skewed. For example, during one week of an intervention period, if out of 10 participants, 5 participants respond 5 days per week and have no responses for 2 days then their end of week response rate is 71.4%. On the other hand, if another 5 participants respond 2 days per week and are marked as being on status for the remaining 5 days for being out of town or hospitalized, the project coordinator will need to decide how to address those participants. They did not do a daily response, but had a valid reason for not doing so. Should that be considered the same as a participant who did not do a daily response and did not have a valid reason such as being out of town or hospitalized? For this reason, in this project, the status days were considered different than regular days of nonresponse and a threshold was made to limit the status days to 2 per week or 4 per intervention period.

Plans for Dissemination

There are different internal and external methods of dissemination of the project outcomes after the completion of this project. The plan is to use internal and external dissemination methods to share the outcomes of this project. First, for internal dissemination, the HT team (nurse care coordinators, program support assistants of HT department, Lead RN, and Facility Telehealth Coordinator) were informed of the results of the DNP Project. They were happy enthusiastic upon hearing the results and the conversation immediately went towards whether or not to change the SOP for HT to include the utilization of electronic daily reminders. Some of the conversation that took place included whether to include this intervention from time of admission, or whether the intervention should be included on if/when participation levels drop below the required threshold.

Next, there was a formal presentation to the group outlining the statistical analysis of the data and translating that into what it means for the Veterans on the program. This was followed up by discussions on editing the internal SOP for handling non-responders in the HT program. Additionally, there are plans on presenting the process of the project and the final outcomes of my project to the Evidence Based Practice Committee at the medical center. This would be a similar presentation as to the HT Team. Finally, there is intent to disseminate the outcomes of this project externally as well. External dissemination has multiple layers. First, I am scheduled to attend the University of Colorado Health 29th Annual Rocky Mountain Inter professional Research and Evidence Based Practice Symposium. This is a national conference to be held in Denver, Colorado in April, 2017. My abstract for a poster presentation has been accepted and I will be there to present. Then there is a plan on publishing the outcomes of this project to a peer reviewed journal to share the outcomes with those inquiring to learn more about technology in healthcare, telemedicine, telehealth, nursing informatics, and other interested bodies. Finally, I am in conversations with the Writer/Communications Specialist from University of Arizona College of Medicine - Tucson who is the representative of the Arizona Telemedicine Program.

Her role is the interview telehealth stakeholders and author Telehealth Blogs in the Arizona Telemedicine Program Magazine. We discussed my DNP Project and its findings as a blog and other innovative telehealth endeavors that we are doing at the Phoenix VA Health Care System. It has been approved as an upcoming story in the Arizona Telemedicine Program magazine.

Summary and Conclusion

The intent of this paper was to describe a scholarly project that was implemented at the PVAHCS whose goal was to answer the question of whether or not adherence, or participation rates, can be increased in Veterans participating in the HT program at the PVAHCS with the implementation of electronic daily reminders. The PVAHCS has an HT program that enrolls Veterans with chronic conditions and aims to provide education and teach Veterans mechanisms by which to manage their chronic health conditions. Veterans on the HT program are assigned to a nurse care coordinator, they receive an in-home device, and the Veterans complete daily HT sessions on their HT devices.

The nurse care coordinators then receive the responses from the Veterans, they formulate trends of vital signs, weights, and symptoms, and case manage the Veteran to provide timely correction of non-acute care issues to prevent exacerbation of a chronic illness to an acute situation requiring a higher level of care. This project was aimed at implementing an electronic daily reminder to the Veterans who are not responding at the program-required level of at least 70% of the time on their HT devices. Inclusion and exclusion criteria were used to identify the Veterans whose response rate is less than 70%, who are on the HT device that allows for unidirectional reminder messages, and who do not currently receive daily reminder messages.

An implementation period of 4 weeks was completed where a daily reminder message was sent reminding the Veterans to complete their daily HT session and reminding them of the importance of the daily HT sessions. After the implementation period of four weeks, their post-intervention response rates were compared to their pre-intervention response rates. There are research studies that suggest that the implementation of daily reminders have been used successfully to increase treatment adherence. Indeed, the findings of this project display that electronic daily reminders have resulted in an 8.5% increase in the HT response rate of the participating Veterans. Additionally, 60% of the participants in this study displayed an increased telehealth response rate and a compelling 35% of the participants in this project went from below a 70% participation rate to $\geq 70\%$ as a result of this intervention. For healthcare organizations with poor participant rates in their HT programs who are looking for a cost-effective solution to poor HT response rates, electronic daily reminders can be used to increase adherence to program requirements.

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Appendix A

Summary of Primary Research Evidence

	Citation	Question or Hypotheses	Theoretical Foundation	Research Design (include tools) and Sample Size	Key Findings	Recommendations/Implications	Level of Evidence
1	Armstrong, A. W., Watson, A. J., Makredes, M., Frangos, J. E., Kimball, A. B., Kvedar, J. C., (2009). Text-message reminders to improve sunscreen use. <i>Archives of Dermatology</i> , (145)11, 1230-1236.	What is the effect of an electronic text-message reminder system on adherence to sunscreen application?	None	-RCT -70 participants -6 week study -adherence to daily sunscreen use was appraised using a novel electronic monitoring device to track when the sunscreen bottle was opened. - reminders were sent daily between 6:30 AM and 7 AM, and a variety of "prompt" messages were used to help maintain participant interest. -(41 references)	-the 35 participants who did not get reminders had an average daily adherence rate of 12.6 days or 30.0% - the 35 participants who did get TM every day as a reminder had an average daily adherence rate of 23.6 days or 56.1%	-Data showed that adherence rate between the 2 groups started to differ significantly by week 2 of the study. - a simple daily reminder could maintain adherence to sunscreen application during a 6-week study period, thereby encouraging sun-protective behavior on a short-term basis. -not all socioeconomic groups have cell phones. -long term benefit of reminders has not yet been demonstrated. -although electronic monitors instantaneously transmitted information on the dates and times the sunscreen bottle was opened, they were not able to assess how much and where the sunscreen was applied.	II
2	Cocosila, M., Archer, N., Haynes, R. B., Yuan, Y., (2009). Can wireless text messaging improve	To determine the usefulness of TM on mobile phones for improving adherence to a healthy	None	-A randomised, unblinded, controlled trial -102 subjects -1 month study -data was collected	- 51 participants in intervention group reported missing 2.5 vitamins on average	-measuring adherence through self-reports presents a great deal of approximation because of participant tendency of over-estimation in post hoc reports	III

	<p>adherence to preventive activities? Results of a randomised controlled trial.</p> <p><i>International Journal of Medical Informatics, (78), 230-238.</i></p>	<p>behavior (taking 1 vitamin C tablet daily for the duration of a month for preventive reasons.)</p>		<p>thru baseline and endpoint web surveys -first 2 weeks intervention group received daily messages; last 2 weeks frequency was decreased to 1 reminding-basic text QOD, and either a message aimed as a reminder / reinforcer or a message aimed as a reminding / correcting Q3 days.</p> <p>-(37 references)</p>	<p>in the last week compared to the baseline where they reported an average of 1.3 vitamin pills per week (this indicates an increase in compliance by 246%.)</p> <p>-48 participants in control group reported missing 3.3 vitamins on average in the last week (adherence increased from 1.6 initially to 3.7 at endpoint, resulting in compliance increase by 131%.)</p>		
3	<p>Maduka, O., Tobin-West, C. I., (2013). Adherence counseling and reminder text messages improve uptake of antiretroviral therapy in a tertiary hospital in Nigeria.</p>	<p>What effect on adherence does counseling and text message reminders have on improving patients' adherence to Highly Active Anti-Retroviral Therapy?</p>	<p>None</p>	<p>-RCT -104 patients -4 months -The intervention group received monthly adherence counseling and twice weekly short message reminders for four months, while the</p>	<p>-76.9% of the intervention group and 55.8% of the control group achieved adherence. -median CD4+ cell count of the intervention group increased from 193</p>	<p>A combination of adherence counseling and text message reminders improved adherence among HIV patients. Its adoption for HIV patient management is advocated.</p>	11

	<i>Nigerian Journal of Clinical Practice, (16)3, 302-308.</i>			control group received only standard care. Self-reported adherence and CD4+ cell counts were measured pre- and post intervention. -1 adherence counseling session per mo for 4 mos. -SMS reminder twice per week (Mon & Thurs) for duration of 4 mos. -(30 references)	cells/ml to 575.0 cells/ml -median CD4+ cell count of the control group increased from 131.0 cells/ml to 361.5 cells/ml in the control group		
4	Nundy, S., Razi, R. R., Dick, J. J., Smith, B., Mayo, A., O'Connor, A., Meltzer, D. O., (2013). A text messaging intervention to improve heart failure self management after hospital discharge in a largely African-American population: Before-after study.	To assess the feasibility and acceptability of a text message-based (SMS: short message service) intervention in a largely African American population with ADHF and explore its effects on self-management.	None	-pilot study designed as a single-arm prospective study. -15 patients enrolled (a total of 6 patients (5 Black, 1 Caucasian) completed the entire study including pre-intervention and post-intervention surveys. -for 30 days following discharge -Messages delivered	- Maintenance (mean composite score 49 to 78) and management (57 to 86) improved at 4 weeks, however confidence did not change as much (57 to 75) -Of the 6 SCHFI items that showed a significant improvement, 5 were specifically targeted by	-The TM intervention was linked to improvements in self-care maintenance and management. -24% of patients approached for recruitment did not own a personal cell phone	VII

	<i>Journal of Medical Internet Research</i> , (15)3, e53.			reminders on self-care and provided education on healthcare navigation, ability to recognize symptoms, and diet. -(26 references)	the text messaging intervention .		
5	Pena-Robichaux, V., Kvedar, J. C., Watson, A. J., (2010). Text messages as a reminder aid and educational tool in adults and adolescents with atopic dermatitis: A pilot study. <i>Dermatology Research and Practice</i> , (2010), 1-6.	(1) Are TMs effective in improving the adherence to treatment, self-care behaviors, severity of illness, and quality of life for adults & adolescents with AD. (2) What is the usability and satisfaction of the TM system.	None	-pilot study with no control group -27 participants enrolled, 25 completed the study -6 weeks -all study participants received a daily TM that: (1) reminded them to continue their current treatment for AD, or (2) provided them with educational information about AD. -TMs altered between reminder to continue AD tx (3x/wk) and education (4x/wk) . -pre and post skin evaluations were done to assess the severity of participants'	-Significant improvements in the adherence to treatment, self-care behaviors, skin severity, and quality of life were noted post intervention . -User feedback on the TM system was positive with 88%and 92% of participants reporting that the reminder TMs and educational TMs were helpful, respectively .	-TMs may be effective as a reminder aid and educational tool in young patients with AD. –The implications of the possible impact of this intervention on clinical outcomes in this patient population should be Confirmed by a randomized controlled trial. -Further research is also needed to explore the possibility of incorporating TMs into the management of patients with other chronic dermatologic diseases (acne, psoriasis, etc.).	VII

				AD. -(32 references)			
6	Strandbygaard, U., Thomsen, S. F., Backer, V., (2010). A daily SMS reminder increases adherence to asthma treatment: A three-month follow-up study. <i>Respiratory Medicine</i> , (104), 166-171.	What is the impact of receiving a daily text message reminder on one's cell phone on adherence to asthma treatment.	None	-RCT follow-up study -26 subjects -12 weeks -at week 4 subjects were randomized to either 1) receiving daily TM-a reminder to take their asthma medication (the SMS group), or 2) not receiving TM reminders (the control group) -(15 references)	-From the 4 th week to the 12 th week, the average adherence rate in the Message group went up from 77.9% to 81.5% -From the 4 th week to the 12 th week, the average adherence rate in the control group reduced from 84.2% to 70.1%;	-This 12-week follow-up study revealed that patients with asthma that received a TM reminder every day on their mobile phone remember to take, on average, approximately 18% more doses of anti-asthmatic medication compared with asthmatic patients who do not receive TM reminders.	II
7	Dobson, R., et al., (2015). Diabetes text-message self-management support program (SMS4BG): A pilot study. <i>Journal of Medical Internet Research Mobile Health and Ubiquitous Health</i> , (3)1, 1-9.	To determine the usability and acceptability of SMS4BG among adults with poorly controlled diabetes.	Social Cognitive Theory; Common Sense Model	- Nonrandomized pilot study (no control group) -42 participants -3 months -At the end of the program all participants (including those that withdrew) were asked to complete questions about their satisfaction with the program, its usefulness and usability, and	-This pilot study has established that SMS4BG is an acceptable and potentially useful tool for adults with poorly controlled diabetes. -Perceived positive impacts of the program were complemented by a significant improvement in glycemic	-Strengths of the SMS4BG program included that it was theoretically informed, system initiated (ongoing intervention not dependent on participant behaviors), personally tailored, and provided participant choice. -This study adds to the evidence for the use of TM in providing personally tailored diabetes self-management support and, particularly, the use of text messaging as a medium of delivery.	VI

				<p>perceived positive impacts, via a semi structured telephone interview conducted by a research assistant.</p> <p>-The SMS4BG program was designed so that text messages were send-only (unidirectional) with the exception of the blood glucose monitoring reminders, which provided the option for participants to reply with their blood glucose test results.</p> <p>-individuals could also select the frequency and timing of blood glucose monitoring reminder messages- from 1 per week to up to 4 per day.</p> <p>-average of 13 messages per week</p> <p>-(25 references)</p>	<p>control at follow-up.</p> <p>-all participants reporting SMS4BG to be both culturally and age appropriate</p>		
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8	Downer, S. R., Meara, J. G., Da Costa, A. C., Sethuraman K., (2006). SMS text messaging improves outpatient attendance. <i>Australian Health Review</i> , (30)3, 389-396.	What is the operational and financial efficacy of sending TM reminders to patients who have scheduled outpatient clinic appointments that need to be attended.	None	-cohort study with historical control -45,110 participants (trial group = 22,658), (historical control group = 22,454) -3 months -(14 references)	-in trial group, 20,448 patients (90.2%) attended their appointments -in historical control group in the same months, but 1 year prior, did not receive sms texts – 18,073 patients (80.5%) attended their appointments.	-sms text messaging is a very efficacious technique to improve clinic attendance, access to services and revenue generation in the ambulatory care setting	IV
9	Suffoletto, B., Calabria, J., Ross, A., Callaway, C., (2012). A mobile phone text message program to measure oral antibiotic use and provide feedback on adherence to patients discharged from the emergency department. <i>Academic Emergency Medicine</i> , (19), 949-958.	Does sending automated TMs improve adherence to taking post-discharge antibiotic prescriptions?	None	-RCT in an urban Emergency Room -144 participants -convenience sample -Subjects received either a daily TM query about prescription pickup, and then dosage taken, with educational feedback based on their responses (intervention), or the usual printed discharge instructions	-the proportion of participants adherent in the intervention group was 57% versus 45% in the control group. -The proportion of intervention participants who had filled their prescriptions in the first 24 hours following discharge was 78% versus 69% in control	-sms text messages result in a slight, but not significant, increase in adherence in the intervention group.	II

				with no TM component (control). -(44 references)	participants -The proportion of intervention participants who had no pills left was 68% versus 59% in control participants -The proportion of participants with any reported problem remembering to take their antibiotics in the intervention group was 19% versus 26% in the control group		
10	Khokhar, A., (2009). Short text messages (SMS) as a reminder system for making working women from Delhi breast aware. <i>Asian Pacific Journal of Cancer Prevention</i> , (10)2, 319-322.	Does sending monthly text message reminders make women more adherent to performing breast self examinations?	None	-pre-post -106 working women in India -participants volunteered to be in the study. -6 months -monthly text message reminders were sent -measures were gathered from self report.	-After the first 2 months of sending monthly text reminders the practice of BSE increased significantly -From amongst those who did not do the self exam the main barriers to BSE identified	-sms text messages cause adherence to BSE completion to increase.	IV

					were that they forgot to do it and will do it now (54%), busy (47%), anxiety (12%), pain in the breasts (4%), and some question regarding the exam (4%).		
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Appendix B

Summary of Systematic Reviews (SR)

Citation	Question	Search Strategy	Inclusion/Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/Implications	Level of Evidence
Cole-Lewis, H., & Kershaw, T., (2010). Text messaging as a tool for behavior change in disease prevention and management. <i>Epidemiologic Reviews</i> , (32), 56-69.	What does literature say about behavior change interventions for disease management and prevention delivered through text messaging?	-systematic review -comprehensive electronic literature search was conducted between May and June 2009 for relevant articles published to date using MEDLINE, Cochrane Library, Google Scholar, PsychINFO, and PubMed	-Only those interventions using text message as the primary mode of communication were included from randomized or quasi-experimental controlled trials of text message interventions published in peer-reviewed journals by June 2009. -Studies were required to measure the impact of text message interventions by assessing change in health behavior, health outcomes, and/or clinical outcomes using	-17 articles included -Intervention length ranged from 3 months to 12 months, none had long-term follow-up, and message frequency varied.	-The majority of the studies (8) found evidence of a short term effect regarding a behavioral or clinical outcome related to disease prevention and management. -Of those that found no evidence of effect, only one had sufficient power to detect an effect in the primary outcome. -Evidence for text messaging in disease prevention and management interventions was observed for weight loss, smoking cessation, and	-Text messaging is a tool that has value to both researchers and practitioners, and use of these technologies may facilitate more active collaboration between research and clinical practice. -This review supports the feasibility of using text messaging to effect behavior change.	V

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
			<p>pre-/posttests.</p> <p>-studies had to be published in a peer-reviewed journal.</p> <p>-Studies utilizing communication technologies other than mobile phone text messaging, such as the Internet, e-mail, phone calls, or video messaging, were included only if text messaging was the primary mode of communication and the other technologies were supplementary</p>		<p>diabetes management.</p> <p>-Effects appeared to exist among adolescents and adults, among minority and nonminority populations, and across nationalities.</p>		
<p>Wei, J., Hollin, I., Kachnowski, S., (2011). A review of the use of mobile phone text messaging in clinical and healthy behaviour interventions. <i>Journal of Telemedicine and Telecare</i>, (17),41-48.</p>	<p>Is text messaging (TM) useful for clinical and healthy behavior interventions?</p>	<p>-electronic literature search of PubMed, Medline and the Web of Science for articles published from January 2000 to December 2009.</p> <p>-A combination of keywords related to text messaging and health interventions were applied, including: SMS health, SMS reminder, SMS medication adherence, text</p>	<p>-Eligible articles were those which evaluated the use of textmessaging as a health-care intervention for a form of clinical outcome or behaviour modification.</p> <p>-included relevant feasibility and acceptability trials, provided they quantified the intervention assessment.</p> <p>-excluded studies on</p>	<p>-24 articles total</p> <p>-7 articles focused on medication adherence</p> <p>-8 focused on clinical care management,</p> <p>-9 focused on preventive behaviour Modification</p> <p>-In terms of study design, 16 were randomized controlled trials (RCTs), 5 were non-controlled pre-post comparison studies, and 3 were feasibility pilots not</p>	<p>-TM demonstrated good acceptance and early efficacy in moststudies.</p> <p>-Investigators may use customized TM to deliver reminders, support and education to patients, and offer an effective platform to collect adherence, test results and self-monitored data.</p> <p>Methodological</p>	<p>-evidence that TM can be an effective tool for improving clinical outcomes and healthy behaviour modifications.</p> <p>-Incorporating TM into routine clinical practice and self-monitoring may improve the efficiency of health care.</p> <p>-the evidence base is compromised by methodological limitations and is not yet conclusive.</p> <p>-TM is a ubiquitous and low-cost medium which</p>	V

Citation	Question	Search Strategy	Inclusion/Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/Implications	Level of Evidence
		messaging health, text message compliance, text message reminder and text message medication adherence. -Reference lists of articles of interest were also searched.	outpatient appointment reminders or vaccination outreach because attendance can be related to a complex set of patient- and provider-related factors such as poor health status, transportation problems, family and work commitments and administrative inadequacies -also excluded studies assessing a comprehensive intervention package with text messaging as a component, because it was not possible to isolate the effectiveness of text messaging	reporting a behavioural outcome -Their sample sizes ranged from 16 to 1705. -Only 2 studies attained sufficient sample sizes based on prior power and sample size calculation. -Study periods ranged from 1 to 12 months. - These studies were conducted in 14 countries and their populations varied	Limitations: -many studies were under-powered and not able to detect significant differences. -evaluation periods were generally too short to make valid inferences about long-term efficacy. -The widely varying intervention modes and clinical settings make it difficult to generalize from the results.	appears promising for various large-scale public health initiatives.	

Appendix C

SWOT Analysis

Internal Forces (project)	External Forces (organization or environment)
<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> -no added cost to implement this DNP project -no added technology or staff required to implement this DNP project -this DNP project is backed up by all the necessary stakeholders -already approved by VA IRB -HT Lead and nurse care coordinator assigned to help with this DNP project -there is a VA national push to expand telehealth usage -there is a VA national push to find ways to decrease the number of nonresponding Veterans and improve clinical adherence to daily HT sessions -Growing demand to find ways to prevent hospitalizations and increase access to care 	<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> -may save the VA money by not paying monthly for Veterans who do not fully intend to participate in the program daily as intended. The Veterans that do not want to participate daily may dis-enroll. -smarter use of VA money – paying only for those Veterans who respond daily and maximize on the benefits of the program -publication opportunity as this DNP student and VA is looking to publish the results of the DNP project and VA leaders are in full support of publishing
<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> -cannot send daily clinical reminder to the Veterans who are participating in the HT program on the Interactive Voice Response method, nor on the Net Response, can only be sent on Commander Flex device. 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> -Veterans may look at a daily reminder as a repeating annoyance -Nurse care coordinators may feel like DNP student is invading their work, their panel of patients, and may not fully support DNP student's involvement -not knowing when to send the reminder (if they get the reminder when they are at work, it may not cause their response rates to stay low)

Appendix D

Data Collection Tool for Evaluation (sample Cardiocom Device Usage Detail Report)
<https://itl.cardiocom.cc.med.va.gov/Global/RecordManagement.aspx>

CARDIOCOM
EXPERTS IN TELEHEALTH™

Device Usage Detail Report Report Period: 4/1/2016 - 4/30/2016
Days in Report Period: 30

Primary Filter: Managed Group: 644 - Phoenix (VISN 18)
Secondary Filter: Device Type: Commander Flex

Device Usage Summary

Managed Group	Total Status	Total Reported	Total Possible	% Not Reported	% Reported	
644 - Phoenix (VISN 18)	231	9410	2027	10942	23.1%	78.9%

Device Usage Detail

KEY: S = Status NR = Not Reported R = Reported X = Not Enrolled or Device Not Activated Bold Date = Weekend

Last Name	First Name	SSN	DOB	04/01/16	04/02/16	04/03/16	04/04/16	04/05/16	04/06/16	04/07/16	04/08/16	04/09/16	04/10/16	04/11/16	04/12/16	04/13/16	04/14/16	04/15/16	04/16/16	04/17/16	04/18/16	04/19/16	04/20/16	04/21/16	04/22/16	04/23/16	04/24/16	04/25/16	04/26/16	04/27/16	04/28/16	04/29/16	04/30/16	Total	Total	Total	%			
Names blocked																																								

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CARDIOCOM
EXPERTS IN TELEHEALTH™

Device Usage Detail Report Report Period: 4/1/2016 - 4/30/2016
Days in Report Period: 30

Primary Filter: Managed Group: 644 - Phoenix (VISN 18)
Secondary Filter: Device Type: Commander Flex

Device Usage Detail

KEY: S = Status NR = Not Reported R = Reported X = Not Enrolled or Device Not Activated Bold Date = Weekend

Last Name	First Name	SSN	DOB	04/01/16	04/02/16	04/03/16	04/04/16	04/05/16	04/06/16	04/07/16	04/08/16	04/09/16	04/10/16	04/11/16	04/12/16	04/13/16	04/14/16	04/15/16	04/16/16	04/17/16	04/18/16	04/19/16	04/20/16	04/21/16	04/22/16	04/23/16	04/24/16	04/25/16	04/26/16	04/27/16	04/28/16	04/29/16	04/30/16	Total	Total	Total	%			
Names blocked																																								

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