Doctor of Nursing Practice Project

Entitled

Utilizing the SmokefreeTXT Text Messaging Service to Aid Smokers to Stop Smoking in a

Primary Care Setting

by

Alexander L. Young

Submitted as partial fulfillment of the requirements for the
Doctor of Nursing Practice Degree

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Dr. Huey-Shys Chen, RN, PhD, MCHES, FAAN
Doctoral Project, Chair

_____
Jaclyn Lanham, DNP, MSN, FNP-BC
Doctoral Project, Committee Member

_____
Kristina Reuille, PhD, RN
Doctoral Project, Committee Member

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An Abstract of

Utilizing the SmokefreeTXT Text Messaging Service to Aid Smokers to Stop Smoking

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According to the CDC, 17.8% of people in the United States are current smokers. 23.4%

of Ohioans smoke cigarettes daily, which is significantly greater than the national average. In the

clinical setting where the project took place, approximately one third of patients who came into

the office stated they were active smokers. Review of evidence suggests that text message-based

smoking cessation interventions are an effective means of smoking cessation. This project sought

to answer the PICOT question: (P) In current smokers aged 18-65 in a privately-owned family

practice in a large urban city in southwest Ohio (I) will using SmokefreeTXT text-messaging

service, or SmokefreeTXT in conjunction with NRT (C) compared to patients who do not wish to

stop smoking (O) increase smoking cessation rates (T) over the course of the six-week

intervention duration? The Stetler Model of Research Utilization was used to guide the

implementation of the project. The proposed project was implemented at a family practice office

in a large urban city. Patients were predominantly African American with Medicare and

Medicaid insurances. Patients were provided a pre-assessment tool and were offered the

opportunity to participate in this project if they met inclusion criteria. Three groups participated

in the project: a control group which consisted of smokers who did not wish to stop smoking, and

two intervention groups. The first intervention group used only SmokefreeTXT (SFTXTO) in their smoking cessation attempt. The second group used SmokefreeTXT (SFTXTP) in addition to a nicotine replacement therapy. The first group consisted of patients who wished to solely use SmokefreeTXT during their quit attempt. They did not use any other smoking cessation intervention. The second group consisted of patients who chose to use SmokefreeTXT in conjunction with another means of smoking cessation (nicotine replacement therapy, medication, etc.). The third group was a control group who were current smokers, willing to complete the pre- and post- assessments, but who were not interested in quitting smoking at the time. At the end of the program, a post-assessment was administered to determine what changes in smoking habits occurred between the three groups. The specific outcomes measured during this project are the stage of smoking status measured by the Smoking: Adult Stage of Change (Short Form) tool and the Nicotine Dependence score measured by the Fagerstrom Test for Nicotine Dependence (FTND) questionnaire at the beginning and end of the project. In addition, patient satisfaction with the SmokefreeTXT was collected at the end of the project. SPSS was used for statistical analysis. There was a statistically significant reduction in the FTND scores and levels in the intervention groups. There was a statistically significant change in the stage of smoking cessation change in both intervention groups. Participants found SmokefreeTXT to be helpful, convenient, and easy to use. They enjoyed the messages and support they received, and many of them stated that without SmokefreeTXT they would not have been successful in their quit-attempt. SmokefreeTXT provides an alternative or supplement to the current smoking cessation treatment options. The provider where the project took place has already begun recommending SmokefreeTXT to patients wishing to stop smoking.

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Description of the Clinical Issue

Cigarette smoking is known to cause cancer, heart disease, diabetes, and respiratory diseases including chronic obstructive pulmonary disease among others (CDC, 2015). The CDC (2015) states that cigarette smoking is attributed to an annual spending of $170 billion on direct healthcare related expenses in the U.S. In addition, $156 billion are spent on lost productivity as a result of premature death and secondhand smoke exposure (CDC, 2015). According to the CDC (2015), 17.8% of the United States' population are current smokers and 23.4% of Ohioans smoke cigarettes on a daily basis, which is significantly greater than the national average. With the increased awareness of the harmful consequences of cigarette smoking, and increased public education and awareness efforts, smoking cessation efforts have increased in the United States. As of 2010, 69% of people stated they would like to stop smoking, and more than half of all smokers made an attempt to stop smoking (CDC, 2011). These smoking cessation efforts need to be supported to assist more people to stop smoking.

The prevalence of mobile phones offers a powerful tool in the smoking cessation effort. New mobile phone apps and text messaging services are continually being developed and tested to make smoking cessation more accessible than ever. While not all cell phones are enabled to use data and run apps, most cell phones are able to send and receive text messages. This allows greater access to a very large number of people and makes programs like SmokefreeTXT even more relevant as either a primary therapy, or as an adjunct therapy to nicotine replacement therapies and medications.

Helping patients stop smoking is important because many of the patients who smoke have additional chronic illnesses including heart disease, hypertension, diabetes, and lung disease including asthma and COPD. These chronic health diseases are worsened by cigarette smoking

and contribute to greater health costs, decreased personal earnings, higher insurance premiums, and lost wages from missed work. Assisting people to quit smoking will have a positive impact on patient's health and well-being, as well as a financial impact on their lives.

Practice Gap

While there was no formal analysis of the prevalence of patients who smoked cigarettes at the office where the project was conducted, approximately half of patients who came into the office stated they smoke cigarettes daily. The large percentage of smokers seen by this office demonstrates a need for smoking cessation interventions such as the one utilized in this project. The office where this project took place is a suburb of a large urban city in Ohio. The patients were predominantly African Americans who had insurance through Medicare and Medicaid. Many patients were also private-pay patients with no subsidized, or private health insurance. A large number of the patients were of lower socio-economic status and could not afford to purchase typical smoking cessation aids such as nicotine replacement patches or gum (which are not covered by Medicaid).

Additionally, many patients seen in this office had additional chronic illnesses like heart disease, hypertension, asthma, COPD, and diabetes. These patients were at much greater risk of worsening the chronic nature of the illness, or of triggering an acute event. Reaching these patients and assisting them to stop smoking was of utmost importance to prevent them from requiring an emergency room visit, or having a greater risk of morbidity or mortality.

<div align="center">PICOT Question</div>

This Evidence Based Practice Project (EBP) is guided by the following PICOT question: (P) In current smokers aged 18-65 in a privately-owned family practice in a large urban city in southwest Ohio (I) will using the SmokefreeTXT text-messaging service, or SmokefreeTXT in

conjunction with NRT (C) compared to patients who do not wish to stop smoking (O) increase smoking cessation rates (T) over the course of the six-week intervention duration?

The goals of this project were to improve the quality of patient health, promote healthy lifestyle choices, reduce the financial burden of patients living in an urban area who largely depend on Medicare and Medicaid for their healthcare needs, and to provide an additional smoking cessation modality for healthcare providers.

Theoretical Framework

The Transtheoretical Model of Change (TTM) was used to assess the smoking stage of patients participating in this EBP project. The TTM is comprised of six stages: Precontemplation, Contemplation, Preparation, Action, Maintenance, and Termination (Prochaska & Velicer, 1997).

Precontemplation is the first stage, in which people have no intention of changing their behavior within the foreseeable future, typically considered to be a time period of about six months. Prochaska & Velicer (1997) state that people are typically in this stage because they are ignorant of the consequences of the behavior they are partaking in or have attempted to make a behavior change in the past, but failed and have lost confidence in their ability to make the change in question. These patients may not be willing to consider any type of intervention or behavior change at this point.

The second stage is Contemplation during which the person is considering modifying their behavior within the next six months (Prochaska & Velicer, 1997). This stage can be longer than other stages because, while the patient is aware of the advantages, they may fixate on the disadvantages of the proposed change and be unwilling to fully commit to the change action in question. As a consequence, the patient may stay in this stage for a longer period of time than would otherwise occur (Prochaska & Velicer, 1997).

The Preparation stage involves the patient's preparation for imminent action within the next month or so (Prochaska & Velicer, 1997). The patient may have already started taking overt action toward the behavior change in the form of counseling, a class, or buying a self-help book etc. These patients were more likely to be interested in participating in this EBP project as they were not yet actively trying to quit, but were interested in taking action in the short term.

In the Action stage the patient has made specific, overt changes to their behaviors within the past six months with meaningful progress towards the permanent action change. In the case of smoking, the patient should have completely stopped smoking to be considered to in the action stage (Prochaska & Velicer, 1997). Patients who had already stopped smoking were not part of the target population for this EBP project because they had already made changes necessary to stop smoking. The SmokefreeTXT program is meant to help patients stop smoking, rather than to influence their confidence in their effort to maintain their smoking cessation.

Patients in the Maintenance stage have changed the target behavior and are less tempted to relapse back to their old behavior (Prochaska & Velicer, 1997). These people are more established in their change patterns and are not as likely to adopt new change behaviors like patients in the action stage. The maintenance stage can last anywhere from six months to five years, and the longer the maintenance stage, the more likely the change behavior is to remain a permanent change without fear of relapse. The aim of this project is to assist patients to stop smoking. If the patient can maintain their non-smoking status to the point where they are able to reach the maintenance stage, they are much more likely to eventually reach the termination stage in which they experience no temptation at all to smoke a cigarette again. Achieving this stage is not within the scope of this project, but it remains the ultimate goal as a future provider to help patients completely stop smoking.

The final stage is Termination. In the Termination stage, patients have made the change behavior permanent and are not even remotely tempted to relapse to their old behavior (Prochaska & Velicer, 1997). Regardless of whether the patient is sad, upset, depressed or otherwise emotionally or physically challenged, they have developed coping mechanisms that will prevent them from going back to the old behavior.

This EBP project specifically targets patients in the Preparation stage of the TTM. These patients were most able to make the transition to the Action stage of the TTM. The DNP student did not follow the patients' transitions to the Maintenance stage due to the brevity of the project.

The TTM was chosen to demonstrate the stage of change in this project because it has a strong history of use in smoking cessation literature. Additionally, it provided quantifiable categories to assign patients to enabling them to be compared during the post-intervention screening. Although the target population was specific and needed to be in the Preparation stage, it was a fast and simple measurement to determine if they successfully transitioned to the Action stage at the end of the intervention.

Evidence Based Practice Model

The EBP model used for this project was Stetler's Model of Research Utilization (SMRU). The Stetler model provides a prescriptive approach to implementing an EBP project. The model is comprised of five stages containing sub-sections that clarify and expand each of the primary headings.

Phase I is the preparation stage. During the preparation stage, the literature review was conducted and sorted for review (Stetler, 2001). Stetler (2001) specifically states that systematic reviews should be sought out and that any literature that is specific to the EBP project question be searched for as well. Phase I required the DNP student to consider influential factors, affirm

priority, and define purpose & outcomes related to the issue or catalyst. The potential issue or catalyst was defined as the organizational factors or current practices that precipitated the necessity of the project.

Phase II: Validation is the stage at which the literature selected for the project is to be critically reviewed, and the credibility of the findings examined and criticized (Stetler, 2001). To do this, the Strength of Recommendation Taxonomy (SORT) by Ebell et al. (2004) was used. Stetler (2001) states that the research base should be rated according to a "table of evidence," which is provided by the SORT tool. Literature should be assessed a second time to determine its suitability for use as part of the EBP project during this phase (Stetler, 2001). Finally, a rough outline of how the project will be designed and laid out must be completed (Stetler, 2001).

Phase III: Comparative Evaluation and Decision Making requires an evaluation of the fit of the setting, the feasibility of the project, the substantiating evidence and the current practice of the institution where the project is to take place (Stetler, 2001). Once those elements are considered, a decision is ultimately made whether or not to implement the project (Stetler, 2001). The findings should be synthesized and displayed in an easy to understand format to aid in this decision-making process (Stetler, 2001).

Phase IV: Translation/Application stage includes the determination of the method in which the EBP project will be implemented (Stetler, 2001). Details are laid out and a step-by-step plan is created to provide an instruction manual for exactly how the project will be implemented and how it will achieve the goals established in the Phase II outline (Stetler, 2001). The second part of Phase IV is to determine whether or not to use the EBP project, and whether to implement the project informally or formally (Stetler, 2001). This was a formal EBP project, so implementation was done formally.

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Phase V: Evaluation seeks to understand the impact of the change; and if it had the desired effect (Stetler, 2001). Dynamic review is done in the form of assessing the progress of the project as it is ongoing, and then a formal review is also conducted to determine the final outcomes of the project (Stetler, 2001). Finally, a determination about whether or not the project should be used as a routine part of practice should be made (Stetler, 2001).

Stetler's Model of Research Utilization was chosen for this project because it is geared toward organizational change in an institution and has a prescriptive nature that provides a clear methodology of change. The steps included in the design of the model simplified the EBP process and made performing the project more streamlined.

Review of the Research Evidence

A thorough literature review was conducted to identify the clinical problem, determine the state of the science and affirm the goals of the project. The literature review was updated to include new literature that became available during the review stage of the project.

Search Strategy

The search strategy relied on keyword searches of the CINAHL and PubMed databases. Gray literature was not reviewed for this project due to the extensive quantity of good quality literature that was found using these two search databases. The search terms used were: smartphone app, smoking cessation, SmokefreeTXT, smartphone, and text message. A search strategy table was implemented (Table 1) that kept records of the date, key words, number of results returned, number of articles reviewed, and the number of articles selected.

When selecting articles to be evaluated, the inclusion criteria were that the article be less than ten years old, pertain to smoking cessation by using a text-messaging based intervention, and be from an academic journal. Articles that were level I, II, or III per the Melnyk & Overholt

(2015) level of evidence hierarchy were specifically sought out over articles that were of a lower level of evidence. Articles were excluded if they were more than ten years old, did not using text-messaging interventions, or were not from an academic journal.

Table 1 Evidence Search Strategy

Search Strategy Table					
Date of Search	**Keyword Used**	**Database/Source Used**	**Listed**	**Reviewed**	**Used**
3/16/2015	"smartphone app" Limits: 2010-2015	CINAHL	42	11	0
	Smartphone and smoking Limits: 2010-2015	CINAHL	10	3	0
	"smartphone app" Limits: w/in the past five years	PubMed/MEDLINE	36	10	2
	"smoking cessation" and app Limits: 2009-2015	CINAHL	12	7	2
4/21/2015	Smoking and smartphone Limits: none	CINAHL	10	4	2
4/22/2015	Smoking and Smartphone and app Limits: RCT	PubMed/Medline	13	3	2
4/23/2015	"text message" and smoking	CINAHL	9	3	2
11/1/2016	"text message" and smoking	PubMed	22	8	4

Methods of Appraisal of the Evidence

Literature appraisal was conducted using two tools. The level of evidence was determined using Melnyk & Overholt (2015). Based on the study type, articles are rated on a scale of I-VI. Level I articles are the highest level and consist of systematic reviews and meta-analyses. Level II articles are randomized controlled trials, level III are controlled cohort studies, IV are uncontrolled cohort studies, V are case studies in a case series, qualitative and descriptive studies, EBP implementation and QI projects. Finally, level VI consists of expert opinion, and is the lowest in the level of evidence hierarchy.

The Strength of Recommendation Taxonomy (SORT) tool was used to appraise both the quality of the individual articles and determine the strength of the clinical recommendations that resulted from the body of evidence used in this EBP project. The SORT tool examines two independent aspects of the literature: the Quality of an individual article AND the Strength of the Practice Recommendation that derives from the body of evidence reviewed.

The SORT tool was developed by the American Academy of Family Physicians as a means of creating a consistent way of evaluating literature and subsequent recommendations based on said literature. The SORT tool considers three key elements: quality, quantity and consistency. Quality of evidence is the degree to which the authors were able to control and minimize bias within the study design (Ebell et al., 2004). The authors describe this as being the same concept as validity. Quantity addresses the sample size of the study, and consistency examines whether or not the results are similar between different studies on the same topic (Ebell et al., 2004).

SORT provides two different types of ratings: Quality of the Evidence, and Strength of Recommendation. Quality of evidence rates an individual study based on its characteristics. After

following the SORT algorithm, the reader arrives at a Quality recommendation of 1-3 with level

1 being good quality, patient-oriented evidence, level 2 being limited-quality, patient-oriented

evidence, and level 3 being considered "other" (Ebell et al., 2004).

The Strength of Recommendation rating is applied to a body of evidence and is used to

categorize the level of support for a practice recommendation based on that body of evidence as

A, B, or C (Ebell et al., 2004). A-rated recommendations are awarded to literature which contains

consistent, and good-quality patient-oriented evidence. B-ratings are recommendations which

contain inconsistent or limited-quality patient-oriented evidence. C-ratings are given to evidence

containing "consensus, usual practice, opinion, disease-oriented evidence, or case series for

studies of diagnosis, treatment, prevention, or screening (Ebell et al., 2004)." The authors define

consistency as when "most studies found similar or at least coherent conclusions (coherence

means that differences are explainable), or if high-quality and up-to-date systematic reviews or

meta-analyses exist, they support the recommendation (Ebell et al., 2004)." Inconsistent

evidence has "considerable variation among study findings and lack of coherence or if high-

quality and up-to-date systematic reviews or meta-analyses exist, they do not find consistent

evidence in favor of the recommendation (Ebell et al., 2004)."

Appraisal of the Evidence

The 14 articles used in the review of evidence included randomized control trials, meta-

analyses, and a Cochrane review. The 14 articles used in the review of evidence included

randomized control trials, meta-analyses, and a Cochrane review. There were four Level 1

evidence articles used (Head et al. (2013), Scott-Sheldon et al. (2016), Spohr et al., (2014), and

Whittaker, et al., (2016)), nine Level 2 evidence article (Abroms et al. (2014), Bock et al. (2013),

Bricker et al. (2014), Free et al. (2011), Haug et al. (2013), Naughton et al. (2014), and Rodgers

et al. (2005)), and one Level 3 article (Christofferson et al. (2016). Levels of evidence were based those outlined in Melnyk & Overholt (2015). All 14 articles had a quality rating of 1; good quality, patient-oriented evidence, by the SORT tool. A direct comparison of the level of evidence and quality of evidence can be found in Table 2. A description of each of the articles used as evidence for this project is found below. Please refer to Appendix 3 for the evidence evaluation table.

The first article, Abroms et al. (2014), is a randomized control trial that compares a text-messaging intervention, Text2Quit, to a control group of patients who received only self-help materials. This article was of particular interest and relevance because it specifically mentions SmokefreeTXT, which lends credibility to its use. Abroms et al. used a sample size of n=503 patients that were recruited from the internet and randomized into an intervention group that received Text2Quit, and a control group that received self-help material. Once the Text2Quit program was completed, the participants were assessed at 1, 3, and 6 months to determine their smoking status. The authors collected saliva samples from the participants to determine their smoking status at those intervals. Intent to treat analysis was used. Participants who did not follow up were categorized as smokers. The results of the study determined that the patients who used Text2Quit demonstrated an 11.1% point prevalence abstinence as opposed to the comparison group of 5% point prevalence. In the self-reported repeated point prevalence, the intervention group demonstrated a 19.9% quit rate as compared to the control group's 10.0% quit rate. These results support the efficacy of the Text2Quit program. This article was examined for quality of evidence using the SORT tool (Ebell et al., 2004) and received a quality of evidence rating of 1.

Bock et al. (2013) recruited adult smokers who were interested in quitting smoking within the next 30 days and compared Txt-2-Quit (a text-messaging intervention) with a counseling intervention (Mojo) to determine which was more effective in stopping smoking. The authors randomized n=60 participants for the study. The authors measured nicotine dependence using the 6-item Fagerstrom Test for Nicotine Dependence, measured symptoms of nicotine withdrawal using the Mood and Physical Symptoms Scale, measured urges to smoke using a 16-point assessment scale, and measured readiness and confidence to quit smoking using a 10-point Likert scale. The authors measured readiness to quit smoking using the stages of change measure which relied on the participant indicating the number of quit attempts they had made in the past year, how seriously they were considering quitting within the next 30 days, 6 months, or not at all. This information was then used to determine the person's current stage of change for smoking cessation. Outcome measures were administered at week 4 (mid-intervention), at week 8 (post-intervention), and at 3 and 6 month follow-up visits. The primary outcome measure was the 7-day point prevalence abstinence and the 24-hour point prevalence abstinence (Bock et al. 2013).

The primary outcome of the study, 7-day point prevalence and 24-hour point prevalence, found that there was a significant main effect for the treatment group during the 7-day post prevalence outcome measure. There was no significant effect between the intervention group and the control group at week 8, month 3, or month 8 however, which the authors attribute to a reduced statistical power at those times. Finally, there was also no significant effect found at the three time points (week 8, month 3, or month 8) with the 24 hour point-prevalence (Bock et al. 2013).

The findings of this article support the use of a text-message based smoking cessation intervention like SmokefreeTXT and lend further support to the use of this type of intervention. After evaluating the design of this article with the SORT tool, this article receives a quality of evidence rating of 1.

Bricker et al. (2014) compared two mobile phone apps. The first one, called SmartQuit, was designed and created by the study's author. The second app, QuitGuide, was designed by the National Cancer Institute (NCI) and follows the USCPG guideline, which is the same guideline used to guide this EBP (Bricker et al., 2014). The study selected and randomized (n=196) participants into two groups. One received SmartQuit, while the other received QuitGuide. At the two month follow up, it was demonstrated that SmartQuit had a higher rate of smoking cessation over the NCI's app, QuitGuide. SmartQuit requires a fee to use as opposed to QuitGuide which is free. This article received a quality of evidence rating of 1 according to the SORT tool.

Buller, Borland, Bettinghaus, Shane, and Zimmerman (2014) is a randomized controlled trial (RCT) that compared a smartphone mobile app to a text-messaging based mobile phone application. In the study, adult smokers aged 18-30 (n=102) were recruited and randomized into two groups. One group received the mobile phone app, REQ-Mobile, and the second group received the text messaging program, onQ. The study used self-reporting questionnaires at pretest, 6-week posttest, and 12-week posttest. Ultimately, the study found that, while both interventions were effective, the text-messaging program was more effective in stopping smoking than the standard smartphone app (Buller et al., 2015). This article received a quality of evidence rating of 2 using the SORT tool.

Christofferson et al. (2016) sought to understand how the text-messaging program affected smoking cessation rates of veterans. The authors relied on participants to sign up for the

study on their own behalf; as such there was no randomization. There were n=1470 participants in the study, and five distinct classes were identified based on the level of engagement they had with the text-messaging program. The program lasted 6-weeks, and engagement was determined by tallying the total number of ingoing and outgoing text messages the participants had pertaining to the intervention at which point latent growth mixture modeling was used to identify the different engagement classes from which the results were drawn.

The authors found in regards to quit rates that the longer the participant was enrolled in the program, the more likely there were to stop smoking. Additionally, the participants who were more engaged with the intervention were more likely to stop smoking than those who were less engaged. The authors also included a component in which participants used SmokefreeVET in conjunction with nicotine replacement therapy to aid in their smoking cessation attempt, and found that these patients were also more likely to quit with greater engagement with SmokefreeVET than those who were less engaged (Christofferson et al., 2016). This article received a SORT quality of evidence rating of 1 based on the adequate sample size, relevant population, and adequate follow up.

"Smoking cessation support delivered via mobile phone text messaging (txt2stop)" by Free et al. (2011) was a randomized control trial featuring the text messaging based mobile phone service txt2stop with n=5800 randomized participants. Participants were randomized into two groups: a control and an intervention group. The intervention group received the text-messaging based program and was asked to set a quit date two weeks from the time they were randomized. For 26 weeks, the participants received text messages developed by smoking cessation professionals and smokers. The outcome was self-reported, and was verified at six months using post salivary-cotinine testing, or in-person carbon monoxide testing. The study

found that there was a statistically significant decrease in smoking rates in the intervention group who used the txt2stop program; in fact at six months the quit rate doubled compared to the control group. This article received a quality of evidence rating of 1 using the SORT tool.

Haug et al. (2013) conducted a randomized control trial using a text-messaging intervention called SMS-COACH and compared it against an assessment-only control group. A total of n=755 participated in the study, with roughly equal numbers participating in the intervention group, and in the control group. Text messages were sent to the intervention group three times per week for three months and a follow-up assessment was done 6 months after the start of the study. The primary outcome was 7-day smoking abstinence, and while the intervention did not have a statistically significant effect on 4-week smoking cessation, it did have a statistically significant reduction in the number of cigarettes smoked by the intervention group compared to the control group. This article received a quality rating of 1 according to the SORT tool based on being a study of adequate population size, having a randomized control design, and having a 74% follow up rate at six-months.

Head, Noar, Iannarino, & Harrington (2013) is a meta-analysis that reviewed nineteen randomized control trials. To be selected, the articles had to be published in English, report at least one behavior outcome, be a randomized control trial that included a control group that did not receive any text messages, have at least one intervention that was based on receiving text messages, and had an intervention intended to change health behavior for the purpose of health promotion (Head et al., 2013). Nineteen articles were selected based on these criteria, and the authors coded the articles based on several features ranging from characteristics of the participants to the methodology of the study. The articles selected for this meta-analysis had a wide array of target outcomes, but all of them used text-messaging as the intervention. The meta-

analysis found that overall, text-messaging interventions on health behavior were statistically significant, and had the greatest impact on smokers (Head et al., 2013). The meta-analysis also found that there was no difference between using interventions that are text-messaging-only compared to interventions that utilized a combined modality including websites, human counselors etc. (Head et al., 2013). This article received a level of evidence rating of 1 using the SORT tool.

Kong, Ells, Camenga, & Krishnan-Sarin (2013) provide a narrative review of the different text-messaging based smoking cessation interventions that are currently available. This article compiled twenty-two studies that describe fifteen different smoking cessation interventions based on text-messaging services. The article compiled the different text-messaging interventions into a table that compared intervention and participant characteristics and another that compared the components of the text-messaging interventions. These tables provide an excellent look into the workings of the different text-message programs available. Unfortunately, at the time this paper was published, SmokefreeTXT was not included in the study, and was not able to be compared against the other methods. However, all of the methods shared the similarity that motivational messages were used at their core (Kong, Ells, Camenga, & Krishman-Sarin, 2013). One of the interesting findings of this narrative review was that the use of adjunct cessation intervention did not show an increase in the smoking cessation rate. Txt2Stop was specifically mentioned as having found no increase in the rate of smoking cessation when adjunctive therapies were used (weekly emails, resources for quitting smoking, pharmacotherapy to quit smoking among others). There was a great deal of variation between the different methodologies in that some of them used text-messaging interventions only, others combined the use of NRT and pharmaceutical therapy, while others utilized websites and other informational

aids (Kong, Ells, Camenga, & Krishman-Sarin, 2013). This variation doesn't provide as clean of a comparison as would be ideal, but the results are consistent in suggesting that text-messaging based interventions are an effective means of aiding in smoking cessation (Kong, Ells, Camenga, & Krishman-Sarin, 2013). This article received a quality of evidence rating of 3 using the SORT tool.

Naughton et al. (2014) conducted a randomized control trial comparing a web-based and text-based intervention. The authors recruited n=602 participants from a primary care setting and randomized them into two groups: intervention and control. The number of text messages the intervention group received varied from day to day, but on average the participants received 1.2 text messages per day. The primary outcome was self-reported 2-week point prevalence abstinence at the 8-week follow up from the time of randomization. The secondary outcome was a CO-verified abstinence measure at the 4-week follow up from quit date. The results of the study were that there were no significant differences between the intervention group and the control group for the primary or secondary outcomes, however during the 6-month check, the rates of prolonged abstinence was statistically significant compared to the control group which indicates that although the intervention may not have had a statistically significant effect on short term smoking cessation, there was a statistically significant effect on long term smoking cessation (Naughton et al., 2014). This study received a SORT quality rating of 1 based on the fact that it had an adequate sample size, was a randomized control trial, and was of good quality.

"Do u smoke after txt? Results of a randomized trial of smoking cessation using mobile phone text messaging." by Rodgers et al. (2005) was also a randomized controlled trial that looked at a text messaging based mobile phone application. The study recruited over 1700 smokers (n=1705) and randomized them into an intervention group and a control group. The

participants were instructed to set a quit date 30 days from the date of randomization and were

then sent regular text messages with advice on various aspects of smoking cessation. The text

messages came frequently until the six-week follow up where they began dropping off

dramatically until the 26th week. Over this period of time the number of messages was reduced

from five messages per day, to three messages per week. The control group only received one

text message per week that would thank them for participating in the study. At the six-week

follow up there were more people in the intervention group who quit smoking than the control,

and the same remained true at the 12-week follow up. At the 26-week follow up, the results were

less clear despite quit rates remaining high because, there was also an increase in reported quit

rates in the control group. This article received a quality of evidence rating of 1 using the SORT

tool.

Scott-Sheldon et al. (2016) wrote a systematic review and meta-analysis on text-

messaging based interventions with a three-fold purpose. The first was to evaluate how effective

text-messaging interventions were, second was to determine how robust the evidence was

supporting use of text-messaging interventions, and third was to identify moderators of

intervention efficacy. The authors reviewed 20 different articles that included 22 different

interventions in 10 different countries and found consistently that smokers who received a text-

message based intervention were more likely to stop smoking compared to their control group

counterparts. Smokers who received a text-messaging based smoking cessation intervention were

also more successful in decreasing the number of cigarettes smoked by participants than control

group participants. The authors concluded that there was clear evidence supporting the use of

text-messaging based smoking cessation interventions, and that these interventions should

become a public health priority (Scott-Sheldon et al., 2016). This article received a quality of

evidence rating of 1 according to the SORT criteria of having an adequate number of studies included in the meta-analysis, and the fact that the article is a meta-analysis.

Spohr et al. (2014) wrote a meta-analysis that viewed thirteen studies that met the inclusion criteria. The selected studies were then coded based on the study population and potential intervention moderators. The authors measured 7-day point prevalence as the primary outcome measure because eleven of the thirteen articles measured the outcome in this manner. This meta-analysis found that text-message interventions used for smoking cessation were effective in reducing smoking, and were comparable to other smoking cessation interventions including NRT and pharmaceutical interventions. Although NRT and medication increased the odds of stopping smoking by 1.5-3.1 compared to placebo, Spohr et al. found that text-messaging interventions increase odds of smoking cessation by 1.36, which put it quite close to NRT and medication therapy by comparison. This article received a quality of evidence rating of 1 using the SORT tool.

Whittaker et al. (2011) conducted a randomized controlled trial that had a six-month follow up. The authors recruited young adults aged 16 years and older to participate in a study that would utilize a video-messaging intervention that would be delivered to their mobile phones. The authors recruited 226 participants who were then randomized into the control and action groups. Each of the group members would indicate a quit date, and a time during which they could receive messages. Abstinence rates were recorded at 6-months as 26.4% in the intervention group, and 27.6% in the control group. This data would lead us to believe that the intervention was not effective, but Whittaker et al. claim that there is a lack of statistical significance due to the smaller-than-expected sample size. This article received a quality of evidence rating of 1 using the SORT tool.

The final study Whittaker et al. (2016) is a Cochrane review of twelve randomized

control studies, or quasi-randomized control studies. Studies that were focused on mobile phone

based interventions were included specifically. The notable findings were that those who

received the intervention had a risk ratio of 1.67 (Whittaker et al., 2016). An additional notable

finding was that studies that used a biochemically verifiable cessation measurement found a

higher rate of cessation. This article received a quality of evidence rating of 1 using the SORT

tool.

Table 2 Level and Quality of Evidence

Author (Year)	Level 1	Level 2	Level 3	Quality of Evidence Rating
Abroms et al. (2014)		x		1
Bock et al. (2013)		x		1
Bricker et al. (2014)		x		1
Buller et al. (2014)		x		1
Christofferson et al. (2016)			x	1
Free et al. (2011)		x		1
Haug et al. (2013)		x		1
Head et al. (2013)	x			1
Naughton et al. (2014)		x		1
Rodgers et al., (2005)		x		1
Scott-Sheldon et al. (2016)	x			1
Spohr et al., (2014)	x			1
Whittaker et al., (2016)		x		1
Whittaker, et al., (2011)	x			1

Synthesis of the Evidence

Based on the findings of the research evidence, there is sufficient evidence to support the

use of a text-messaging smoking cessation intervention as an effective means of smoking

cessation. This recommendation was supported by the fourteen articles used in the literature

review and received an "A" rating per the SORT strength of recommendation criteria. Please refer to Table 3 below. This project utilized two intervention groups to eliminate a potential ethical issue if no option were provided for patients to utilize the current best practice recommendations found in the smoking cessation guideline used in this project. The guideline recommends use of NRT, counseling, and suggestion of the smoking cessation hotline for patients (Fiore, 2008). This project design offered patients the option to utilize both NRT and SmokefreeTXT in combination in order to comply with the use of current best practice recommendations. In the literature review, only the article by Christofferson et al. (2016) combined NRT and a text-messaging intervention. Due to the fact that there was only one article found during the literature review which supported the simultaneous use of text-messaging intervention and NRT, the recommendation to use text-messaging interventions in conjunction with medication increased smoking cessation rates only received a B rating according to the SORT tool.

Synthesis of the evidence suggested that text-messaging smoking cessation interventions open several affordable smoking cessation options for patients who may not be able to afford NRT, or who may not wish to use NRT. SmokefreeTXT provides a viable, effective alternative approach to smoking cessation. Recently, Smokefree.gov increased the available smoking cessation programming for its users by adding five additional Smokefree text messaging services. SmokefreeTXT, SmokefreeTeen, SmokefreeMOM, SmokefreeVET, and Spanish-language versions of SmokefreeVET and SmokefreeTXT are the programs currently available. These additions of more targeted smoking cessation text messaging services demonstrate the need for additional smoking cessation options.

Table 3 Synthesis of Evidence Based on SORT Strength of Recommendation

Recommendation	Strength of Recommendation	Reference of Support	Rationale
Use of text-messaging smoking cessation interventions are effective means of smoking cessation.	A	Abroms et al. (2014)	Text2Quit text-messaging program increased smoking cessation.
		Bock et al. (2013)	Overall significant effect of smoking cessation intervention
		Bricker et al. (2014)	ACT intervention increased smoking cessation rates.
		Buller et al. (2014)	Compared App to text messaging; found text messaging more effective.
		Christofferson et al. (2016)	Demonstrated SmokefreeVET effective in supporting smoking cessation.
		Free et al. (2011)	Intervention group demonstrated higher smoking cessation rate over control.
		Head et al. (2013)	Messaging programs with personalized messages were more effective than those without.
		Kong et al, (2013)	Narrative review of 15 text-messaging smoking cessation interventions.
		Rodgers et al., (2005)	Intervention group showed higher rate of cessation than control.
		Scott-Sheldon et al. (2016)	Concluded that text-messaging use for smoking cessation should be made a public health priority.
		Spohr et al., (2014)	Cessation rates 36% higher than control group.
		Taber et al. (2016)	Incorporated self-affirmation into SmokefreeTXT and increased smoking cessation rates.
		Whittaker, et al., (2011)	Positive feedback about ease of use of text-messaging program.
		Whittaker et al., (2016)	Cochrane review update continues to demonstrate support of text-messaging based interventions.

Use of text-messaging interventions in conjunction with medication increased smoking cessation rates.	B	Christofferson et al. (2016)	Increased smoking cessation rates when SmokefreeVET used in conjunction with medication.

Smoking Cessation Guideline

The guideline used for this project was the Treating Tobacco Use and Dependence: 2008 Update by Fiore et al. (2008). This guideline is a 256 page book that discusses how practitioners should assess, and ultimately treat people who smoke. The guideline is broken up into seven chapters that discuss several aspects of smoking. The second chapter discusses how to assess an individual's tobacco use and provides a simple flow chart to guide providers. The chapter indicates that in order for a provider to begin treating someone who smokes, they must first be aware that the person smokes. The flow chart starts off with the simple question "does the patient now use tobacco? (Fiore et al., 2008)". The chart then breaks off into questions of whether the patient is ready to stop smoking, or whether the patient has used tobacco at some point, which harkens back to the Transtheoretical change model determining what stage of change the patient is currently in. Once those questions are answered, the flow chart directs the provider to the appropriate chapter and section that will provide the requisite information to treat the patient (Fiore et al., 2008).

There are three chapter sections depending on the patient's readiness to quit, and the guideline provides recommendations on how the clinician should approach each of these patient groups (Fiore et al., 2008). The groups are broken down into the patient who is ready to quit, the patient who is unwilling to quit, and the patient who has recently quit. This project focused on

the patient who is willing to quit because the patient who is unwilling to quit would require

motivational interviewing according to the guideline (Fiore et al., 2008).

There are ten key recommendations laid out by the guideline which include the different

interventions the provider should use to assist the patient's attempt to stop smoking.

Recommendation five suggests individual, group, and telephone counseling are effective to assist

smoking cessation, and that their efficacy increases with intensity of the contact (Fiore et al.,

2008). The provider should provide the counseling, and social support should be delivered as

part of the treatment. This recommendation most closely relates to the use of a text-messaging

based program as the text-messaging intervention could be considered a social support being

delivered to the patient. The guideline also recommends the use of NRT and other

pharmaceutical interventions, in addition to a strong relationship between the patient and the

provider wherein the provider is to regularly recommend the patient stop smoking (Fiore et al.,

2008)

In order to critically evaluate the Treating Tobacco Use and Dependence: 2008 Update,

the AGREE II tool was used. The AGREE II tool was developed to aid in the assessment of

research guidelines prior to using them in a clinical environment (AGREE, n.d.). The AGREE II

tool uses 25 questions broken down into six domains to thoroughly assess the practice guideline.

The AGREE II tool assesses the scope and practice, the involvement of stakeholders, how

rigorously the guideline was developed, how clearly it is presented, whether it is applicable, and

the editorial quality of the guideline (AGREE, n.d.).

Three users reviewed the Treating Tobacco Use and Dependence: 2008 Update guideline

(TTUD); the DNP student, and two classmates. Rating the guideline using the AGREE II tool

was very consistent because the subjectivity was taken out the process by using questions from

the AGREE II tool. In order to be awarded the appropriate points, the specific item and criteria from the AGREE II question must be addressed by the guideline. As long as the information was present, the point was awarded. If the information was missing or unclear, the point was not awarded. This guideline was rated 6 out of 7 possible points for overall quality and determined it could be used for practice without modification.

The two DNP students who also reviewed the TTUD guideline similarly rated it a 6 out of 7 possible points using the AGREE II, however one classmate rated the guideline as "would recommend for practice" while the other stated she would recommend the guideline for "practice with modification," but did not state what modification she would recommend. Both classmates commented on the length of the guideline, citing it as a potential barrier for a thorough and complete review.

The ratings of the DNP student, and DNP student classmates, as well as recommendations for use of the guideline in practice, suggested that this guideline provided the necessary recommendations and explanations on which to base smoking cessation interventions.

Methods

Project Setting and Population

The project took place at a family practice in a large urban city. The practice is a single-provider, privately owned practice that predominantly sees African American patients with Medicare/Medicaid insurance. Two medical assistants and a receptionist work at the office. The receptionist works at the front desk and registers patients, ensures prescriptions are sent correctly, and manages the office. The two medical assistants are responsible for rooming

patients, taking vital signs, and drawing blood for lab work. One of the medical assistants also completes all of the referrals.

The population of the city where the project took place was 140,599 in 2015 with 22.9% of residents under the age of 18 (United States Census Bureau, 2015). Nearly 43% of the residents were African American, while roughly 52% of residents were white (United States Census Bureau, 2015). The median household income between 2011 and 2015 was $27,683 and 55.9% percent of residents were employed during that time (United States Census Bureau, 2015). 15.3% of the population under age 65 years lived with a disability, and 16.6% of people under the age of 65 did not have any form of health insurance (United States Census Bureau, 2015). These demographics are mostly representative of the patients at the clinical site where the project took place. Based on an informal estimation of the day-to-day patient population, and of the observations of the provider and owner of the practice, the majority of patients seen were African American which does not align with the census data. The contributing factors of this discrepancy are not known.

Implementation

This project was implemented in five phases as described in the Stetler Model of Evidence-Based Practice. In the months leading up to implementing the project, the evidence search was completed, a site selected, buy-in obtained, a letter of support obtained, and University of Toledo Institutional Review Board (IRB) approval obtained.

Phase I: Preparation

The preparation phase is the first phase of the Stetler model and is when the DNP student conducted the literature review, sorted it and made a determination about which literature supported the evidence based practice project (EBP). During this phase, the DNP student

considered other influential factors, affirmed the priority and purpose of the proposed EBP, and

defined the purpose and outcomes based on the PICOT question. This section provided the DNP

student time to consider the rationale for completing the project, and whether the literature

indeed supports the PICOT question to such a degree that conducting the EBP would be a

positive addition to the existing body of evidence. The DNP student reviewed the literature and

determined that there is indeed a gap in the literature that the project will fill.

Search, sort, & select sources of research evidence. Once the aim of the project was

determined by the DNP student and stakeholders, the PICOT question was formed. Formulation

of the PICOT question then guided the literature review which was conducted as described in the

Literature Review section. The literature was read and categorized according to the evidence

hierarchy (Melnyk & Fineout-Overholt, 2015) and the SORT tool (Ebell et al., 2004). Evidence

that was relevant and of good quality was included in the evidence body, and evidence that was

of poor quality, or was irrelevant to the project was discarded.

Although SmokefreeTXT was not specifically studied in the evidence chosen to support

this project, text-messaging based smoking cessation programs of varying different types were

used throughout the evidence with outcomes that supported the use of text-message based

interventions. The meta-analysis by Scott-Sheldon et al. (2016) succinctly justified this statement

in the conclusion drawn by stating that the evidence for the efficacy of text-message smoking

cessation interventions was well documented and established and that use of such programs

should be considered a priority in the field of public health. This justification is strong, and is

also supported by Whittaker et al. (2016) in the Cochrane review where the findings also

supported the use of text-based interventions. Based on these justifications, as well as the body

of literature supporting this project, the choice to use SmokefreeTXT specifically was made on

the basis that it is produced by a reputable organization, and is free of charge. The fact that SmokefreeTXT was free was a major driving factor in the decision to use the program because it was felt that asking participants to pay for a text-messaging intervention would be prohibitive. Additionally, the scope of this EBP is to determine whether or not a text-based intervention would be effective in a specific practice and patient population, not to compare different text-based interventions for the purpose of determining which is most effective.

The intervention used in the project was the SmokefreeTXT smoking cessation text messaging service. SmokefreeTXT was launched in 2011 (Abroms, Boal, Simmens, Mendel, & Windsor, 2014) and is a free text messaging service aimed at young adults and adults in the United States with the intent to aid them in smoking cessation (Smokefree.gov, n.d.). The program is an eight-week program wherein users will receive between one and five text messages per day on their mobile device offering encouragement, tips, and advice for smokers to stop smoking (Smokefree.gov, n.d.). Users can also interact with the service by entering one of several keywords depending on their current smoking status (Smokefree.gov, n.d.). Keywords include: "CRAVE, MOOD, SLIP, and STOP (Smokefree.gov, n.d.)." The term "CRAVE" can be texted by the user when they crave a cigarette (Smokefree.gov, n.d.). SmokefreeTXT will then respond with a reminder text about why the user should not smoke a cigarette. The term "MOOD" can be sent when the user is experiencing a depressed mood and needs some positive encouragement to uplift them. "SLIP" can be texted if the user smokes a cigarette . The user will be sent a text message offering encouragement and additional solutions to avoid smoking a cigarette again. "STOP" is the final term that may be texted, and is used to opt out of the program at any time. Once the user signs up for the program, either online of through their mobile phone, the text messages will begin arriving two weeks prior to the "quit date" the user

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selects during sign up. The text messages will continue for six weeks after the quit date, and again at one, three, and six months to assess how the user is faring with their quit attempt (Smokefree.gov, n.d.).

Consider influential factors. Stetler (2001) defines influential factors as "internal and external factors, such as beliefs, resources, or timelines." In the case of this project, the biggest internal influential factor was the need to determine whether an alternative to NRT will be effective in actual practice. Many patients who have been prescribed NRT lose motivation and ultimately relapse, so an additional tool is needed to improve patient success with smoking cessation. The utilization of a text-messaging program has been demonstrated in the literature to have a statistically significant effect on the smoking cessation rates in those who use them (Scott-Sheldon et al., 2016).

An appealing feature of SmokefreeTXT is that SmokefreeTXT is a free service while many other smoking cessation tools and apps are not. Patients who are already paying out of pocket for NRT can use SmokefreeTXT in addition to that therapy with no additional cost.

The third influential factor for this project was the time line. SmokefreeTXT is an eight-week program, which should allow ample time to initiate and complete within a semester. The program does have three follow-ups at one, three, and six months that will not be assessed as part of the project due to time constraints.

Affirm priority. During the time the student was completing the clinical courses as part of the DNP program, the DNP student asked his preceptor if there was interest in the DNP completing an EBP at the clinical site using a text-messaging based intervention. The preceptor stated that the idea of a text-messaging smoking cessation intervention would be beneficial to this patient population due to the large number of smokers seen by the practice, and the fact that

most patients have a mobile phone capable of sending and receiving text messages. The preceptor stated the DNP student should discuss the plan with the committee chair, perform a literature review, and then discuss the finer details of how the EBP would work. Once the literature review was performed, and had demonstrated the efficacy of text-messaging based smoking cessation interventions, the preceptor was fully interested in having the DNP student complete the EBP at the clinical site. The student also met with the preceptor to discuss the implementation plan and to ask for additional feedback on how to alter the implementation plan so as not to disrupt the daily workings of the practice. The DNP student incorporated this feedback into the implementation plan and discussed the updated plan with the preceptor and office staff who all agreed to provide the support the DNP student would need to conduct the project. To further demonstrate this support, the preceptor wrote a letter of support for the DNP student which is attached as Appendix 4.

The specific support provided by the members of the project clinical site is as follows: The provider authorized the DNP student to conduct the EBP at the clinical site, and agreed to allow the DNP student access to patients who met the project inclusion criteria. Additionally, the preceptor agreed to ask the patients whether they were interested in participating in the EBP while they are in the exam room, then notify the DNP student of their interest. The provider also supplied a conference room for the DNP student to use to educate the participants about the project and conduct the training needed by the participants. The medical assistants were also supportive of the project and were willing to collect and bring the pre-assessment form back with the patient when the patient was being put into an exam room. The office assistant also supported the project and provided each patient with a copy of the pre-assessment when they signed in for their appointment.

Based on the support of the body of evidence, and the support and buy-in from the practice's provider this project proved to be both feasible and useful. Once the proposed project was explained in detail, the provider felt the project would be beneficial and would have a meaningful effect on this patient population. The office staff were also addressed, and their opinions sought. They also felt the project would be beneficial for their patient population. When the individual roles and responsibilities were discussed, they agreed that these would pose minimal intrusion into the daily operation of the practice. Nothing similar to the intervention in this project was currently being utilized or offered at this practice; only medication and counseling was being offered to these patients, so this offered an alternative, or conjunctive treatment modality.

Define purpose & outcomes per issue/catalyst. The purpose of this project was to determine (P) In current smokers aged 18-65 of a privately-owned family practice in a large urban city in southwest Ohio (I) will using SmokefreeTXT text-messaging service, or SmokefreeTXT in conjunction with NRT (C) compared to patients who do not wish to stop smoking (O) increase smoking cessation rates (T) over the course of the six-week intervention duration?

By stopping smoking, patients will see an improvement in their overall health, will see a decreased financial burden from cigarettes, and will experience a better quality of life.

The specific outcomes measured during this project were the stage of smoking status measured by the Smoking: Adult Stage of Change (Short Form) tool (University of Rhode Island, 2017) and Nicotine Dependence score measured by the Fagerstrom Test for Nicotine Dependence questionnaire (NIDA, 2014) at the beginning and end of the project.

For this project, five stages were addressed: Precontemplation, Contemplation, Preparation, Action, and Maintenance. In the Precontemplation stage, the patient is not seriously thinking of quitting smoking (University of Rhode Island, 2017). In the Contemplation stage, patients are thinking of quitting smoking in the next six months, or in the next 30 days with 24-hour quit attempt in the past year. In the Preparation stage, the patient is thinking of quitting smoking in the next 30 days as long as they have had at least one 24-hour quit attempt in the past year. The Action stage is defined as the patient have quit smoking in the last six months. If the patient quit smoking more than 6 months ago they are considered to be in the Maintenance stage (University of Rhode Island, 2017).

The Fagerstrom Test for Nicotine Dependence (FTND) is scored on a scale from 1-10, and is broken into four categories based on six questions the patient answers which were incorporated into the pre/post assessment tool (NIDA, 2014). If the patient scores 1-2, they are considered Low Dependence (NIDA, 2014). If the patient scores 3-4, they are considered Low to Moderate Dependence. If the patient scores 5-7, they are considered to have Moderate Dependence. Finally, if the patient scores 8 or more, they are considered to have High Dependence. In addition, patient satisfaction with the SmokefreeTXT was collected at the end of the project by soliciting subjective statements.

Phase II: Validation

In the Validation phase, the literature found during Phase one was critically reviewed, collated, and summarized into meaningful information and justification for the proposed intervention. During this stage, key information or unique qualifiers were identified in the literature and incorporated into the EBP. If the literature did not adequately support the recommendation of the proposed EBP intervention, it was reviewed and discarded in favor of

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something more appropriate. During this stage the evidence was reviewed and was organized based on the Evidence Hierarchy found in Melnyk & Fineout-Overholt (2015). The individual articles were then organized by the Quality rating according to the SORT tool. Finally, the clinical recommendations made based on the evidence were examined using the SORT tool to assess the Strength of the Recommendations in order to determine whether they were suitable recommendations to use for the evidence based practice project.

The evidence supporting the use of the intervention in the project is found in table 3. Although the specific intervention utilized in this EBP was not specifically studied in any of the evidence supporting this project, all the evidence used utilizes a text-messaging smoking cessation intervention. The literature consistently found that text-messaging interventions assisted people to stop smoking, or helped them reduce the number of cigarettes they smoked by the end of the intervention. This consistent agreement of the findings of the literature supports the recommendation that *the use of text-messaging smoking cessation interventions are an effective means of smoking cessation*. Based on the criteria set forth by the SORT tool, the strength of this recommendation is an A. The second recommendation of *using SmokefreeTXT in conjunction with NRT* receives a B rating as there was only one article in the body of literature that specifically paired those two elements.

Phase III: Comparative Evaluation/Decision Making

In Phase III the DNP student assessed the fit of the project setting, determined the feasibility of the project with regards to any risk to the patient, what resources were needed for the project to take place, and how ready the DNP student, the project setting and staff were, and whether the project would be appropriate and meaningful. The current practice of the setting was discussed so that there could be clarity on how the intervention will be different, and the use of

substantiating evidence would be used to justify and make a determination regarding the use of the chosen intervention.

Fit of setting. In this section the key facilitators and barriers are discussed. The key facilitators were the buy-in from the provider and owner of the site where the project took place, the ubiquity of mobile phones that enabled the intervention that the intervention was free to use, the time-efficient approach of the project, the accessibility to the participant population, and the credibility of the organization providing the intervention.

The primary barrier to the project's completion was the ability to recruit the number of participants necessary to have a meaningful sample size. There were two intervention groups, which should enable the project to have meaningful results in at least one of the two groups. Other barriers such as inability for the participant to use the text messaging service were overcome through communication with the DNP student and through training by the DNP student on how to access and setup SmokefreeTXT on the participant's phone. An additional barrier to the success of the project was completing the follow up phone calls during the two-week intervals and at the end of the project. Patients were unreliable at answering the phone to allow the DNP student to follow up with them. One final barrier was the disposable phone the DNP student purchased for the project. The service provider SmartTalk through Walmart was inconsistent in their billing practices. Each month when the phone plan would be "auto-billed" the transaction would occur but the phone service would be interrupted and the DNP student would have to contact the phone company in order to get the phone service reinstated. This would also cause a disruption in the voicemail setup on the phone. Each month the voicemail would have to be setup again; this caused disruptions during the months of May and June

because the DNP student was not aware such a disruption had occurred until one of the participants notified the DNP student of the problem.

Current practice. Prior to implementation of this project, the standard of practice at the project location was to ask every patient whether they smoked cigarettes or not. If they responded that they did currently smoke, the provider then asked whether they were interested in stopping smoking. Depending on the answer the patient provided, the provider would then work with the patient to determine the best method for the patient to stop smoking. Aside from this method, there was no formal tool or method being used to determine and quantify the patient's readiness to stop smoking. A follow up to reassess the patient's attempt at smoking cessation often only occurred at the next scheduled office visit, so there was minimal feedback and continuity with the patient between visits. There were only two cessation options being offered: NRT therapy (nicotine patches and nicotine gum) and Wellbutrin. No alternative methods were being utilized.

Feasibility. This project meets the three components of feasibility according to Stetler (2001): minimal risk, minimal resources needed, and demonstrated readiness to begin the intervention.

The risks associated with this project are minimal. Patients were not deprived of any standard of care treatment that is in accordance with the smoking cessation guidelines. Patients who knowingly wished to participate in the SmokeFreeTXT Only (SFTXTO) group are able to, while those who wished to utilize the intervention in addition to a NRT were also able to. Those who did not wish to participate at all, but who are willing to be part of the control group were able to participate as well.

There was no financial risk to the clinical site as there was no financial outlay on their behalf. The time involved in recruiting and training patients for the intervention did not interfere with the scheduled patient visit, or with the daily schedule of the practice because instruction as to the use and scope of the project was explained outside the exam room after the scheduled patient visit.

Resources required for the project were also minimal. The nurse practitioner student recruited the participants, and provided the teaching involved with the project. The financial incentive for the participants of the project was paid for with grant money secured by the DNP student, as were the printed materials for the pre- and post- assessments. Text-messaging enabled mobile phones were a requirement for patient to participate in the project, however this did not produce an additional need for resources. The pre-paid mobile phone used to contact the participants was provided by the DNP student as well.

The final component, readiness, was addressed through discussions the nurse practitioner student had with the CEO of the implementation site. The provider/CEO was ready for the student to begin the evidence-based practice project and provided a letter of approval which is attached as Appendix 4. Once IRB approval was achieved, the DNP student was prepared to begin recruiting immediately by having the pre-assessment forms printed, labeled, and organized.

Substantiating evidence. The evidence from the evidence review and summary supported the use of a text-message based smoking cessation intervention. There were a total of fourteen articles whose findings showed that the groups with text-messaging intervention have higher rates of either total smoking cessation, or decreasing the number of cigarettes smoked. These findings are summarized in Appendices 1 and 3.

State decision regarding use of findings. Based on the evidence, the decision to utilize the text-message based intervention, SmokefreeTXT is well supported. The recommendation to use a text-messaging program received an A SORT recommendation, and the secondary intervention group in this project received a B SORT recommendation. After achieving buy-in and obtaining a letter of support (Appendix 4) from the office and provider, this project was deemed to be appropriate, and beneficial to the practice. Additionally, the intervention was accessible to the target population due to the large number of mobile phones that were available to people, and because the intervention was free of charge. With support from Whittaker et al. (2016), Scott-Sheldon et al. (2016) and others, the DNP student and owner of the project site were comfortable and optimistic that the project would be a meaningful and useful addition to the practice.

Phase IV: Translation/Application

Phase IV describes the methodology behind implementing the project. The following phase describes how recruitment was done and how the project was implemented at the clinical site.

Confirm type and level of method of application. The Stetler model identifies several different method types: cognitive change, symbolic or instrumental (Stetler, 2001). This EBP project used SmokefreeTXT as an instrument to assist patients to alter their cognition towards smoking cigarettes at the individual level. Levels in the Stetler model are described as individual, group, or department/organization. The DNP student interacted with the patient directly by first assessing their current smoking habits, and then discussing their readiness to stop smoking. Based on their readiness, they were asked about whether they would like to use SmokefreeTXT as a means to stop smoking. Stetler (2001) describes methods of application as

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either being direct or indirect. Direct application refers to interacting with the patient individually, having face-to-face interaction with them. Indirect interaction refers to the provider not actually interacting with the patient in person, but implementing the intervention remotely (Stetler, 2001).

Formal implementation. Following successful application to the University of Toledo Institutional Review Board (IRB), the DNP student was granted permission to formally implement the evidence-based practice project at the clinical site.

The team members in the project were broken down into two tiers (Figure 1). The first tier included the DNP student, the faculty chair of the project, and the clinical preceptor who owns the practice where the intervention took place. The second tier included the additional project committee members, and the support staff at the preceptor's practice. Most of the responsibilities belonged to the DNP student and included many facets. First, the DNP student was responsible for determining the purpose and intention of the project and formulating a PICOT question to guide the project. The DNP student then was responsible for conducting the literature review to identify gaps in the literature and determine whether the proposed intervention was well-founded. The DNP student was responsible for determining and securing an appropriate site to conduct the project, identifying and designing a study design and implementation process, recruiting study participants, explaining the study to the participants, collecting the data from the study, analyzing the data, and ultimately interpreting the data to prepare for presentation.

The faculty chair of the project was the person with the most experience in project design and implementation and served to guide and support the DNP student in all aspects of the project. While the DNP student provided the original idea for the project, the faculty chair helped

the DNP student form and shape the PICOT question into something precise and meaningful. As the DNP student progressed with the structure of the project, the faculty chair assisted the DNP student to identify weaknesses in the study design, objectives and outcomes. The faculty chair was able to point out missing information or components of the study design, or make suggestions that would strengthen the overall integrity of the project.

The clinical preceptor also had a major role in the project. The clinical preceptor was responsible for aiding the DNP student in recruiting participants for the study. The DNP student discussed the target population with the clinical preceptor so that she was clear on which patients were to be recruited for the study. During all patient encounters, the clinical preceptor ascertained the patient's smoking status, their desire to stop smoking, and which (if any) interventions the patient was currently employing to aid in the effort to stop smoking. The clinical preceptor utilized the results of a brief screening questionnaire to aid in recruiting patients for the study.

Figure 1 Project Roles and Responsibilities
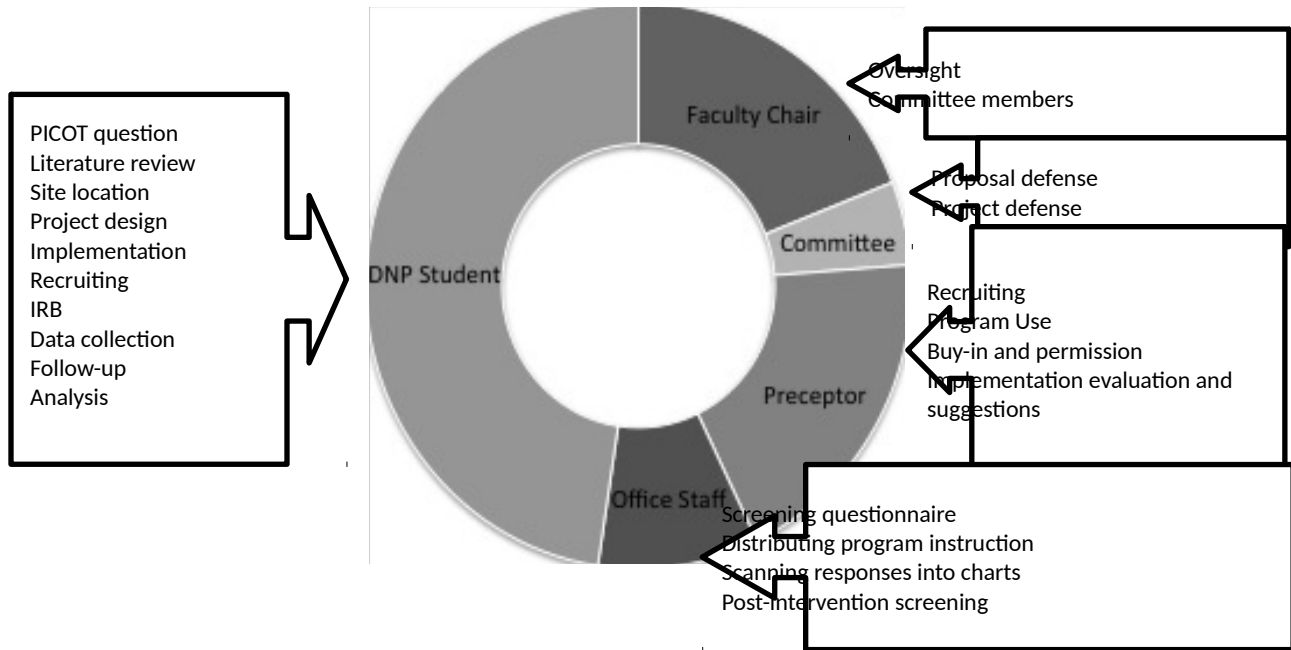
This project focused on patients of an urban family practice who were aged 18 years and older who were current smokers and had a text-messaging enabled phone. It was not necessary for them to have a smartphone as SmokefreeTXT is a text-messaging service as opposed to being an application (app). Patients needed to be interested in quitting and be willing to set a quit date within two weeks from signing up for the intervention.

There were a total of 44 participants recruited for this project. The target population for this project were adult smokers aged 18 years and older. The demographics show the mean age in the control group was 50.06 (9.43), 47.33 (12.33) for the SmokefreeTXT Only group, and 48.93 (12.26) in the SmokeFreeTXT Plus group. Additionally, most of the participants were female. Also of note is the number of years smoked. In the control group, the mean number of years smoked was 26.44 (11.97) years compared to the SFTXTO group in which 20.67 (14.51) years was the mean, and the SFTXTP group in which 25.00 (10.20) years was the mean. Interesting as well was that in the control group where smokers had no interest in stopping smoking, the mean

number of quit attempts in the past year was 1.83 (4.76), as compared to the two intervention

groups in which the SFTXTO group had a mean of 3.42 (2.50) quit attempts in the past year, and

the SFTXTP group had a mean of 3.36 (3.50) quit attempts in the past year. Although there is no

statistical significance (p-value .432) it is interesting to note that the two intervention groups had

more quit attempts per year than the participants in the control group. Of note was the annual

income level of the participants. All but one participant had an annual income of less than

$60,000. Given this information, the income scale the participants had to choose from should

have been in a lower range to get a more accurate portrayal of the income level of the residents

of this area.

Table 4 Characteristics of Participants

Characteristics	Control (n=18)	SFTXTO (n=12)	SFTXTP (n=14)	P-value
Gender				
Male (%)	4 (22.22%)	3 (25%)	4 (28.57%)	.919
Female (%)	14 (77.78%)	9 (75%)	10 (71.43%)	
Race				
African American (%)	11 (61.11%)	6 (50%)	8 (57.14%)	.716
Asian/Pacific Islander (%)	1 (5.56%)	0	0	
Caucasian (%)	6 (33.33%)	6 (50%)	6 (42.86%)	
Age				
Mean (SD)	50.06 (9.43)	47.33 (12.33)	48.93 (12.26)	.809
Number of Years Smoked				
Mean (SD)	26.44 (11.97)	20.67 (14.51)	25.00 (10.20)	.443
Number of Quit Attempts in Past Year				
Mean (SD)	1.83 (4.76)	3.42 (2.50)	3.36 (3.50)	.432
Marital Status				
Single (%)	10 (55.56%)	6 (50%)	4 (28.57%)	.450
Married (%)	2 (11.11%)	0	3 (21.43%)	
Separated (%)	2 (11.11%)	1 (8.33%)	1 (7.14%)	

Divorced (%)	4 (22.22%)	4 (33.33%)	6 (42.86%)	
Widowed (%)	0	1 (8.33%)	0	
Annual Income				
$<60,000	18 (100%)	12 (100%)	13 (92.86%)	.334
$80,000-90,000	0 (0%)	0 (0%)	1 (7.14%)	
Highest Education				
High School (%)	10 (55.56%)	5 (41.67%)	10 (71.43%)	.148
University (%)	3 (16.67%)	0	1 (7.14%)	
Community College (%)	3 (16.67%)	6 (50%)	1 (7.14%)	
Graduate School (%)	2 (11.11%)	1 (8.33%)	0	
<High school (%)	2 (11.11%)	0	2 (14.29%)	
Comorbidities				
Heart Disease (%)	1 (5.56%)	1 (8.33%)	2 (14.29%)	.692
Hypertension (%)	9 (50%)	7 (58.33%)	4 (28.57%)	.278
Asthma (%)	4 (22.22%)	2 (16.67%)	5 (35.71%)	.503
COPD (%)	3 (16.67%)	3 (25%)	5 (35.71%)	.467
Diabetes (%)	5 (27.78%)	4 (33.33%)	4 (28.57%)	.944

After IRB approval was received and the project was cleared to begin, the DNP student

provided pre-assessment forms (Appendix 5) to the receptionist. At the beginning of every visit

the receptionist provided patients a clipboard with the assessment form attached to it. Figure 2

demonstrates the way the patients were addressed and approached to participate in the project.

The patient would fill the form out and bring it into the exam room with them. The DNP student

was present while the patient was completing the questionnaire to answer any questions, or

address any needs while filling out the questionnaire. The pre-assessment questionnaire collected

demographic information, whether the patient was a smoker, and used two standardized sets of

questions (Fagerstrom Test for Nicotine Dependence and the Transtheoretical Stage Model) to

determine how dependent the patient was on nicotine, and what stage of readiness to stop

smoking the patient was in. If the patient answered that they did not currently smoke cigarettes, the form was returned to the receptionist and then to the DNP student. Once in the exam room, the patient would undergo their scheduled appointment. At the end of the visit, the provider would ask the patient if they were a current smoker. If the patient was a current smoker the provider would follow up by asking if they would be willing to speak with the DNP student about a smoking cessation project. The provider did not ask the patient if they would like to stop smoking, only whether they would be willing to speak with the DNP student. This strategy left the opportunity to recruit for the project open ended. If the patient agreed to speak with the DNP student, the DNP student could determine whether the patient was interested in quitting smoking or not. If they were, the DNP student was then able to determine whether the patient was eligible for the project (text message capable phone, age, etc.) and could recruit the patient to join the project. This strategy worked well because it did not take up and more of the provider's time than necessary since the provider did not have to explain the project, or the intervention.

If the patient was interested in participating in the project, the DNP student would obtain informed consent from the patient, record their phone number, quit date, patient ID number, and name in a spreadsheet, and then sign the patient up for SFTXT in the room. The first text message would be delivered moments after signing the patient up for the program, so there was no confusion about whether the patient was registered or not. If the patient was to join the intervention group that utilized both SFTXT and a nicotine replacement therapy (SFTXTP), the provider would be notified of the patient's preference of nicotine replacement therapy, and the order would be entered by the provider. The DNP student clearly explained to the patient that the SFTXT program would be administered by the student, and that any and all medications were administered by the provider. Participants were informed during the consent process that they

were permitted to leave the project at any time for any reason without consequence. Satisfactory

completion of the project included completing the pre-assessment, the intervention, following up

with the DNP student every two weeks, and the post assessment. Only after each of these

components were complete did the patient become eligible for the $10 participation gift card.

Figure 2 Prescreening Discard Algorithm
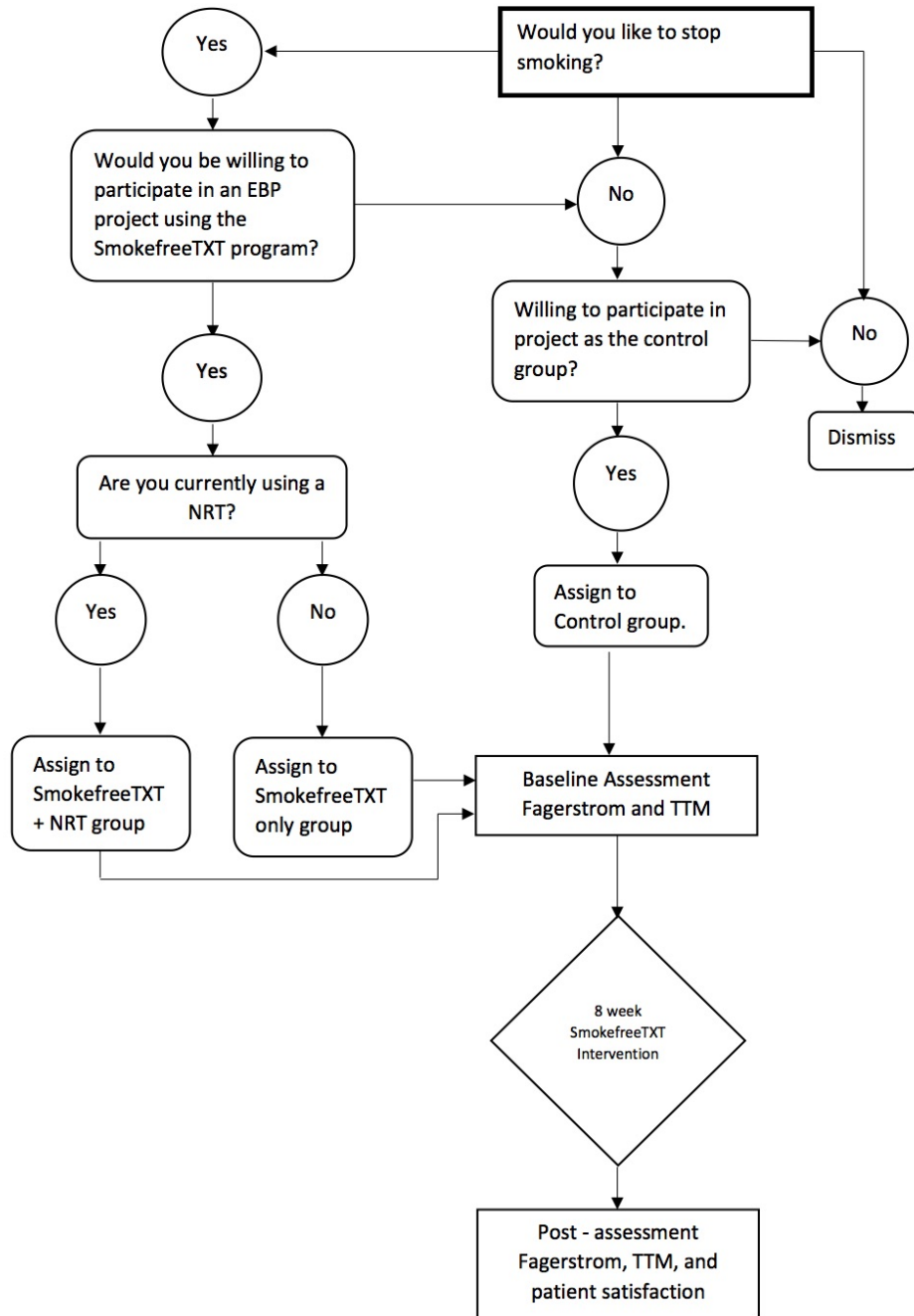
Phase V: Evaluation

        The final phase was when the evaluation criteria were discussed including how the project was to be evaluated, how the results were to be evaluated, and how the site should evaluate the success and flow of the project. In this section, the details of how the data was collected and analyzed are discussed. Additionally, the information on how the results were disseminated are discussed.

        Formative Evaluation. During the course of the intervention, the DNP student called each of the participants in the project every two weeks to assess the patients continued participation in the program. The DNP student asked if the patient was progressing in the smoking cessation attempt, if they were still receiving text messages, and if they were still participating in the program. The DNP student also asked if the participant had any questions or concerns about the program. The participants also had a phone number that allowed them to contact the DNP student any time during the intervention should they have any questions or concerns regarding the project.

        There were few issues that needed to be addressed. One participant could receive text messages, but was not able to send them. This restricted the participant's ability to interact with the SmokefreeTXT program as they could not send text prompts back to SFTXT if a craving, mood, or slip was experienced. This particular participant contacted the DNP student early on to notify the DNP student of the issue, but still wanted to continue participating in the program. Another participant notified the DNP student that they would be undergoing a surgical procedure during the time of their quit attempt. The patient was confident that the surgery would not have any impact on their quit attempt.

Phone calls were one of the most difficult aspects of the project, which was unexpected. Many times, the DNP student would be required to call the participant multiple times before they could finally be reached, and several patients never answered the phone and were dropped from the program despite multiple voicemail messages and daily attempts to contact them. Two participants answered the phone during the first two weeks of the project, expressed that they would remain as participants in the smoking cessation program, but then stopped answering their phone and responding to messages thereafter. Another issue was that participants would answer the phone, not recognize the phone number of the DNP student, and would take a harsh tone with the DNP student. Sometimes the DNP student would be unable to make an introduction before the participant would hang up. The DNP student would then have to call back and attempt to contact the participant again in hopes that they would pick up the phone a second time, or listen to a voicemail.

Additionally, the DNP student maintained an ongoing relationship with the provider and office staff at the office where the project took place. The DNP student periodically called the provider to discuss any issues the provider was experiencing, though, the provider stated that no issues had been encountered.

Summative Evaluation. Two data collections were completed as part of this project. The first was the pre-assessment questionnaire that was completed by the patients in the office. These results were combined into a spreadsheet in the IBM statistics program, SPSS. The results included demographic information, patient smoking status, medical history, and standardized questions assessing the patient's dependency on nicotine as well as the Transtheoretical stage of change the patient was in. The nicotine dependence score was measured using the Fagerstrom Test for Nicotine Dependence (FTND), and a score was calculated both before and after the

intervention for each participant. The stage of change was measured using the Transtheoretical

Change Model questions, and a stage of change was determined for each participant before and

after the intervention.

ANOVA tests were used to compare the Fagerstrom test of nicotine dependence score

(FTND) among the three participant groups prior to the SmokefreeTXT intervention. A paired t-

test was used to compare the FTND before and after the SmokefreeTXT intervention for each of

the three participant groups. Chai-squared tests were used to compare the level of Nicotine

Dependence and the stage of smoking cessation among the three participant groups before the

intervention. Wilcoxon Signed Ranks tests were used to assess the level of Nicotine Dependence

and the stage of smoking cessation for each group before and after the intervention.

Nicotine Dependence

Table 5 compares the mean FTND scores before and after the intervention for all three

groups, as well as the Nicotine Dependence groups the project participants' FTND scores

categorize them in both before and after the intervention. From this table, we observe that the

mean FTND scores for the Control group remained similar. These scores were not statistically

significant (p=.530). The lack of change in the scores indicates that participants did not decrease

their dependence on nicotine. The SFTXTO group did have a statistically significant difference

in FTND scores after the intervention period (.002). Based on the decrease in the score from

before the intervention period, these participants decreased their dependence on nicotine over the

intervention period. Additionally, the SFTXTP group also had a statistically significant

difference in mean FTND scores (<.001). The decrease in nicotine dependence score from before

the intervention period to after indicates a decrease in dependence on nicotine.

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Table 5 also compares the level of nicotine dependence between the three groups before and after the intervention period. The Control group demonstrates a statistically significant change (p=.047) during the intervention period. This change can indicates a regression in the level of nicotine dependence of the participants during the intervention period; these participants actually became more dependent on nicotine during the intervention period. The SFTXTO group also demonstrated a statistically significant change (p=.012), but this correlates to reduction in nicotine dependence. The same is true for the SFTXTP group. There is a statistically significant (p=.012) change in the level of nicotine dependence during the intervention period.

Table 5 Comparison of FTND Scores and Nicotine Dependence Before and After Intervention

	Control		SFTXTO		SFTXTP	
	Pre (n=18)	**Post (n=13)**	**Pre (n=12)**	**Post (n=10)**	**Pre (n=14)**	**Post (n=12)**
FTND Score Mean (SD)	3.85 (2.64)	3.46 (3.07)	3.90 (2.08)	.70 (1.34)	4.58 (2.91)	.42 (.90)
Paired T-test (p-value)		.530		.002		<.001
Low Dependence (%)	5 (27.78%)	3 (23.08%)	4 (33.33%)	2 (20%)	3 (21.43%)	2 (16.67%)
Low-Moderate Dependence (%)	4 (22.22%)	2 (15.38%)	3 (25%)	1 (10%)	4 (28.57%)	1 (8.33%)
Moderate Dependence (%)	8 (44.44%)	3 (23.08%)	5 (41.67%)	0	2 (14.29%)	0
High Dependence (%)	1 (5.56%)	2 (15.38%)	0	0	5 (35.71%)	0
Stopped Smoking (%)	-	3 (23.08%)	-	7 (70%)	-	9 (75%)
Wilcoxon Signed Rank Test (p-value)		.047		.012		.012

Stage of Smoking Cessation

       The other outcome measure of this project was determining whether the intervention

elicited a change in the Transtheoretical Stage of Change (SOC). Table 6 provides a comparison

of the change in the Transtheoretical stage of smoking cessation between the three groups during

the intervention period. Using Wilcoxon signed rank test, we observe that the Control group did

not have statistically significant change (p=.102) in the stage of smoking cessation after the

intervention period. This means that the participants in this group did not change which stage of

smoking cessation they were in after the intervention period. The SFTXTO group did have a

statistically significant change (p=.021) after the intervention. By looking at Table 6, the data

shows that the participants in this group were successful in their attempt to stop smoking to some

degree. Additionally, the SFTXTP group also had a statistically significant change (p=.003) in

stage of smoking cessation after the intervention period. According to the data in table 6, these

participants were also successful in their smoking cessation attempt to some degree.

Table 6 Comparison of Transtheoretical Stage of Smoking Cessation Before and After Intervention

	Control		SFTXTO		SFTXTP	
	Pre (n=18)	**Post (n=13)**	**Pre (n=12)**	**Post (n=10)**	**Pre (n=14)**	**Post (n=12)**
Precontemplation (%)	3 (16.67%)	6 (46.15%)	0	0	0	0
Contemplation (%)	12 (66.67%)	6 (46.15%)	3 (25%)	1 (10%)	8 (57.14%)	0
Preparation (%)	3 (16.67%)	0	9 (75%)	2 (20%)	6 (42.86%)	3 (25%)
Action (%)	0	1 (7.69%)	0	7 (70%)	0	9 (75%)
Wilcoxon Signed Rank Test (p-value)	.102		.021		.003	

Discussion

The purpose of this evidence based practice project was to determine (P) In current smokers aged 18-65 in a privately-owned family practice in a large urban city in southwest Ohio (I) will using SmokefreeTXT text-messaging service, or SmokefreeTXT in conjunction with NRT (C) compared to patients who do not wish to stop smoking (O) increase smoking cessation rates (T) over the course of the six-week intervention duration? The goals of this project were to improve the quality of patient health, promote healthy lifestyle choices, reduce the financial burden of patients living in an urban area who largely depend on Medicare and Medicaid for their healthcare needs, and to provide an additional smoking cessation modality for healthcare providers. The goals of promoting healthy lifestyle choices, reducing financial burden, and providing an additional smoking cessation modality are discussed in greater detail in this section.

Nicotine Dependence

The nicotine dependence scores and interpretations were quite telling. Additionally, the Control group helped to clearly demonstrate the effect of the intervention groups as compared to no intervention. Within the nicotine dependence results, the Control group showed more people in the High dependence group after the intervention period than before it. This was not expected as they underwent no intervention at all. This group was populated with persons who were current smokers with no desire to stop smoking. One possible explanation for this could be that participants were not completely honest when completing the pre-assessment. Many times, during the post-assessment follow-up calls, participants would sheepishly answer that they "still smoke" and that "I know that's not what you want to hear." Additionally, when the DNP student was completing the post-assessment with the Control group participants, the participant would have to answer directly to the question. For instance, when asked over the phone "How many

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cigarettes do you smoke?" the participant would answer the question with a whole number. They would not have the option of looking at a range as they did when they themselves completed the questionnaire.

Smoking Cessation Stage of Change

Measuring the Stage of Change was one of the most important outcome measures in this project. The stage of change would clearly state whether the participant had stopped smoking, or not. Indeed, measuring the stage of change provided clear evidence that the SmokeFreeTXT intervention had a statistically significant effect on its users. The project would have benefitted from a larger sample size, however the smaller sample size also had the benefit of demonstrating the efficacy of the intervention through strong statistical significance. On the other hand, reaching a greater population would have benefitted the practice more as it would have reduced their population of smokers.

Compare to Existing Literature

When compared with the evidence that provided the foundation for this project, the findings in this EBP project come as no surprise. There was a strong body of evidence to support the use of text-messaging based smoking cessation interventions, including a Cochrane review (Abroms et al. 2014, Bock et al. 2013, Bricker et al. 2014, Buller et al., 2014, Christofferson et al. 2016, Free et al. 2011, Haug et al. 2013, Head et al. 2013, Naughton et al. 2014, Rodgers et al., 2005, Scott-Sheldon et al. 2016, Spohr et al., 2014, Whittaker, et al., 2016). Most of the evidence used for this project showed that text-message smoking cessation interventions were effective in helping people stop smoking, or at the very least, reduce the amount they did smoke (Abroms et al. 2014, Bock et al. 2013, Bricker et al. 2014, Buller et al., 2014, Christofferson et

al. 2016, Free et al. 2011, Head et al. 2013, Naughton et al. 2014, Rodgers et al., 2005, Scott-Sheldon et al. 2016, Spohr et al., 2014, Whittaker, et al., 2016). This project was able to demonstrate that SmokefreeTXT on its own did help this population stop smoking over the control group. The second intervention group (SFTXTP) was also able to demonstrate it was effective in helping people stop smoking.

One factor that is worth noting in this population, and is also evident in the data is that those who were successful in their smoking cessation attempt were intent on stopping smoking. They were motivated to make a behavior change, and in many cases, had attempted to stop smoking in the past. The Control group regressed in the Stage of Change measurement, and did not change greatly in the Nicotine Dependence measure either. Those in the intervention groups had markedly different results.

Recruitment and Retention

One of the most important aspects of any project is the recruitment of its participants, and this project was no different. The recruitment phase of this project went well, but in future projects, in order to increase the number of participants for the project, the recruitment phase should be as long as possible with the expectation that some portion will be lost to attrition. As was stated previously, this project's recruitment phase was five weeks long and was able to recruit 44 participants of the 60 that were targeted. If the recruitment phase had been another three to four weeks long, it is more likely the target number of participants would have been recruited. Providing a gift card incentive appeared to be appreciated by the participants. It did not appear to significantly sway

recruitment, however it seemed as though participants in the control group were more likely to participate in the project because of the gift card. Participants in the two intervention groups were grateful for the gift card but considered it to be a "bonus" or "perk" at the end of the smoking cessation attempt rather than something that specifically changed their mind to participate or not.

Participant retention was another challenge of this project that was not expected to be as challenging as it was. Each of the participants was called every two weeks per the protocol, however many of them did not consistently answer their phone during that time. The DNP student would leave voicemail on the participant's phone requesting they call the DNP student back. In most instances, the DNP student did not receive a return phone call, and would have to call the participant back. Nine participants dropped out of the program: five from the Control group, two from the SFTXTO group, and two from the SFTXTP group. Of the nine participants who left the program, only four of the participants actually informed the DNP student they were dropping the program. Two of the people who notified the DNP student stated they were dropping for medical reasons. One person said they did not recall signing up for the program, and the final participant stated the DNP student had the wrong number. The remaining five participants simply never responded to the phone calls or voicemail messages.

To aid future participant retention, requesting the participant add the provider's phone number as a contact in their personal phone could be beneficial. Informing the participant, they would not receive a gift card if they failed to talk

to the DNP student at the appointed two week intervals, as well as at the end of

the project did not have an impact on the participants who dropped out of the

project. Finally, rather than calling the participants two weeks after their quit date,

the provider could follow up with the participant sooner to ensure the participants

remembered the provider and that they were participating in the project.

Reducing Financial Burden

Participants commented on how the SmokefreeTXT program being free of charge helped

them in their desire to use it to stop smoking. Nicotine Replacement Therapies are not covered

by Medicaid which provides a barrier to many people attempting to stop smoking. Medications

like Wellbutrin are covered by Medicaid, but have side-effects that make patients wary about

using them. Participants stated they liked having SmokefreeTXT as an alternative to medication

or expensive Nicotine Replacement Therapies they could not afford.

Strengths and Limitations

There are several strengths this project features, the first of which is that it was founded

on a sufficient literature review that supported the use of the text-messaging based smoking

cessation intervention. There was enthusiastic buy-in from the owner of the facility where the

project took place, such so that immediately after the recruitment phase of the project was

completed, the owner began recommending SmokefreeTXT to other patients. Project participants

also provided verbal feedback about the SmokefreeTXT program as part of the final data

collection period. Overall, participants were happy with the intervention stating they found it

"very helpful" and that they "couldn't have stopped smoking without the text messages".

Participants also stated that they had recommended SmokefreeTXT to their friends and family

members who were also smokers and that they had also found it very helpful. With regards to the text messages specifically, participant stated they found the messages to be "very encouraging" and that the text messages "helped keep me on track when I was thinking about smoking". Participants stated that they felt as though the text messages kept them accountable, and provided a personal mentor to help them get through the weeks after quitting smoking.

Participants found the SmokefreeTXT program to be very convenient, and many participants actually saved the text messages to use in the future to refer to should they experience cravings in the future. Several participants asked if they could go through the program again to help keep them smoke-free into the future because they stated, although they had successfully stopped smoking for the six-weeks following their quit date, they were still experiencing cravings and wanted the reminders to continue for a while longer.

The greatest limitation of this project was the small sample size. The recruitment phase was extended from two weeks to five weeks in total, and during that time 44 participants were recruited between the three groups. When the project was initially designed, the DNP student had hoped to recruit 20 participants into each of the three groups for a total of 60 participants. It was thought that offering the $10 gift card as an incentive would make recruitment significantly easier, however the incentive didn't appear to have a noticeable effect on the number of people who signed up to participate in the project. The provider was very apologetic about the lack of recruitment because she found it surprising that more people were either: not smokers, not interested in quitting smoking, or did not own a text-capable mobile phone. The provider stated that she did not expect to have any difficulty recruiting the total number of participants needed for the project because of the large number of smokers who are patients at the practice. The provider was not able to provide any specific rationale as to why there were fewer smokers on a

daily basis who were interested in quitting smoking, but speculated that the patients who are frequent smokers may have had recent appointments in the preceding months and that the recruitment window may have just missed this cycle of patients. Additionally, the provider stated that many of the patients who were smokers and who came in have family members who are also smokers that are patients at this practice. These patients were not scheduled for office visits at the time of this project and could not be recruited to participate in the project during the recruitment phase.

Another limitation of this project was using the mobile phone as the means of follow up with the participants because many of the patients did not recognize the phone number, and thus did not answer the phone when the DNP student was calling to follow up. In future, phone calls should be made from the office phone at the practice so patients would recognize the phone number and be more likely to answer the phone. Alternatively, the provider could schedule a follow up with the patient at the end of the six-week intervention period. This would coincide with the conclusion of the intervention period, and would likely be an appropriate time to follow up with the patient's medical needs as well.

The final limitation this project faced was the condensed period of time over which it took place. Depending on the quit date the participant chose, the intervention lasted between six to eight weeks which was the period of time required for the participant to stop smoking, and receive six weeks of daily text messages to help them stop smoking. However, the full program also has a follow up text at one, three, and six months to check in with the participant and assess their smoking status as well. This project did not have the luxury of time to accommodate these follow up times, but this would have added to the project by allowing additional data to be collected regarding which Stage of Change the participant was in. Knowing what stage of change

the participant was at three and six months would have provided a clearer picture of how effective the SmokefreeTXT program was, or how effective the SmokefreeTXT and nicotine replacement therapy program was.

Conclusion

Cigarette smoking is a tremendous problem throughout the United States, but is an even greater problem in Ohio where the rate of smoking is higher than the national average (CDC, 2015). Cigarette smoking causes illnesses that cost the U.S. billions of dollars in healthcare services and lost wages. While there is a good evidence base on the use of text-message based smoking cessation interventions, there were none that were specific to SmokefreeTXT. This project fills that evidence gap and provides other providers, researchers, and patients with an evidence-based practice project that answers the question (P) In current smokers aged 18-65 at a privately-owned family practice in a large urban city in southwest Ohio (I) will using SmokefreeTXT text-messaging service, or SmokefreeTXT in conjunction with NRT (C) compared to patients who do not wish to stop smoking (O) increase smoking cessation rates (T) over the course of the six-week intervention duration? The mean nicotine dependence scores between the pre-intervention groups and post intervention groups were statistically significant with the SmokefreeTXT Only group demonstrating a mean Fagerstrom Test of Nicotine Dependence score of 3.90 (2.08) before the intervention and .70 (1.34) after. The SmokefreeTXT Plus group had a pre-intervention FTND score of 4.58 (2.90) that was reduced to .42 (.90) after the intervention. Additionally, the change in the Transtheoretical Stage of Change demonstrated participants of the intervention groups had increased rates of smoking cessation compared to the Control group with the SmokefreeTXT Only group moving seven participants into the Action

group (stopped smoking) and the SmokefreeTXT Plus group moving nine participants into the Action group.

SmokefreeTXT provides an alternative, or a supplement to the typical Nicotine Replacement Therapies and medications used to assist patients stop smoking. The nurse-practitioner, and owner of the practice where this project took place was interested in an additional method of smoking cessation to complement what is currently being used. The idea was that approaching smoking cessation with more than one treatment strategy would enhance the likelihood that the patient would be successful in their smoking cessation attempt. The provider is currently recommending the SmokefreeTXT program to other patients who wish to stop smoking because she finds the program to be convenient, helpful, and economicalIn the subjective feedback the DNP student received from the participants of the project, participants found SmokefreeTXT to be helpful, convenient, and easy to use. They enjoyed the messages and support they received, and many of them stated that without SmokefreeTXT they would not have been successful in their quit-attempt. Finally, the practice owner had already begun recommending SmokefreeTXT to the patients in the office who wish to stop smoking. Participants in this project also verbalized they have recommended this program to their friends and relatives due to their experiences with it.

Future Recommendations

Future recommendations based on this evidence-based practice project are for providers to recommend a text-messaging based intervention as part of their smoking cessation management plan. With the results of this project showing a statistically significant reduction in participant smoking, the DNP student will

recommend the provider use this intervention as part of the smoking cessation treatment plan. The DNP student recommends that the provider have each patient complete the assessment form (Appendix 5) at the beginning of each visit, then use that form to track the patient's desire to stop smoking, and their progress in the endeavor. The DNP student will also provide training to the provider and office staff on how to register patients for the SmokefreeTXT program.

This evidence practice project also has the potential to effect political change as well on a local level because it addresses a preventable problem that has significant cost-effects for a large group of people. Many of the participants in this project got their health insurance through Medicaid/Medicare which is paid for by the federal government. These same patients also frequently have co-morbidities that are exacerbated by cigarette smoking. By helping these people to stop smoking, this project has the potential to decrease Medicare/Medicaid spending at the local and federal level. The DNP student has the opportunity to appeal to state representation to notify them of the significant good programs like SmokefreeTXT and smokefree.gov do and to request that programs like these continue to receive funding.

An additional recommendation would be to conduct another evidence-based practice project with a larger sample size. Future projects could also use the other text-message based programs offered by Smokefree.gov in order to determine their efficacy in facilitating smoking cessation.

DNP Essentials

This project addresses six doctoral essentials (American Association of Colleges of Nursing, 2006): scientific underpinnings for practice, organizational and systems leadership for quality improvement and systems thinking, clinical scholarship and analytical methods for evidence-based practice, information systems/technology and patient care technology for the improvement and transformation of care, clinical prevention and population health for improving the nation's health, and advanced nursing practice.

DNP Essential I: Scientific underpinnings for practice was met because this is an evidence based practice project, and is inherently derived from the evidence that supports it. The intervention used for this project is evidence based and is justified by the findings that support it. Additionally, the project utilizes the Stetler Model of Research Utilization to guide the project and provide structure to the manner in which the project was derived, justified, and implemented in practice. Finally, the intervention outcome measures are standardized measures frequently used in smoking cessation literature; the Fagerstrom Test for Nicotine Dependence and the Transtheoretical Model Stages of Change were used to measure the participant's smoking status prior to, and following the intervention.

DNP Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking is met with this project because the intervention, SmokefreeTXT is currently not widely used in smoking cessation treatment in primary care, nor is it addressed in smoking cessation guidelines. With continued evidence based practice projects like this one, and other research

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being done using text-messaging interventions, there is a possibility of it being a standard of care alongside NRT and counseling.

DNP Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice is addressed in this project because of the structured evidence search and review that was part of this project. An initial literature review was conducted, then another evidence search was completed later and the evidence used in the project was updated accordingly.

DNP Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Care is met because the primary intervention of the practice project was a text-messaging service which used mobile phones to deliver the intervention.

DNP Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health was met through the purpose of the project. Roughly half of the patients at the clinical site where the intervention took place are smokers and providing an additional means for them to stop smoking is a step towards decreasing that population of smokers, as well as the overall number of smokers in the United States.

DNP Essential VIII: Advanced Nursing Practice is met with the project because the DNP student assessed a clinical need at this particular clinical practice site. The DNP student was able to obtain buy in from the owner of the practice and demonstrate a method that had not been used by this office to assist its patients. The DNP student also supplied the provider with the materials used

by the project once the project was completed in order to continue the use of the

intervention into the future.

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Appendix

Appendix 1 Evidence Synthesis table – Text Messaging Interventions

Citation	Design	Population	Intervention	Outcome Measure	Intervention Effect	Dosage	Finding
Abroms et al. (2014)	RCT	18 yrs old with cell phone with unlimited test messaging and email who are not pregnant and are interested in quitting.	Text2Quit	• Biochemically confirmed repeated point prevalence (Cotinine level <15 ng/mL). • Self-reporting smoking status.	Biochemically confirmed OR=1.8988 Self-reported OR=	User could text at any time for help through key words. 5 messages on their quit date. 2 messages per day in the week after the quit date. 3 text messages per week for the next 2 months, then <1 per week for the remaining portion of outgoing phase.	Improved biochemically confirmed point prevalence testing of smoking cessation compared to control group (11.1% vs. 5%). Improved self-reported point prevalence abstinence compared to control group (19.9% vs. 10.0%)
Bock et al. (2013)	RCT	Adult current daily smokers interested in quitting in the next 30 days who have a SMS capable mobile phone and use	Txt-2-Quit	• 7-day point prevalence abstinence • 24-hour point prevalence abstinence • Smoking status	7-Day Quit: 8 weeks: OR=2.5362 7-Day Quit: 3 months: OR=5.400 7-Day Quit: 6	Once daily messages for up to 14 days. Twice daily messages. Four times daily for 14	Higher odds of 7-day point prevalence abstinence for the TXT group compared

		SMS messages at least once per month.		(yes or no)	months: OR=6.7500 24-hour quit: 8 weeks: OR=2.1818 24-Hour quit: 3 months: OR=2.6000 24-Hour quit: 6 months: OR=3.2500	days, then twice daily for 4 weeks.	with control group (OR=4.52). Overall main effect was significant, but contrast estimates did not find specific difference between TXT vs. control at week 8, month 3, or month 6.
Bricker et al. (2014)	RCT	>18 year old smokers who smoke at least 5 cigarettes daily for at least past 12 months who want to quit in the next 30 days who have an iphone and can read English.	SmartQuit (ACT) & QuitGuide	• Self-reported 30-day point prevalence cessation at 2 month follow up.	Self-reported cessation: SmartQuit vs. Quitguide OR=2.7	User logs in daily and accesses the apps on their smartphone.	SmartQuit had a quit rate of 13% compared to 8% in QuitGuide users.
Buller et al. (2014)	RCT	18-30 year old current smokers interested in quitting who speak English and are U.S. residents.	onQ (SMS) vs. REQ-Mobile (App)	• Self-reported 30-day point prevalence cessation at 6 weeks and 12 weeks follow up.	Self-reported point prevalence 6 weeks: OR=4.4252 Self-reported	onQ – received daily text messages depending on which group participant joined	More smokers quit at 6 weeks using onQ than REQ-Mobile.

					point prevalence 12 weeks: OR=2.0658	REQ-Mobile – 13 audio testimonials; 16 short support documents, daily messages. Once quit for 1 week, shifted to onQ.	
Christofferson et al. (2016)	Cohort	Veterans who were enrolled in the SMokefreeVET program between 0000 May 30, 2013 and 0000 May 1, 2014.	SmokefreeVET	• Self-reported point prevalence abstinence.	Quit rate of high engagement group compared to low engagement group d=.504; OR=2.4947	2-5 messages sent for the 8 week duration of the program.	Results were broken up into five groups based on the number of text messages (defined as engagement). Over all 13% of participants stopped smoking; as engagement increased, so did smoking cessation.
Free et al. (2011)	RCT	Smokers >16 willing to quit smoking in the next month who have a mobile	Txt2stop	• Self-reported continuous smoking abstinence, biochemically	Biochemically verified at 6-months with postal salivary-	Set a quit date within 2 weeks of randomization. 5 texts/day for	Biochemically verified continuous abstinence at 6 months was

		phone.		verified at 6-months with postal salivary-cotinine testing <7 ng/mL or carbon monoxide testing <6 ppm.	cotinine testing <7 ng/mL or carbon monoxide testing <6 ppm. OR: 2.3348	first 5 weeks, then 3/week for next 26 days.	significantly increased with txt2stop.
Haug et al. (2013)	RCT	Vocational school students who smoke in German-speaking Switzerland.	SMS-COACH	• Self-report 7-day point prevalence smoking abstinence	Self-report 7-day point prevalence: OR=1.02	1 weekly text assessing smoking-related target behaviors; 2 weekly text messages tailored to the data of the online and SMS message assessments, and an integrated quit day preparation and relapse-prevention program.	Abstinence rate was 12.5% in the intervention group and 9.6% in the control group; no significant intervention effect was found in the intervention group.
Head et al. (2013)	Meta-analysis	Inclusion Criteria: Written in English, report at least 1	Unspecified	• Standardized mean difference	Smoking cessation: d=.447;	Unspecified text-messaging programs were	The overall mean of all categories

		behavioral outcome, be an RCT that randomly assigned individuals and include control/comparison group that did not receive any text messages focuses on the target behavior, include at least one condition that was solely mobile phone text messaging or a broader intervention that included text messaging as a component, report on an intervention designed to change health behavior in the service of health promotion.		statistic.	OR=2.2496	used in this meta-analysis.	was d=.329 (95% CI=.274, .385; p<.001; N=5137) which indicates that text-messaging interventions have a statistically significant effect on health behavior and health-related outcomes.
Naughton et al. (2014)	RCT	18-75 year old current smoker who is able to read English willing to set a quit date w/in 14 days of signing	iQuit	• Self-reported 2-week point prevalence at 8 week follow-up. • CO-verified	Self-reported 2 week point prevalence at 8 week follow up: OR=1.22 (95% CI-0.88-	4-page advice report. 90-day program of automated text messages that	No statistically significant short-term benefit to iQuit, but

		consent who has a mobile phone and is not using additional smoking cessation interventions.		abstinence at 4-week follow-up from quit date <10 ppm.	1.69) CO verified 4-week: OR=1.21 (95% CI-0.84-1.76)	star the day before the participant's quit date. 0, 1, or 2 texts per day were sent.	there was a statistically significant benefit at 6-months compared to control.
Rodgers et al., (2005)	RCT	>16 years old, current daily smoker interested in quitting within the next month, able to receive text messages, English speaking.	Unspecified text messaging program.	• Self-reported 1-week point prevalence 6 weeks after randomization.	Self-reported 1-week point prevalence 6 weeks: RR=2.20 (95% CI, 1.79 to 2.70). OR=2.2253	Intervention group received regular personalized text messages after setting a quit date within 30 days of randomization.	The trial showed that quit rates doubled using a text-message based intervention.
Scott-Sheldon et al. (2016)	Meta-analysis	Studies included if they examined an individual-level text messaging intervention to promote smoking cessation, used a RCT design, assessed smoking outcomes, provided sufficient statistical information to calculate ESs and were available by 12/1/2014.	Text2Quit, Quit on Q, Happy Ending, SMS-Coach, iQuit, MiQuit, STUB IT, SMS-Turkey, SMS-USA,	• Point prevalence 24hours, 7 days, 30 days • Continuous abstinence • prolonged abstinence • Repeated point prevalence	• Point prevalence 24 hrs: OR=3.62 (95%CI, 1.46, 8.99) • Point prevalence 7 days: OR=1.43 (95% CI, 1.31, 1.56) • Point prevalence 30 days: OR=1.57 (95%CI,	Text messaging programs were widely varied in their frequency of messages.	Smokers who received text-message interventions were more likely to abstain from smoking relative to controls across a number of other measures.

| | | | | | 1.39, 1.77)
• Continuous abstinence: OR=1.92 (95%CI, 1.55, 2.38)
• Prolonged abstinence: OR=2.33 (95%CI, 1.60, 3.39)
Repeated point prevalence: OR=2.33 (C95%CI, 0.83, 2.13) | | |
| Spohr et al. (2015) | Meta-analysis | Studies were included if they targeted smoking cessation, randomized controlled trials, delivered main intervention via SMS, included a follow up measure of smoking abstinence, and published in an English scientific peer-reviewed journal. | Text only, text plus emails, text plus 30 minute counseling session, text and self-help pamphlet, text plus smoking cessation advice from PCP, text plus supporting website and online chat. | • 7-day point prevalence | 7-day point prevalence combined result: OR=1.37 (95%CI, 1.25-1.50). | Text messaging programs were widely varied in their frequency of messages. | Text plus programs performed only slightly better than text-only programs. Odds ratios demonstrated statistically significant improvement of text-interventions over control group. |

Whittaker et al., (2011)	RCT	>16 years old, current daily smokers ready to quit and have video-message capable phone. Particularly targeted young Maori.	STUB IT	• Continuous abstinence defined by Russell standard (<5 cigarettes over 6 months after QD) verified with NicAlert test strips at 6 months.	Intent to treat continuous abstinence at 6 months: OR=0.9398	Recruits were directed to an online	Not able to demonstrate significantly significant result due to low population recruitment.
Whittaker et al., (2016)	Cochrane Review	Randomized or quasi-randomized trials. Participants were smokers of any age who wanted to quit. Studies examined any type of mobile phone-based intervention for smoking cessation.	Various	• 26 week cessation outcome.	26 week cessation outcome: RR 1.67 (95%CI, 1.46, 1.90)	Various	Evidence supports a beneficial impact of mobile-phone based smoking cessation interventions on 6-month cessation outcomes. Studies with biochemical verification had an even higher rate of smoking cessation.

Appendix 2 Implementation Table

Stetler Model Phase	Plan Item	Responsible Party	Estimated Start	Estimated Time to Completion
Phase 1: Preparation	• Identify PICOT question • Define purpose and outcomes of DNP project • Literature review • Consider barriers and facilitators • Cost analysis of project • Identify a site to perform DNP project data collection • Discuss buy in and interest with clinical preceptor	DNP student	August 2015	1-2 months
Phase 2: Validation	• Literature critique and analysis	DNP student	Fall 2015	1 month
Phase 3: Comparative Evaluation/Decision Making	• Discuss implementation with office staff • Provide intervention and screening tool teaching to clinical preceptor and office staff • Teach roles and responsibilities to office staff • Discuss recruitment and intervention protocol with clinical preceptor • Discuss records keeping information with preceptor • Barrier and Facilitator to intervention • Discuss	DNP student, project chair, clinical preceptor	Spring/Summmer 2016	1 month
Phase 4: Translation/Application	• Defend DNP Proposal. • Obtain IRB approval for proposed DNP Project	DNP student, clinical preceptor, project chair	Spring/Summmer 2017	3 months

	• Print and provide intervention teaching tool to office staff • Provide office staff with patient screening tool • Recruit 60 intervention participants • Begin conducting exit-interviews as patients move through intervention			
Phase 5: Evaluation	• Create data spreadsheets • Conduct data analysis and draw conclusions from intervention • Present and disseminate findings • Provide clinical preceptor with digital files of resources to continue intervention	DNP student	Spring/Summer 2017	3 weeks

Appendix 3 Evidence Evaluation

Author (Year)	Theory	Major Variables	Sample/Setting	Design/Method	Measurement of Major Variables	Data Analysis	Major Findings	Appraisal
Abroms et al. (2014)	none	Bio chemically confirmed repeated point prevalence abstinence Self-reported quitting	N=503; aged >18y/o smoke 5+ cigarettes/day U.S. mailing address email address cell phone number with unlimited short messaging service (SMS) interest in quitting in next month not pregnant	RCT; Online recruitment; randomization into intervention and comparison group.	Bio chemically confirmed repeated point prevalence abstinence Self-reported quitting	T-test Chi squared Intent to treat Logistic regression Relative risk	11.1% abstinence confirmed repeated point prevalence in intervention group compared to 5% of control group (RR=2.22)	Adequate sample size. Results support use of intervention Supports PICOT question
Bock et al. (2013)	Social cognitive theory	IV1: TXT IV2: Individual counseling session DV: smoking cessation	Current daily smoker, interested quitting smoking in the next 30 days, mobile phone with text capability, use SMS at least monthly N=60	RCT	7-day point prevalence abstinence and 24-hour point prevalence abstinence	7-day point prevalence abstitnence using generalized estimating equations (GEE) using Proc GENMOD.	Significant main effect for 7 day point prevalence with higher odds of cessation for TXT group than comparison	Good quality RCT with adequate sample size and significant results that supports PICOT question
Bricker et	None	IV1: SmartQuit	Mobile phone	RCT	Nicotine	Two sample	SmartQuit	Demonstrated

al. (2014)		(ACT) IV2: QuitGuide DV: smoking cessation rate	apps. N=196 Attrition: 31; no response to follow up.	Participants assigned either SmartQuit or QuitGuide apps and were evaluated over 8 weeks receiving weekly reminders to use the apps.	dependence, treatment satisfaction, utilization [apps], ACT theory-based acceptance process, thirty-day point prevalence cessation outcome at two-month follow-up	t-test for continuous variables and Fisher's exact test for binary variables	quit rate was 13% and 8% with Quitguide	difference between two types of apps. Possible bias because author created the app.
Buller et al. (2014)	Social cognitive theory, trans theoretical model	IV1: REQ-Mobile app IV2: onQ app DV: smoking cessation rates	Cellphone app. N=102 Attrition: 18 people were lost from the REQ-Mobile group at 6-weeks, and 18 were lost at 12 weeks. 18 were lost from the on Q groups at 6-weeks, 16 were lost at 12-weeks. Those who did not follow up at the intervals	RCT Young adult smokers were divided into two groups and given smartphones with one of two applications: REQ-mobile which sent text messages and interactive tools, or onQ which sent text messages only. They were used for 30 days, at	Online pretest, follow-up questionnaires at 6 and 12 weeks.	Chi-squared and logistic regression in SAS software. Spearman correlations estimated relationship of program use to quitting. Alpha criterion was p=0.05	97% of those who used REQ-Mobile or onQ set a quit date. 53% of users reported a quit attempt at 6 weeks, and 66% of all cases reported an attempt at 12 weeks. Use of both services was positively correlated	Strengths: Demonstrates that smartphone apps assist in smoking cessation. Weaknesses: small sample size, self-reported abstinence is over reported. Possible bias: author is employee of

			were dropped from the study.	the end of which their smoking habits were assessed.			with quitting at 12 weeks. (n=68)	wife's company who developed the apps.
Christofferson et al. (2016)	None	IV: SmokefreeVET alone, and SmokefreeVET in combination with medication. DV: smoking cessation at weeks 1, 2, 3, 4, and 5.	n=1470 active smoker veterans	Pre-experimental study.	User engagement: Tally of total number of texts sent weekly. Latent growth mixture modelling (LGMM) determined discreet classes of user engagement. Self-reported point prevalence	LGMM, Cox regression, multi-level modeling	13% of reported abstinence at 5 weeks. Concurrent use of medication increased abstinence in weeks 1 and 2, but not significant after week 2.	Strengths: adequate sample size. Weaknesses: self-reported data collection
Free et al. (2011)	None	IV: txt2stop smartphone app DV: smoking cessation	Cell phone app. N=5800 Attrition: 392 lost to follow up.	RCT Smokers recruited to use smartphone application to stop smoking	Self-reported continuous smoking abstinence, biochemically verified at 6-months with postal salivary-cotinine testing or carbon	Relative Risk was assessed of those who quit vs. those who did not.	Smoking cessation support from txt2stop doubled quit rates at 6 months.	Strengths: sample size, telephone randomization ensured staff was blind. All analyses were on intention to treat basis. Weakness:

					monoxide testing.			possible that some people were randomized twice.
Haug et al. (2013)	Health Action Process Approach (HAPA)	IV1: SMS-COACH IV2: Assessment only control DV: Smoking cessation rates	Smoking vocational school students n=755	RCT	7-day point prevalence and 4-week point prevalence	STATA software. Regression models used for 7-day and 4-week point prevalence outcomes.	No statistically significant intervention effect was found for 7-day or 4-week point prevalence	This study was well done, but didn't now support the SMS based intervention.
Head et al. (2013)	None	IV: text messaging interventions DV1: health behavior DV2: health related outcomes	k=19 articles chosen based on inclusion criteria	Meta-analysis	Weighted mean	Weighted mean	Text-messaging interventions had statistically significant effects on health behaviors and health outcomes	Large meta-analysis that reviewed 19 articles, several of which are used in this project.
Naughton et al. (2014)	None	IV1: iQuit IV2: routine smoking cessation advise DV: smoking cessation	N=602; current smoker, able to read English, set a quit date within 2 weeks, aged 18-75 years and have a mobile phone	RCT	Self-reported 2 week point prevalence; point prevalence 8 weeks after randomization	2 week point prevalence; 8 week point prevalence	No significant differences at 2-week point prevalence, 6-month point	Well-constructed RCT with adequate sample size that supports use of intervention

							prevalence showed significant difference	at long term use.
Rodgers et al., (2005)	None	IV: group receiving text messages DV: smoking cessation	Cell phone app. N=1705 Attrition: 440 lost to follow up.	RCT Smokers recruited to use smartphone application to stop smoking.	Self-reported continuous smoking abstinence by text, phone call, and biochemically verified abstinence through salivary cotinine assessment	X^2 analyses, analysis of covariance, standard logistic regression analyses	More people stopped smoking at 6 weeks in action group than control, and again at 12 weeks. Minimally different at 26 weeks.	Strengths: large sample size, doubled quit rates at 6 weeks Weaknesses: over reporting of quitting status, and the loss to follow up.
Scott-Sheldon et al. (2016)	Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)	IV: text message based interventions DV: smoking cessation effectiveness	20 studies included	Meta-analysis	Point prevalence at 24 hrs, 7 days, 30 days, and continuous	Homogeneity statistics	Overall odds of smoking abstinence were 1.37 times more likely with text-messaging than with control measures	Meta-analysis with adequate sample size that supports PICOT question.
Spohr et al., (2014)	None		13 studies were used	Meta-analysis	Odds ratio based on random effects models	Odds ratio based on random effects models	Interventions increased quit rates. Efficacy higher in	Meta-analysis that looked at 13 articles. Several outcome

							studies with a 3 month follow up compared to 6 month follow up.	variables all revolving around intervention design with the ultimate outcome of increased smoking cessation.
Taber et al. (2016)	None	IV: SmokefreeTXT baseline, SmokefreeTXT with affirmation variables. DV: smoking cessation, days enrolled completion of intervention, 6-week smoking status	n=1260; active smokers enrolled in SmokefreeTXT intervention	Proof of concept study; 2x2 factorial design; collapsed across baseline affirmation during in analysis	Number of days users enrolled following their quit date. Point prevalence cessation. Smoking frequency at enrollment.	SPSSv.21 to run t-test and chi-squared	No significant effect of affirmation on intervention completion, days enrolled, 1 week smoking status or 6 week smoking status. Affirmation did increase cessation at 6 weeks.	Weaknesses: small sample size.
Whittaker et al. (2016)	None	IV: text messaging based interventions	12 studies included	Cochrane Review	Relative effect	GRADE rating for quality of evidence	Results demonstrated 1.7 times more likely	Cochrane review supporting use of project

		DV: smoking cessation rates					smoking cessation with text-messaging interventions than control.	intervention.
Whittaker, et al., (2011)	App based on social cognitive theory	IV: STUB IT phone application. DV: smoking cessation	Cell phone application. N=226 Attrition: 61 lost to follow-up.	RCT Smokers recruited to use multimedia phone app to stop smoking.	Continuous abstinence defined by Russell standard. NicAlert test-strips to verify abstinence.	Chi-square to compare groups.	Unable to demonstrate a statistically significant result because of sample size.	Sub-optimal recruitment

Appendix 4 Letter of Support

Colbert Family Health & Wellness

2580 Shiloh Springs Rd, Ste B*Trotwood, OH 45426*P:937-529-4376*F:937-529-4538

January 10, 2017

Alexander Young, BSN, RN
505 E. Sandusky Ave.
Bellefontaine, OH 43311

Dear Mr. Young:

Thank you for providing the information pertaining to your Nurse Practitioner Doctoral Project for our consideration. We understand the purpose of your project is to implement a text-messaging based smoking cessation program on three groups of patients. We understand the student will recruit a total of 60 patients to participate in the 8-week long program, and that the patients will be included in one of three groups depending on their preference. One group of patients will receive only the SmokefreeTXT intervention. The second group will receive the SmokefreeTXT program in addition to a nicotine replacement therapy, and the third and final group will receive no intervention but will complete the pre- and post-assessment. The participants of each group will be able to withdraw from participation in the project at any time, for any reason, without consequence.

We feel this project will benefit both the practice, and the patients and offer our support of it. We will accommodate the student by allowing access to the patient population here at Colbert Family Wellness. The student will have access to a conference room to recruit, and discuss the project with patients. The student will maintain patient privacy in accordance with HIPPAA regulations, and at the end of the project, any patient information will be returned to Colbert Family Health and Wellness and destroyed. The student will provide Colbert Family Health and Wellness with copies of the pre- and post-assessment for the office to use, as well as a summary of the findings from the project. Please feel free to contact me at 937-529-4376 if I can provide any additional information in this regard.

Sincerely,

Marquetta D. Colbert, CNP

Appendix 5 Assessment Form

Smoking Cessation Questionnaire

Date of Assessment: (mm/dd/yyyy)   ____/____/_____

Do you currently smoke cigarettes?   ☐ No   ☐ Yes

Instructions: Please provide a response for each of the following questions:

1. **What is your age?** _____

2. **What is your gender?**   ☐ Female   ☐ Male

3. **What is your marital status?**   ☐ Single   ☐ Married   ☐ Separated
   ☐ Divorced   ☐ Widowed

4. **What is your annual income (or combined annual income if you have a spouse)?**
   ☐ Less than $60,000   ☐ $60,001 to $70,000   ☐ $70,001 to $80,000
   ☐ $80,001 to $90,000   ☐ $90,001 to $100,000   ☐ Greater than $100,000

5. **With which racial or ethnic category do you identify?**
   ☐ African American   ☐ Asian/Pacific Islander   ☐ Caucasian   ☐ Latino

6. **What is your highest level of education?**
   ☐ High School   ☐ University
   ☐ Community College   ☐ Graduate school

7. **Please indicate if you have following health problems**
   Heart disease   ☐ Yes   ☐ No
   Hypertension   ☐ Yes   ☐ No
   Asthma   ☐ Yes   ☐ No
   COPD   ☐ Yes   ☐ No
   Diabetes   ☐ Yes   ☐ No
   Cancer   ☐ Yes   ☐ No
   Other (please describe)   ☐ No   ☐ Yes _____

8. **How soon after you wake up do you smoke your first cigarette?**

   ☐ Within 5 minutes   ☐ 6 to 30 minutes   ☐ 31 to 60 minutes   ☐ After 60 minutes

Heatherton TF, Kozlowski LT Frecker RC (1991). The Fagerström Test for Nicotine Dependence: A revision of the
   Fagerström Tolerance Questionnaire. British Journal of Addiction 86:1119-27.
University of Rhode Island (2017). Smoking: Adult stage of change (short form). Retrieved from:
   http://web.uri.edu/cprc/smoking-adult-stage-of-change-short-form/

Smoking Cessation Questionnaire

9. **Do you find it difficult to refrain from smoking in places where it is forbidden** (e.g., in church, at the library, in the cinema)? ☐ Yes ☐ No

10. **Which cigarette would you hate most to give up?**
    ☐ The first one in the morning   ☐ Any other

11. **How many cigarettes per day do you smoke?**
    ☐ 10 or less   ☐ 11 to 20   ☐ 21 to 30   ☐ 31 or more

12. **How many years have you smoked?**
    _____

13. **Do you smoke more frequently during the first hours after waking than during the rest of the day?**   ☐ Yes   ☐ No

14. **Do you smoke when you are so ill that you are in bed most of the day?**
    ☐ Yes   ☐ No

15. **In the last year, how many times have you quit smoking for at least 24 hours?**

    _____

16. **Are you seriously thinking of quitting smoking?**

    ☐ Yes, within the next 30 days.
    ☐ Yes, within the next 6 months.
    ☐ No, not thinking of quitting.

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