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The Use of Automated Text Messaging as an Intervention for Smoking Cessation

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THE USE OF AUTOMATED TEXT MESSAGING AS AN INTERVENTION FOR SMOKING CESSATION

by

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DEDICATION

This EBP project is dedicated to God, my husband, my children, my parents and my siblings. First of all, I would like to thank God for his faithfulness, grace and mercy because without Him, I am nobody. To my other half (my husband), thank you for holding my hands all the way and never giving up on me. Words are not enough to show you how much I appreciate you. To my beautiful daughter Ariella, thank you for allowing me to be a God-given role model and to my handsome prince who was born three months ago, thank you for making me stronger than I thought I was. I love you both and I hope I am able to inspire you and that anything is possible irrespective of the obstacle. To my mom, dad and siblings, Thank you for the financial and spiritual sacrifices. God bless you all. To my loving friend (Gaelle Bula-Bula), thank you for being a shoulder to cry on and walking these past few years with me. Finally to Salamatu Yusif, my predecessor who has shown enormous strength, thank you for your guidance and encouragement.

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TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

ABSTRACT

The use of Automated Text Messaging as an Intervention for Smoking Cessation

Oluwasayo M. Sinkaiye, BSN, RN

Tobacco smoking is a widespread problem that affects the adult population in the United States (U.S.). In 2018, about 14 of every 100 adults in the USA aged 18 years or older were cigarette smokers (Centers for Disease Control and Prevention [CDC], 2020). Tobacco smoking is associated with chronic disease conditions that have serious health implications including cancer, heart disease, diabetes, and chronic obstructive pulmonary disease (COPD) (CDC, 2020). The purpose of this evidence-based practice project (EBP) was to determine the effectiveness of an automated text messaging application (SmokefreeTXT) for smoking cessation in a primary care setting for adult cigarette smokers aged 18 years or older. The revised Iowa Model was used to guide this project in a primary care setting located in northwest Indiana. A single group comparison design was used and it consisted of eleven males and two females. Participants were enrolled on the SmokefreeTXT website to receive daily text messages focused on smoking cessation for six weeks. All participants set their quit date as the following day after enrollment. A comparison of the number of cigarettes smoked per day before and after the intervention was done to determine if abstinence (smoked five or less cigarettes during the project) was achieved or if there was a decrease in number of cigarettes smoked per day. Descriptive statistics were used to analyze abstinence while a paired *t* test was used to analyze the mean pre-intervention and mean post-intervention number of cigarettes smoked per day. Abstinence was achieved in 69.23% of participants ($n = 9$). The mean pre-intervention number of cigarettes smoked per day was ($M = 10.85$, $SD = 3.78$) and the mean post-intervention number of cigarettes smoked per day was ($M = 3.92$, $SD = 5.19$). The decrease in the number of cigarettes smoked per day was found to be statistically and clinically significant $t(12) = 4.83$, $p < .001$). Results demonstrated that the SmokefreeTXT application was effective

as an intervention for smoking cessation. This EBP project has been adopted by the project site as a viable method for smoking cessation.

Keywords: smoking cessation, intervention, primary care, advance practice nurse, SmokefreeTXT, text messaging

CHAPTER 1

INTRODUCTION

Background

In the United States (U.S.), about 40 million adults currently smoke cigarettes. The Center for Disease Control (CDC) (2020a) defines a smoker as any adult who has smoked 100 cigarettes in his or her lifetime and who currently smokes cigarettes. In 2018, about 14 of every 100 adults in the U.S. aged 18 years or older were cigarette smokers (CDC, 2020b). These statistics are directly related to the economics, productivity, and the health and wellbeing of a nation.

Tobacco smoking is associated with chronic disease conditions that have devastating health implications. It is the leading cause of preventable disability, disease, and death in the U.S. (CDC, 2020b). In the U.S. alone, more than 480,000 deaths are caused annually from the use of tobacco and approximately another 41,000 deaths are attributed to exposure to second-hand smoking (CDC, 2020b; Scott-Sheldon et al., 2016). According to the CDC (2020b), tobacco smoking can cause chronic diseases such as cancer, heart disease, diabetes, and chronic obstructive pulmonary disease (COPD). Tobacco smoking can also increase the risk of diseases such as tuberculosis, eye disease, and rheumatoid arthritis (CDC, 2020b). Furthermore, second-hand smoking has been linked to the incidence of stroke, lung cancer, and coronary heart disease in adults (CDC, 2020b). In children, exposure to second-hand smoking has been linked to an increased risk for sudden infant death syndrome, acute respiratory infections, middle ear disease, stunted lung growth, and severe asthma (CDC, 2020b).

Tobacco smoking has great economic consequences. Globally, the economic cost associated with the use of tobacco is estimated to be over U.S. $1 trillion yearly and of this

amount, about $300 billion is lost in productivity and healthcare combined (Scott-Sheldon et al, 2016). In the U.S., nearly $170 billion is spent on medical care to treat smoking-related diseases in adults (CDC, 2020b). Therefore, it is essential that healthcare providers are aware of current interventions that can reduce the usage of tobacco within their local population.

Although various smoking cessation techniques have been implemented in the past, sustainable impact through these techniques has been challenging due to the inability of previous tobacco smokers to maintain abstinence (CDC, 2020b). One reason is that tobacco companies spend billions of dollars on marketing and advertisements yearly. In 2018, the Federal Trade Commission reported that tobacco companies spent about $9.5 billion in 2016 on advertising and promotional expenses in the U.S. (Federal Trade Commission Smokeless Tobacco Report for 2016, 2018). This factor can diminish the rate of abstinence after smoking cessation interventions have been implemented. The World Health Organization (WHO, 2020) noted that the ban placed on tobacco advertising actually lowered consumption. Therefore, it is important for healthcare practitioners to mitigate the effect of these advertisement companies by improving awareness on smoking cessation.

Data from the Literature Supporting Need for the Project

Although current smoking has declined from 20.9% in 2005 to 13.7 % in 2018, more than 16 millions Americans currently live with smoking related diseases (CDC, 2020b). This poses a challenge for healthcare workers. Without urgent intervention, the U.S. risks an increase in people who live with smoking related diseases which can lead to a higher mortality rate. Also, the rising cost of healthcare and the loss of productivity which smoking has caused necessitates the urgency in finding interventions that are effective in the family care setting (CDC, 2020; WHO, 2020).

Globally, there are about 1.3 billion tobacco users worldwide (WHO, 2020). Of these, over 80% live in low- and middle-income countries where the burden of tobacco-related illness and death is heaviest (WHO, 2020). Tobacco smoking directly contributes to poverty by diverting household spending from basic needs such as food and shelter to tobacco usage (WHO, 2020). It is pertinent that interventions which are effective in promoting smoking cessation are implemented in order to reduce poverty in households most likely to be impacted by the cost of smoking.

In Indiana, the State Department of Health (ISDH, 2020) noted that about 1 in 5 adults are current smokers which cost the state about 11,100 lives annually. Currently, Indiana ranks high in prevalence of adult smokers. In 2018, Indiana had the 4th highest smoking prevalence among all states and the District of Columbia in the U.S. (ISDH, 2020). These statistics are indicative of the need for smoking cessation interventions within the family practice setting. As providers encounter patients in their daily care, providers have an opportunity to assess patients' smoking status and provide them with information and counsel.

The need for this project is highlighted by numerous challenges peculiar to the primary setting. Firstly, there are limited data regarding the effectiveness of smoking cessation interventions when they are provided in primary care (Pipher et al., 2018). Secondly, healthcare providers only provide advice about quitting to fewer than two-thirds of smokers, and fewer smokers receive evidence-based treatment if any (Pipher et al., 2018). Furthermore, an estimated 70% of tobacco smokers visit a primary care provider each year underscoring the need for effective treatments for smoking that are feasible for use in family practice (Piper et al., 2018).

Technology use as a means of health promotion and disease prevention is a rapidly growing area of research. The development of mobile phone interventions such as short-

message service (SMS), multimedia message service, and other internet applications are on the increase (Scott-Sheldon, 2016; Spohr et al., 2015). In 2014, an estimated 4.55 billion people worldwide used a mobile phone (Spohr et al., 2015). The growth and acceptance of mobile communication provides healthcare providers with opportunities for delivering innovative health behavior change interventions such as smoking cessation.

Data from the Clinical Agency Supporting Need for the Project

This project was implemented at a family practice clinic situated in Merrillville, IN. After consultation at this site, it was determined that there is no current protocol or program for smoking cessation (R, Albert, personal communication, June 1, 2020). Furthermore, there was a lack of evidence-based interventions targeted at patients who were willing to quit smoking (R, Albert, personal communication, June 1, 2020). The project facilitator also acknowledged the need for a smoking cessation intervention due to the high number of patients encountered daily who were at a greater risk for the development of cardiovascular disease.

According to the project facilitator, one in three patients seen at this clinic was at an increased risk for developing cardiovascular disease (R, Albert, personal communication, June 1, 2020). Additionally, one in four patients aged 18 years or older who were seen in this clinic identified as “current” tobacco smokers (R, Albert, personal communication, June 1, 2020). Since cigarette smoking is one of the risk factors for the development of cardiovascular disease and a reduction in the number of current smokers will greatly reduce the risk of these patients developing cardiovascular disease in the future, it was determined that text messaging as a method of smoking cessation would be appropriate in this clinic.

Purpose of the Evidence-Based Practice Project

The purpose of this project was to implement an evidence-based practice (EBP) smoking cessation intervention in the family care setting. The EBP intervention was achieved by using current and relevant evidence on the use of text messaging to promote abstinence and decrease daily cigarette consumption in adult cigarette smokers aged 18 years or older.

PICOT Question

The PICOT question which this project addressed was: “In the primary care setting, in adults aged 18 years or older who smoke (P), does receipt of a daily automated short message service (SMS) program such as SmokefreeTXT for six weeks after each participant’s quit date and a follow-up call after completion of the six weeks program (I) compared to current practice (C) increase the rate of smoking abstinence or decrease the number of cigarettes smoked (O) within six weeks (T) ?

Significance of the EBP Project

Tobacco smoking is a major risk factor for the development of cardiovascular disease, and it is known to be the cause of one in every four deaths from cardiovascular disease (CDC, 2020c). Tobacco use is also the single most preventable cause of morbidity and mortality (CDC, 2020; Pipher et al., 2018; WHO, 2020). Therefore, primary care providers must ensure that death from preventable causes are limited. A successful smoking cessation intervention should reduce morbidity and mortality.

One of the goals of Healthy People 2020 developed by the United States Department of Health and Human Services (USDHHS, 2020) is to reduce illness, disability and mortality from tobacco usage and secondhand smoking exposure (USDHHS, 2020). This EBP project was developed to improve patient outcomes by assisting patients who were ready to quit smoking using text-messaging as a smoking cessation intervention, thereby contributing to the Healthy

People 2020 goal of decreasing tobacco smoking and promoting abstinence. Also, increased abstinence would decrease morbidity, mortality, and the economic burden caused by tobacco usage. Finally, the use of SMS is a cost-effective tool for smoking cessation, has the potential for greater reach, and eliminates the inconveniences associated with pharmacotherapy (Scott-Sheldon et al., 2016; Whittaker et al., 2019).

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

A general description of the overview of the EBP model chosen to guide this project is provided. The steps used during literature search are described and summarized along with a literature review on the use of text messaging as a means of smoking cessation.

Evidence-based Practice Model

Overview of EBP Model

The evidence-based practice (EBP) model used to guide the development of this project was The Iowa Model Revised; Evidence-Based Practice to Promote Excellence in Health Care (The Iowa Model Collaborative, 2017). This model outlines a pragmatic approach to EBP by using a multiphase approach with feedback loops (Melnyk & Fineout-Overholt, 2019).

The Iowa Model was originally developed in 1994 as a guide for nurses and other health care providers to use findings from research for improvement of patient care. It was developed at the University of Iowa Hospitals and Clinics (Titler et al., 2001). Due to changes in healthcare, the need to revise this model was warranted (Titler et al., 2001). The latest revision was published in 2017 after an extensive literature review, author experiences, and a survey of users (The Iowa Model Collaborative, 2017). The steps of the revised model include:

Step I

The first step is the identification of triggering issues or opportunities for change. In this phase, clinicians identify clinical questions that can improve practice and healthcare. These questions are identified by questioning current practice. Problems identified can either be patient triggered, clinically identified, or highlighted from scientific knowledge that needs improvement (Melnyk & Fineout-Overholt, 2019).

Step II

This step consists of clearly stating the question or purpose of the EBP project. Clearly stating the clinical question or purpose of the project helps to guide the team during implementation of the various stages in the EBP process. Key elements of the purpose statement or clinical question must include the clinical problem, patient population, pilot area, intervention, comparison, and the desired outcome (Melnyk & Fineout-Overholt, 2019).

Step III

The clinical question is prioritized as high priority or low priority because issues that are priority to an organization will usually gather the support needed to complete the EBP process. Also, priority is given to issues that address patient safety or other market or institutional factors such as reimbursement and cost. There is a feedback loop at this stage where if the topic is a priority, the clinician can move to the next step, otherwise, if an issue is not of priority to an organization, the clinician should consider other issues that better fit organizational needs or patient welfare (Melnyk & Fineout-Overholt, 2019).

Step IV

A team is formed for developing, implementing, and evaluating the practice change. The team comprises stakeholders such as staff nurses, unit managers, advance practice nurses (APNs), physicians, medical assistance, interprofessional colleagues, and representatives of shared governance committees (Melnyk & Fineout-Overholt, 2019).

Step V

Assembling, appraising, and synthesizing the available body of evidence happens at this stage of the model. All evidence available is systematically searched, selected, reviewed, and critiqued. A nursing librarian can be useful in this step as the librarian may provide guidance in conducting a systematic literature search (Melnyk & Fineout-Overholt, 2019).

Step VI

In this step, it is determined if there is sufficient evidence to support the EBP project. If it is determined that there is no high-quality evidence available, a decision can be made to use related evidence or lower level evidence. Furthermore, if there is no sufficient evidence, research is conducted and the feedback loop is used to determine which direction to go following the steps of this model (Melnyk & Fineout-Overholt, 2019).

Step VII

The EBP project is designed and piloted in this step. During this phase, baseline data are collected, implementation and evaluation plans are developed, and post pilot data are collected and reported. Also, potential issues are identified during the piloting phase (Melnyk & Fineout-Overholt, 2019).

Step VIII

After the pilot study, a determination is made regarding the appropriateness of the adoption of the practice change. This decision is based on the data collected post-evaluation during the pilot phase. If the practice change is not appropriate for adoption, alternatives such as redesigning the practice change, searching for new knowledge, or conducting research to guide practice decisions are done. If the results are positive, then practice change is integrated into current practice (Melnyk & Fineout-Overholt, 2019).

Step IX

The practice change is integrated into practice through engagement with stakeholders identified in step IV. Sustainability of practice change is promoted by continuous communication of outcomes, local champions, education, and organizational leadership (Melnyk & Fineout-Overholt, 2019).

Step X

The final step in this model is the dissemination of results which is an important part of professional learning. Sharing results within and outside the organization through presentations and publications serves as means to promote an EBP culture in the organization. It also expands nursing knowledge and encourages practice change in other organizations (Melnyk & Fineout-Overholt, 2019).

Application of EBP Model to DNP Project

Step I

The project coordinator was able to identify opportunities for practice change after interacting with patients and discussing these potential issues with the project facilitator. Tobacco smoking was identified as a major issue with the patients attending this clinic. Also, there was no standard protocol for smoking cessation even though patients were screened for smoking at every visit. Many of these patients were at an increased risk for developing cardiovascular diseases (CVD). Since smoking is a known risk for developing CVD, it was determined that an EBP project on smoking cessation would be an appropriate method of reducing the risk associated with developing CVD (CDC, 2020c).

Step II

The clinical question was formulated after careful consideration of the types of patients that would benefit from this EBP project. Since this is a primary care clinic that treats few pediatric cases, it was determined that a smoking cessation intervention for adults aged 18 years or older will be beneficial for this setting.

Step III

To determine if this project was a priority, a meeting was conducted with the stakeholders which included the project facilitator, medical assistants, and office manager. All agreed that this project would be beneficial to both patients and the organization as it could be

adopted as the standard protocol for smoking cessation if implementation and evaluation was successful.

Step IV

Forming a team consisted of the project coordinator selecting key players who were enthusiastic about the project and who were beneficial in the implementation of the project. These stakeholders acted as champions for the change required. The key stakeholders included the primary care providers, medical assistants, administrative assistants, and the office manager.

Step V

A systematic search of several databases was done to gather evidence available in relation to the clinical question. Guidance and assistance were received from the nursing librarian on search strategies. After applicable evidence was selected, each source of evidence was appraised for quality in order to select high or good quality evidence for this project.

Step VI

It was determined that there was sufficient evidence to proceed in the development of the EBP project using this model. Available evidence on smoking cessation was abundant but evidence pertaining directly to the PICOT question and agency patient population was selected.

Step VII

Designing the EBP project and piloting the practice change consisted of the joint effort of project coordinator and stakeholders. The stakeholders involved in this project were required to promote the adoption of this practice change. They were involved in the evaluation of the practice change.

Step VIII

The practice change was assessed and determined appropriate for adoption. Stakeholders such as medical assistants were asked to always screen patients for smoking status and physician was encouraged to offer program to smokers at every visit.

Step IX

The practice change was promoted by change champions such as the project coordinator and project facilitator who ensured the sustainability of the change. Stakeholders were required to monitor outcomes continuously and monitor key indicators of quality improvement.

Step X

All stakeholders were responsible for disseminating the results within and outside the organization.

Strengths and Limitations of EBP Model for DNP Project

The Iowa Model Revised; Evidence-Based Practice to Promote Excellence in Health Care has several pros and cons. One of the pros of the usage of this model for this project is its simplicity and ease of use. This model is also detailed and systematic which made it easy for the project coordinator to follow a systematic process during the development and implementation of this EBP project. This model encouraged a collaborative approach in the EBP process which gave stakeholders an opportunity to be involved in the developing, implementing, and evaluating of this EBP project.

A major disadvantage encountered with the use of this model during the development and implementation of this project was the lack of commitment from some team members. Some of the medical staff were not as committed to this project for several reasons such as time constraints and other official assignments. Some of the medical assistants stated that they

already had a lot of assignments assigned to them and therefore, could not take on extra work such as this project.

Literature Search

Search Engines and Keywords

A comprehensive literature search was conducted for relevant evidence related to smoking cessation interventions in primary care patients. Four databases were searched for the most current evidence, and the evidence that fit the inclusion criteria and answered the PICOT question were selected. Databases searched included Joanna Briggs Institute Clinical Online Network of Evidence for Care and Therapeutics (JBI ConNect), Cochrane Collaboration and Library, MEDLINE with Full text, and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

A combination of keywords was used during the search to achieve relevant results within the last 10 years (2010-2020) (see Table 1). Keywords such as “smoking cessation” were used in JBI ConNect which yielded 143 results. The search in Cochrane yielded 97 results using the keywords “smoking cessation”. There were 221 hits in CINAHL when searched with mesh heading MM “smoking cessation” AND intervent* OR strateg* OR method* OR technique* AND “primary care” OR “primary health care” OR “family practice” as keywords. Limiters used in CINAHL included, English language, Scholarly peer reviewed journals, research articles, and all adults 19+. Medline with Full Text had 56 hits using search terms; mesh heading (MM “smoking cessation”) AND (MM “primary health care”) as keywords. Limiters used in Medline with Full text included, English language, Scholarly peer reviewed and all adults 19 +.

At the end of the literature search, eight studies were chosen (see Table 1) while 15 were duplicates. These studies were deliberately chosen because they focused on answering the PICOT question which is about using automated text messaging (SMS) as an intervention

for smoking cessation. From JBI ConNect, one evidence summary was chosen which summarized the recommendations for the use of technology for smoking cessation (Chronic Disease Node Group, 2019). From Cochrane library, one systematic review (SR) was chosen because it compared mobile phone text-messaging to app-based interventions for smoking cessation (Whittaker et al., 2019). Three pieces of evidence were chosen from Medline. One source was a SR (Scott-Sheldon et al., 2016), one was a randomized control trial (RCT) of an automated SMS service for smoking cessation (Abroms et al., 2014), and one clinical practice guideline which summarized recommendations for smoking cessation interventions in primary care was also chosen from Medline with Full Text (Verbiest et al., 2017). Finally, one meta-analysis (Spohr et al., 2015) and two RCTS (Free et al., 2011; Ybarra et al., 2013) were chosen from CINAHL.

Table 2.1

Literature Search Results

Database/Resource Searched	Keywords/Phrases Used	Limiters Used	Number of Results from Search	Number of Pieces of Evidence Selected for Use
Cochrane Library	"smoking cessation"	Date limiter: 2010-2020	97	1
Joanna Briggs Institute EBP Database (JBI)	“smoking cessation”	Date limiter: 2010-2020	143	1
CINAHL	MM “smoking cessation” AND Intervent* OR strateg* OR method* OR technique* AND “primary care” OR “primary health care” OR “family practice”	Date limiter: 2010-2020 English language Scholarly peer reviewed Research article Age related: All adults	156	3
Medline with Full Text	(MM "Smoking Cessation/MT") AND (MM "primary health care")	Date limiter: 2010-2020 English language Age related: All adults Scholarly peer-reviewed journals	56	3
			Total Number of pieces of Evidence Identified for Use:	8

Inclusion Criteria and Exclusion Criteria

The inclusion criteria used to identify the most relevant evidence included evidence rated as high or good quality and evidence ranked as level I and level II evidence on the Evidence Hierarchy by Melnyk and Fineout-Overholt (Melnyk & Fineout-Overholt, 2019). Exclusion criteria included any study conducted in acute-care or inpatient setting**,** any medical or surgical specialty setting other than primary care, and studies published in a language other than English because translation to English language would be challenging and might be inaccurate. Also, any low quality evidence was excluded for the purpose of this project.

Levels of Evidence

The pyramid of Evidence Hierarchy by Melnyk and Fineout-Overholt (2019) was used to rank all the evidence selected for this project. This Pyramid of Evidence is made up of seven levels that go from the highest, strongest, and most reliable evidence (level I) to the weakest and lowest evidence (level VII).

Level I evidence includes studies such as systematic reviews and meta-analysis of RCTs. Five sources of evidence used for this project were level I because they were either SRs, meta-analyses, evidence-based clinical practice guidelines or evidence summaries containing RCTs (Chronic Disease Node Group, 2019; Scott-Sheldon et al.,2016; Spohr et al,. 2015; Verbiest et al., 2017; Whittaker et al., 2019). Level II evidence contains evidence from a well-designed single study RCT; three level II sources of evidence were used for this project (Abroms et al., 2014; Free et al., 2011; Ybarra et al., 2013). Evidence that contains controlled trials without randomization is considered level III evidence. Level IV evidence is any case-control or cohort study, while level V is any evidence from systematic reviews of qualitative and descriptive studies. Level VI evidence is made of studies from a single descriptive or qualitative study while level VII includes evidence from reports of expert committees or opinions of

authorities. Only level I and II sources of evidence were selected for this EBP project because they are considered high levels of evidence (Melnyk and Fineout-Overholt, 2019).

Appraisal of Relevant Evidence

The Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool (JHNEBP) (Dang & Dearholt, 2017) was used to appraise each level of evidence (see Table 2). This tool can be used to appraise evidence such as SRs, meta-analyses, single quantitative studies, qualitative studies, and mixed studies. The tool rates the quality of an evidence as either high quality (A), good quality (B), or low quality or major flaws (C). High quality evidence is defined as any evidence that is consistent, has generalizable results and sufficient sample size for the study design, has adequate control and definitive conclusions, and has consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence (Dang & Dearholt, 2017). Good quality evidence is one that has reasonably consistent results, sufficient sample size for the study design, some control, fairly definitive conclusions, and reasonably consistent recommendations based on a fairly comprehensive literature review that includes some reference to scientific evidence (Dang & Dearholt, 2017). Low quality evidence is an evidence source that has little evidence with inconsistent results, insufficient sample size for the study design, and one that conclusions cannot be drawn (Dang & Dearholt, 2017). All selected evidence were appraised as either high or good quality and all low quality studies were excluded.

The AGREE II instrument (The AGREE Next Steps Consortium, 2010) was used to appraise the clinical practice guideline (CPG) chosen for this project. This instrument was chosen because of its simplicity, easy accessibility, and widespread usage in critiquing CPGs. This instrument rates the quality of clinical practice guidelines from one (low quality) to seven

(highest quality). The CPG chosen was determined to be of high quality after critique and is a Level I piece of evidence (Verbiest et al., 2017).

Level I Evidence

Three sources of level 1 evidence were chosen for this EBP project. All of these sources of evidence were rated as high quality evidence by the JHNEBP research appraisal tool.

An evidence summary by the Chronic Disease Node Group (2019) included eight SRs of RCTs. In one of the SRs that compared targeted tailored messaging (intervention group) to those who did not receive any form of text messaging i.e. they received no intervention at all (control group), the authors found that individuals who received text messaging interventions were 1.37 times more likely to abstain from smoking than the control group. Furthermore, text messaging interventions were shown to be more effective than controls in reducing cigarette consumption (d + random = 0.14, 95% CI [0.05, 0.23]. The authors also noted that the addition of social support to the use of daily text messaging did not have any effect on quit rates, nor did the addition of in-person support with text messaging have any effect on quit rate or abstinence. Furthermore, when text messaging alone versus text messaging and nicotine replacement therapy were compared, the authors found that text messaging alone was more effective in achieving smoking cessation in a three to six months follow up period (Chronic Disease Node Group, 2019).

Whittaker et al. (2019) conducted a SR review of 26 RCTs to determine if mobile phone interventions such as receipt of automated text messages increased quit rates in people who smoke. Study findings regarding text messaging in this SR were categorized into two groups. In the first group (one), text messaging (intervention group) was compared to minimal smoking cessation support. In the second group (two), text messaging with other smoking cessation techniques were compared to other methods of smoking cessation. Outcomes such as self-report and biochemical validation of long-term abstinence obtained at six to twelve months were

measured for both groups. The text messaging intervention group received messages that varied in length from one to eight weeks. These text messages were either tailored to the individual's quit dates, readiness to quit, smoking status, or personalized with the individual's personal name or baseline information. The comparison group (other/minimal smoking techniques) were categorized into four groups.

The first group received no smoking cessation or minimal support such as non-related smoking cessation text messages, written information, general health information, or information provided by a healthcare provider. The second control group received another cessation technique that did not include text messaging but may have included pharmacotherapy, behavioral therapy, or counselling. The third group in the control arm received an internet-based program or a five-minute counselling cessation session, while the fourth group compared the frequency of text messages received to see if length and number of messages received made any difference. Study findings from the first group (one) noted that automated text messaging alone versus minimal smoking support (no smoking cessation support or unrelated text messages about smoking, or links to smoking cessation support) at 6-12 months had a relative risk (RR) of 1.54 with a confidence interval of 95% CI [1.19 to 2.00]. Findings from the second group (two) noted that text messaging in addition to other smoking cessation support had a relative risk of RR = 1.59 with confidence interval of 95% CI [1.09 to 2.33]. Overall, the authors noted that text messaging programs increased quit rates by 50% to 60% in people who smoke.

Verbiest et al. (2017) authored a CPG to assess the development of clinical practice guidelines, analyze recommendations made within these guidelines pertaining to smoking cessation in primary care, and to ascertain the validity and correlation of the recommendations contained in these guidelines. The authors came up with 12 recommendations for clinicians in the primary care setting. They included:

1. Identification of individual smoking status
2. Motivation to quit should be assessed
3. Brief advice on quitting should be given
4. Smokers wishing to quit should be offered assistance
5. Pharmacotherapy should be offered/encouraged
6. Behavioral therapy should be offered
7. Abstinence should be evaluated after cessation
8. The ABC guide should be used as an interventional guide.
9. The 5 As Framework should be used as a guide
10. Healthcare professional should be educated on delivering tobacco treatment plans
11. Hypnotherapy/acupuncture are not effective therapy for smoking cessation
12. Self-help materials should be offered.

Primary care providers were encouraged to consider these recommendations when promoting smoking cessation. Clinicians in the primary care setting were advised to consider usage of any these recommendations depending on the assessment, clinical expertise of the medical provider, and patient preference.

Scott-Sheldon et al. (2016) conducted a SR to determine the effectiveness of text messaging as a method for smoking cessation in reducing cigarette consumption and abstinence. This SR included 20 studies with 22 interventions. Outcomes measured included abstinence, quit attempts, and cigarette use per day/week. Smoking abstinence was assessed using four measures of abstinence. Measures included point prevalence abstinence (abstinence from a specific time-point to follow-up assessment), continuous abstinence (abstinence from quit date to follow-up assessment), prolonged or sustained abstinence (sustained abstinence between two assessments), and repeated point prevalence abstinence (abstinence from at least

two specific time-points to follow-up assessments). The intervention groups received either text-messages alone or a combination of text-messaging with another type of intervention such as phone calls, in-person counselling or print materials. The comparison group received other forms of smoking cessation interventions not delivered through text messaging and irrelevant content. From this SR, it was found that smokers who received text messages were more likely to abstain from smoking on measures such as point prevalence, continuous abstinence, prolonged abstinence, and repeated point prevalence. The overall results for smoking abstinence were significant (OR = 1.37, 95% CI [1.25, 1.51]; k = 19). For cigarette consumption, it was found that those in the intervention group reported fewer cigarettes per day or week versus the control group (d+ random = 0.14, 95% CI [0.05, 0.23]). Finally, the authors found no difference between the control and intervention groups with regards to quit attempts.

Spohr et al. (2015) conducted a meta-analysis to analyze the effectiveness of text messages as a smoking cessation intervention and to determine the different moderators that affected quit rates in smokers. The authors considered 13 RCTs for this study, and the overall results suggested that text-messaging interventions could increase smoking cessation rate by 36% as observed in the intervention group when compared to the control group. The authors also assessed the differences between the intervention groups (text messaging) at three and six months follow-up; they found that there were no significant differences over time (Q_B = 0.46, df = 1, p = .49). Those who received text messages alone versus those who received text-messages plus additional materials such as individual counseling sessions, tailored self-help pamphlets, and video messaging were compared; it was found that there was no significant difference (Q_B = 1.66, df = 1, p = .20). Thirdly, they examined the differences between messaging frequencies. They discovered that there was no statistically significant difference among the three message frequencies: decreasing schedule, fixed schedule, and a variable schedule (Q_B = 0.86, df = 2, p = .65).

Spohr et al. (2015) also compared text message interventions that implemented a fixed message track to those that used a dynamic message track. The authors found no significant difference based on choice of message track (QB = 1.03, *df* = 1, *p* = .31). Furthermore, the authors compared the differences between tailored and non-tailored messages. It was determined that the use of message tailoring (OR = 1.51, 95% CI [1.17, 1.94]) or the use of message targeting and tailoring (OR = 1.39, 95% CI [1.25, 1.56]) were equally as effective for increasing smoking cessation when compared to control groups with no significant difference between the two groups. The authors also compared the receipt of on-demand messaging services requesting for additional support such as help with craving to those that did not, and they observed that there was no significant difference between both programs (OR = 1.50, 95% CI [0.91, 1.55]). A comparison between interventions that included assessment messages (assessment of quit status or status of change) to those that did not assess for quit status or stage of change was also done. There was no statistically significant difference between both interventions (QB = 0.69, *df* = 1, *p* = .41). Lastly, the authors compared text message interventions which provided a peer-to-peer support component to those that did receive peer-to-peer support. The results were not statistically significant between studies that included peer-to-peer support plus text messages and those that did not (QB = 0.31, *df* = 1, *p* = .58).

Level II Evidence

Three RCTs (Abroms et al., 2014; Free et al., 2011; Ybarra et al., 2013) focused on the use of automated text messaging as an intervention.

Abroms et al. (2014) conducted an RCT which focused on the use of Text2Quit, an automated messaging program for smokers as an intervention for smoking cessation. Text2Quit is an automated, personalized, interactive mobile SMS program that sends daily text messages to offer advice, support, and reminders to current smokers about quitting smoking for a duration of six months. Participants were either randomized to the intervention group where they

received Text2Quit SMS or the control group which received self-help materials (a weblink of contained information on smoking cessation similar).

In this RCT, participants' smoking status were assessed at baseline, one, three, and 6 months post-enrollment (Abroms et al., 2014). Two outcomes were considered, a self-report of abstinence from smoking and a biochemical confirmation. A biochemical confirmation was done (saliva test) for those who reported abstinence in the past seven days at the 6-month follow-up. Biochemically confirmed repeated point prevalence abstinence suggested that the intervention group (11.1%) was twice as likely to quit compared with the control group (5%) (RR = 2.22, 95% CI [1.16, 4.26], $p < 0.05$). Self-report repeated point prevalence abstinence of the intervention group was 19.9% compared with 10.0% in the control group (RR = 1.99, 95% CI [1.27, 3.13], $p < 0.01$). At 6-months follow up, there was no statistical significance found in the biochemical validation of abstinence between the intervention group (15.7%) and control group (11.2%) (RR = 1.40, 95% CI [0.89, 2.20], $p = 0.15$).

Ybarra et al. (2013) also conducted an RCT to pilot test the effectiveness of another automated text messaging program, Stop My Smoking USA (SMS USA), that is tailored to young adults (18-25 years old) for smoking cessation. Participants were randomized to either a six weeks SMS USA program or an attention-matched activity aimed at improving sleep and activity. Participants received tailored messages based upon their quitting status. All participants received two weeks of pre-quit messages aimed at encouraging them to clarify reasons for quitting, to understand their smoking patterns, and to address tempting situations/triggers/urges. On quit day, difficulties commonly experienced and coping strategies were sent in a text message and through the first week of each participant post-quitting. Post-quit messages were also sent to encourage participants to recognize relapse and information about how to deal with issues such as stress that can arise after quitting. For this study, participants were classified as

having quit if they smoked five or less cigarettes since their quit date which was verifiable by a significant other of each participant. After four weeks, participants in the intervention group (39%) were significantly more likely to have quit at four weeks post-quit compared to 21% in the control group (*aOR* = 3.33, 95% CI [1.48, 7.45]). This result was also consistent for the 7-day point prevalence (44% vs. 27%; *aOR* = 2.55, 95% CI [1.22, 5.30]). At three months, these findings were not sustained although the intervention group seemed to be favored (intervention: 40% vs. control group: 30%, respectively) (*OR* = 1.59, 95% CI [0.78, 3.21]).

Free et al. (2011) conducted a RCT in the United Kingdom focused on the short-term effect of TXT2stop, an automated SMS service on abstinence. The intervention group in this single-blinded study received motivational text messages focusing on behavioral change while the control group received messages that were unrelated to quitting. For the duration of this study, the intervention group received five text messages a day for the first five weeks, and received three messages a day for the next 26 weeks. These messages were personalized with an algorithm based on demographic and other information gathered at baseline, such as weight gain after quitting and cravings.

The primary outcome for this study was self-reported continuous smoking abstinence i.e. no more than five cigarettes smoked in the past week at the 4 week at follow-up and no more than five cigarettes smoked since the start of the abstinence period at 6 months (Intervention group = 10.7 %, control group = 4.9 % , RR = 2.20 95% CI [1.80-2.68]) (Free et al., 2011). Self-reported continuous abstinence was also verified biochemically (postal salivary-cotinine testing) at six months. Secondary outcomes were point prevalence of abstinence (abstinence in the past seven days) at four weeks (intervention (28.7%) versus control (12.1%; RR = 2.37) and self-reported continuous abstinence at 28 days (intervention (19.8%) versus control (13.5%); RR = 1.47).

Table 2.2

Evidence Table

Citation (APA	Purpose	Design	Sample	Measurement/ Outcomes	Results/Findings	Level/ Quality
Abroms, L. C., Boal, A. L., Simmens, S. J., Mendel, J. A., & Windsor, R. A. (2014). A randomized trial of Text2Quit: A text messaging program for smoking cessation. *American journal of preventive medicine*, *47*(3), 242–250. https://doi.org/10.1016/j.amepre.2014.04.010	The effect of automated text messaging programs such as Text2Quit on smoking abstinence	Randomized Control Trial	503 participants recruited on the internet	1. Primary outcome : Biochemically confirmed abstinence (cotinine level of ≤15 ng/mL at 6 months 2. Secondary outcome: self-report of no smoking in the past 30 days on the 3- and 6-month surveys 3. Self-reported abstinence at 7 and 30 days	1. Biochemically repeated point prevalence abstinence in intervention group (11.1%) and control group (5%) ; (RR = 2.22, CI [1.16, 4.26], $p < 0.05$) 2 . Self-reported point prevalence abstinence for the intervention group (19.9%) than in the control group (10.0%) (RR = 1.99, 95% CI [1.27, 3.13], $p < 0.01$). Secondary outcome: At the 6-months follow-up, Self-reported quitting for intervention group for past 7-day smoking (RR = 1.53, 95% CI [1.13, 2.07], $p < 0.01$). 24.8% of the intervention group reported not smoking compared with 15.8% of control group participants at	Level II/ Good

					30-days post quitting (RR = 1.57, 95% CI [1.10, 2.26], $p < 0.05$). Biochemical confirmation 1.The intervention (15.7%) and control group (11.2%) (RR = 1.40, 95% CI [0.89, 2.20], $p = 0.15$).	
Chronic Disease Node Group. (2019). Evidence summary. Smoking cessation: Digital health. *The Joanna Briggs Institute*. Retrieved from http://ovidsp.dc2.ovid.com.ezproxy.valpo.edu/sp-4.04.0a/ovidweb.cgi?&S=KNKIFPNELAEBGIIJIPBKNFPEMIGMAA00&Link+Set=S.sh.21%7c2%7csl_190	To assess the effectiveness of a taper down approach in long term smoking cessation	Evidence summary	Eight systematic reviews	N/A	1. Best practice recommendations are that "technology-based interventions should be offered to individuals who wish to quit smoking. The use of targeted text messaging interventions appears to be the most promising approach based on the available evidence" (p.3). 2. One systematic review demonstrated that groups that received text messaging interventions were 1.37 times more likely to abstain from smoking than the control groups.	Level 1/High
Free, C., Knight, R., Robertson, S.,	To assess the effectiveness of automated	Single blinded RCT	5,792 participants	1 . Primary outcome:	1. Abstinence at 6 months verified biochemically:	Level II/High

Whittaker, R., Edwards, P., Zhou, W., Rodgers, A., Cairns, J., Kenward, M. G., & Roberts, I. (2011). Smoking cessation support delivered via mobile phone text messaging (txt2stop): A single-blind, randomized trial. *Lancet*, *378 North American Edition*(9785), 49–55. https://doi-org.ezproxy.valpo	smoking cessation text messaging intervention such as TXT2stop in continuous abstinence at 6 months			Smoking abstinence at 6 months confirmed biochemically 2 . Secondary outcome: Self-reporting of no smoking at 4 weeks and 6 months. The intervention group received TXT2stop messages related to motivational and behavioral-change support, and the control group received text messages unrelated to quitting.	- Intervention group = 10.7 % - Control group = 4.9 % (RR =2.20 95% CI [1.80-.68]) 2. Self-reporting at 4 weeks: - Past 7 days reported no smoking • Intervention = 28.7% • Control = 12.1% (RR = 2.37 95% CI [2.11-2.66]) 3. Self-reporting at 6 months - 28 days continuous abstinence • Intervetion:19.8% • Control:13.5% (RR = 1.47, 95 CI [1.30-1.66]) - No smoking reported in the past 7 days • Intervention:24.2% • Control:18.3% (RR = 1.32, 95 CI [1.19-1.42])	
Scott-Sheldon, L. A. J., Lantini, R., Jennings, E. G., Thind, H., Rosen, R. K., Salmoirago-Blotcher, E., &	To determine the effectiveness of text messaging as a method for	Systematic review and meta-analysis	20 RCTs (15,593 smokers)	1 . Quit attempts 2 . Abstinence and cigarette consumption	1. Smokers who received text messages daily were more likely to quit than no intervention at all. Overall" abstinence	Level I/High

Bock, B. C. (2016). Text messaging-based interventions for smoking cessation: A systematic review and meta-analysis. *JMIR MHealth and UHealth*, *4*(2), e49. https://doi-org.ezproxy.valpo.edu/10.2196/mhealth.5436	smoking cessation in reducing cigarette consumption and abstinence				(OR = 1.37, 95% CI [1.25, 1.51]) 2. Intervention group reported fewer cigarettes per-day/week if they received text message versus the control group: (d + random = 0.14, 95% CI [0.05, 0.23]).	
Spohr, S. A., Nandy, R., Gandhiraj, D., Vemulapalli, A., Anne, S., & Walters, S. T. (2015). Efficacy of SMS text message interventions for smoking cessation: A meta-analysis. *Journal of Substance Abuse Treatment*, *56*,	To analyze the effectiveness of text messages as a smoking cessation intervention To assess different moderators that can affect quit rates	Meta-analysis	13 RCTs	1. 7-day point prevalence quit rate. 2. Text messaging frequency.	1. Quit rates for the SMS intervention group were 36% higher compared to the control group quit rates (self-help pamphlets, assessment only group, web and phone-based assistance, general cessation information on the website, daily motivational SMS not related to smoking) 2. SMS intervention (OR = 1.36, 95% CI [1.23, 1.51]) 3. Use of tailored messaging (OR = 1.51, 95% CI [1.17, 1.94])	Level I/High

1–10. https://doi-org.ezproxy.valpo.edu/10.1016/j.jsat.2015.01.011					4. Combined use of targeted and tailored SMS techniques were equally effective for increasing smoking cessation when compared to control groups (OR = 1.39, 95% CI [1.25, 1.56]) 5. Demand messaging had a higher efficacy than studies that offered on demand messaging, this result was not statistically significant (OR = 1.50, 95% CI [0.91, 1.55])	
Verbiest, M., Brakema, E., Kleij van der, R., Sheals, K., Allistone, G., Williams, S., … Chavannes, N. (2017). National guidelines for smoking cessation in primary care: A literature review and evidence analysis. *NPJ Primary Care Respiratory*	To analyze recommendations made within these guidelines pertaining to smoking cessation in primary care	Clinical practice guidelines (evidence analysis/summary)	26 clinical practice guidelines from 22 countries	Congruence or disparity of recommendations from guidelines available for tobacco Smoking cessation in primary care	1. Identification of individual smoking status 2. Assessment of motivation to quit in each patient 3. Brief advice on quitting should be given 4. Smokers wishing to quit should be offered assistance 5. Pharmacotherapy should be offered/encouraged 6. Behavioral therapy should be offered 7. Abstinence should be evaluated after cessation 8. The ABC guide should be used as an interventional guide. 9. The 5 As Framework should be used as a guide	Level 1/High

Medicine, *27*(1), 1-11. doi:10.1038/s41533-016-0004-8					10. Healthcare professional should be educated on delivering tobacco treatment plans 11.Hypnotherapy/acupuncture are not effective therapy for smoking cessation 12. Self-help materials should be offered	
Whittaker R, McRobbie H, Bullen C, Rodgers A, Gu Y, Dobson R. Mobile phone text messaging and app-based interventions for smoking cessation. *Cochrane Database of Systematic Reviews* 2019, Issue 10. Art. No.: CD006611. DOI: 10.1002/14651858.CD006611.pub5.	To determine if mobile phone interventions such as automated text messages increased quit rates in people who smoked	Systematic Review	26 RCTs	Self-report or biochemical confirmation of rate of abstinence from smoking after intervention such as text messaging alone or text messaging combined with other types of cessation techniques such as pharmacotherapy, behavioral therapy, and counselling for at least 6 month from baseline and at 12 months	1. Evidence supports the use of text messaging as a smoking cessation intervention as it was found to be just as effective as other smoking cessation methods 2. Text messaging vs minimal smoking support (no smoking cessation support or unrelated text messages about smoking, or links to smoking cessation support) at 6-12 months (RR = 1.54 95% CI [1.19, 2.00]) 3. Text messaging in addition to other smoking cessation support such as behavioral support, pharmacotherapy and non-smoking related text messaging (RR = 1.59 (95% CI [1.09 to 2.33])	Level I/High

Ybarra, M. L., Holtrop, J. S., Prescott, T. L., Rahbar, M. H., & Strong, D. (2013). Pilot RCT results of stop my smoking USA: a text messaging-based smoking cessation program for young adults. *Nicotine & Tobacco Research*, *15*(8), 1388–1399. https://doi-org.ezproxy.valpo.edu/10.1093/ntr/nts339	To pilot test the effectiveness of a text messaging smoking cessation intervention such as (Stop My Smoking SMS USA) tailored to young adults	Randomized Control Trial	164 (18-25-year-old) smokers who were willing to quit smoking in the next 30 days	1 . 3 months continuous abstinence from tobacco smoking verified by phone call to a significant other 2 . Number of cigarettes smokes by 4 weeks post quit day verified by a significant other as continuous abstinence was classified as a person who has only smoked 5 or less cigarettes since their quit date. Intervention : 6 weeks SMS USA tailored to a person's quit stage e.g. pre-quit, quit, early quit and late quit stage Control: txt message aimed at how quitting smoking can improve sleeping and physical activity	Smoking cessation at 4 weeks post quit : 1 . Intervention group (39%) were significantly more likely to have quit at 4 weeks compared to control group (21%) *aOR* = 3.33, 95% CI [1.48, 7.45] 2 . 7-day point prevalence intervention (44%) versus control group (27%); *aOR* = 2.55, 95% CI [1.22, 5.30]). At 3-month follow-up: 1. Amongst 104 who did not abstain completely since quitting, 30% of intervention and 20% of control participants reported not smoking in the past 7 days (p = .52). 2 . Out of the 93 participants who reported smoking at least one cigarette in the past 28 days intervention reported reducing their average daily intake by 6.7 cigarettes (*SD* = 8.3) and the control group by 5.9	Level II/high

	cigarettes (*SD* = 4.5; *p* = .60).

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

Several interventions have been used as a method of smoking cessation in primary care. Some of these methods include self-help materials such as pamphlets (Verbiest et al., 2017), behavioral therapy (Verbiest et al., 2017), pharmacotherapy (Verbiest et al., 2017), technology (Chronic Disease Node Group, 2019), or a combination of any of these methods (Abroms et al., 2014; Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013). It has also been suggested that primary care providers should use a framework to guide the interventions given. One such framework is the 'ABC' model, where 'A' stands for **a**sk for smoking status, 'B' for providing **b**rief advice and 'C' for referring to appropriate evidence-based **c**essation programs (Verbiest et al., 2017). Due to rising health care costs and changes in healthcare dynamics, primary care providers need to seek cost effective alternatives for smoking cessation. Technology is an effective tool for smoking cessation due to its convenience, cost effectiveness, and the ability to reach a larger population at the same time (Abroms et al., 2014; Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013).

Technology

The effect of technology-based interventions such as, internet, mobile phones, text messages, computers, laptops, and other devices on smoking cessation have been used as effective strategies for smoking cessation (Abroms et al., 2014; Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al., 2015; Whittaker et al., 2019; Ybarra et al., 2013). An efficient example of a technology that has been shown to be advantageous in smoking cessation is the use of automated text messaging such as Txt2Quit

(Abroms et al., 2014), SMS USA (Ybarra et al., 2013), SmokefreeTXT (Smokefree, 2020), and Txt2stop (Free et al., 2011). Advantages such as safety, cost effectiveness, ability to reach a larger population, and ability to tailor content specific to a population are attributed to the use of automated text messaging (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al., 2015; Whittaker et al., 2019; Ybarra et al., 2013).

Automated text messaging as a means for smoking cessation is discussed in relation to abstinence, message direction, message frequency, message tailoring (tailored or non-tailored) and outcomes measured (biochemical verification or self-reported point abstinence).

Abstinence: Abstinence was an important concept with a consistent definition throughout the evidence analyzed. It was defined as smoking no more than five cigarettes since a participant's quit date, or smoking five or less cigarettes in the past four weeks at the six months follow-up, or no more than five cigarettes smoked since the start of the abstinence period at six months of follow-up (Scott-Sheldon et al., 2016; Free et al., 2011; Whittaker et al., 2019; Ybarra et al., 2013). Any participant who fulfilled this definition was considered to be abstinent from smoking cigarettes.

Message direction. Text messages can vary by direction and initiation. Some programs used only unidirectional messaging initiated by the researcher or project facilitator while others use bidirectional messaging to assess real-time quit status from smokers. Bidirectional messaging was also used to be able to provide services where participants could request additional services and support (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Smokefree, 2020; Spohr et al., 2015; Whittaker et al., 2019; Ybarra et al., 2013). For example, a participant could request additional support by typing the word "CRAVE" if they currently felt like they were craving cigarettes. It was found that there was no statistical

difference between using a unidirectional or bidirectional messaging program (Sophr et al., 2015).

Message frequency. Messages were sent with varying frequencies. Some were sent weekly, some were daily, while some received several messages in a single day. An individual's quit date was also used to vary the frequency of messages such that the number of messages received were centered around a participant's quit date. Although different researchers used different strategies, there was no significant difference noted by any particular message frequency route (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Smokefree, 2020; Spohr et al., 2015; Whittaker et al., 2019; Ybarra et al., 2013).

Tailored text-messaging. Some text-messaging programs were specifically designed to send tailored messages to participants who decided to quit smoking. The contents of these messages were tailored based on information obtained from participants at baseline such as quit status which could be pre-quit, quit, post quit, personal characteristics such as stage of change, coping or self-efficacy, demographics, number of cigarettes smoked per day, and quit date (Scott-Sheldon et al., 2016; Spohr et al., 2015; Whittaker et al., 2019). Message tailoring increased the relevance and salience of the content of a message. This information was usually gotten from participants and was used to formulate the content of the text-messages during the duration of the program. Although some participants of these programs found tailored text messages more beneficial, there was no statistical significance found to favor the use of tailored-text messages over non tailored text messages (Scott-Sheldon et al., 2016; Spohr et al,. 2015; Whittaker et al., 2019).

Non-tailored text messages. In these types of text messaging programs, each participant received the same non-personalized content. The only type of personal touch to this type of program noted was the ability for participants to engage in bidirectional messages where

they were able to reply to automated messages with an answer. For example, a message would be sent to participants to reply with certain words such as “CRAVE” if they were currently craving cigarette. If a participant replied with the word “CRAVE”, the participant would be sent non-personalized information on how to deal with cravings. All participants received the same reply regardless of the reply word (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Smokefree, 2020; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013).

Self-report. Self-report is the most consistent method of measuring outcomes for smoking cessation intervention discovered in the literature (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Smokefree, 2020; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013). Self-report was defined as continuous abstinence (abstinence from quit date to follow-up assessment), point prevalence abstinence (abstinence from a specific time-point to follow-up assessment), prolonged or sustained abstinence (sustained abstinence between two assessments), and repeated point prevalence abstinence (abstinence from at least two specific time-points to follow-up assessments (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013).

Biochemical verification. One of the ways to measure the outcome such as abstinence after the conduction of these automated SMS programs was to use biochemical verification using saliva e.g. salivary cotinine test (Sophr et al., 2015). Biochemical verification through saliva is a reliable marker for abstinence as it is objective, confirmable, and verifiable. This verification was usually done to confirm long term-abstinence after a self-report had been given for short term abstinence. This verification was most commonly done at the six-month follow-up as a validation for smoking cessation (Abroms et al., 2014; Scott-Sheldon et al., 2016; Spohr et al., 2015; Whittaker et al., 2019).

Best Practice Model Recommendation

After a thorough review of evidence selected, it is important to understand the use of automated text messaging as a means for smoking cessation. Evidence suggests that the use of text messaging and frequency should be chosen based on the particular setting because no statistical significance was found between using either bidirectional or unidirectional message, tailored text messages or non-tailored text messages, or between varying message frequencies. Furthermore, evidence suggests that abstinence should be measured using a self-report of every participant (continuous abstinence).

Based on the clinical site and the participants, the best practice recommendation to address the clinical problem identified for this project is to use a daily automated text messaging program as an intervention for smoking cessation (Abroms et al., 2014; Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al., 2015; Whittaker et al., 2019; Ybarra et al., 2013). Abstinence and change in number of cigarettes smoked will be measured by the follow-up assessment at the end of the six weeks using the SmokefreeTXT program. The SmokefreeTXT application was chosen because it was inexpensive, easy to follow, and non-burdensome to patients as they did not physically need to come back to the clinic for the follow-up appointment. Abstinence is defined as smoking five or less cigarettes since each participant's quit date and a comparison will be made between the number of cigarette smoked per day (pre-intervention and post-intervention) if abstinence was not attained.

Finally, The SmokefreeTXT automated program can reach a large number of participants at the same time, is cost-effective, and non-burdensome to implement at the clinical site. This intervention is advantageous due to the ease of implementation as it would ensure continuity after project completion. Continuation after completion of this project is important because this intervention will be beneficial to patients seen in the primary care setting and can be adopted as a standard protocol.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

The implementation of the practice change (step VII of the Iowa model revised) is discussed in this chapter. A general description of the participants, setting, interventions, comparisons, timeframe, outcome, and protection of participants are provided.

The purpose of this EBP project was to implement an automated text messaging program as a means for smoking cessation in current cigarette smokers in the primary care setting. A collaboration between all stakeholders was required for successful implementation of this project.

Participants and Setting

The site for this EBP project was a primary care clinic located in northwest Indiana consisting of three primary care physicians. This clinic is part of a larger healthcare organization with several other subsidiaries located in northwest Indiana. Stakeholders that were involved in the implementation of this project included the office manager, one medical provider (project facilitator), one medical assistant (MA), Doctor of Nursing Practice (DNP) student (project coordinator), and all eligible current cigarette smokers. The project facilitator is a primary care physician who has been practicing in the primary care setting for 38 years.

Both males and females aged 18 years and older were eligible to participate in this project provided they were current smokers, could read and speak English, had a mobile phone which they could operate, had access to the internet on their mobile phones, could receive and send unlimited text messages, and agreed to participate in this project. Participants who were excluded from this project included patients under the age of 18, former smokers, pregnant women, those unable to receive or send text messages, patients with inaccessibility to internet on their phone, those with dementia or other cognitive dysfunction, and those who were unable to read.

Pre-Intervention Group Characteristics

Patients who met the inclusion criteria were invited to participate in this project. Demographic data were collected using a participant information sheet. Information such as age, date of birth, gender, race/ethnicity, phone number, educational level, annual household income, number of cigarettes smoked per day, year smoking started, number of years of smoking, number of past attempt at quitting, previous methods of smoking cessation tried, and current triggers for smoking were collected through the information sheet. Twenty-three people were invited to participate in this project per eligibility criteria. Fifteen participants were enrolled in this project and two were lost to attrition. The participants were made up of eight white males, three black males, and two white females, with a mean age of 46.6 years.

Intervention

The Iowa Model Revised; Evidence-Based Practice to Promote Excellence in Health Care (The Iowa Model Collaborative, 2017) was used to guide the development of this project. Prior to implementing the intervention, eligible participants were identified by the project coordinator (DNP student) and the MA. Those eligible to participate were invited to participate by the project coordinator during their scheduled appointment at the clinic using a standardized recruitment statement (see Appendix A). The project coordinator explained the purpose, plan, and benefits of the project to each eligible patient using a SmokefreeTXT informational sheet (see Appendix B) and a verbal consent was also received. Interested participants were then asked to fill out a participant information sheet containing demographic information (see Appendix C). Participants were educated on their participation in the project and the right to withdraw from the text messaging program at any point in time during the duration of this project. Additionally, they were educated on how confidentiality and privacy would be maintained during this project.

Participants were given an informational sheet on the intervention (SmokefreeTXT) which is a six weeks automated text messaging program designed to help current smokers quit

smoking (Smokefree, 2020). These participants were required to sign up at the SmokefreeTXT website (https://smokefree.gov/tools-tips/text-programs/quit-for-good/smokefreetxt) at the clinical site during their office visit. The project coordinator was onsite to help each participant sign up immediately when they agreed to participate. Participants were asked to enter their names, phone numbers, and set a quit date to enroll in the program. Each participant's quit date was set as the day after their doctor's appointment (next day after sign-up) to give each person a uniform and trackable six weeks. After enrollment, each participant was sent an enrollment text message to welcome them to the program. Lastly, participants were given a weekly tobacco smoking tracker form which they used to track their daily cigarette consumption for the duration of the program (see Appendix D).

During the program, participants received an average of four text messages daily focusing on educational information to help in aiding smoking cessation. Some of the encouraging messages participants received included, congratulatory messages on an eve of a participant's quit date and an optional choice of seeking additional help by engaging in bi-directional text messaging (participants were able to reply to some of the messages sent from the application). Some of the messages where participants could ask for additional help contained questions about current cigarette craving levels. Participants were asked to reply "high, medium or low" to get additional information on how to deal with their level of cravings in response to the craving question. Questions such as, if participants have smoked in the last seven days were also asked, and participants were asked to reply with a "yes or no" response. Furthermore, participants were sent links with information on mindfulness activities and messages containing experiences of other participants with the SmokefreeTXT application. Participants were able to opt out of the program at any point during the project by texting "STOP" as a reply to any of the messages. There is a "frequent asked" questions section on the website that addressed most questions that participants might have had.

After completion of this project, each participant was contacted (telephone) at the end of his or her six weeks program (six weeks from their quit date). Each participant was also asked to complete a survey on the evaluation of their experience with the SmokefreeTXT program (see Appendix E). They were asked what they found most helpful and least helpful and how they think these factors (helpful and least helpful) affected their quit rate after completion of the program.

Comparison

The high number of patients seen at this clinic who are at an increased risk for developing cardiovascular disease was a motivation for this project coupled with the lack of a current protocol for smoking cessation in patients who were current smokers (R, Albert, personal communication, June 1, 2020). One in four patients aged 18 years or older, seen at this clinic identified as current tobacco smokers, and an intervention to reduce this number was deemed beneficial to these patients (R, Albert, personal communication, June 1, 2020). For those who decided to participate, pre-intervention smoking status (number of cigarette smoked/day) was compared to post-intervention (abstinence and number of cigarettes smoked/day).

Outcomes

A primary and a secondary outcome were evaluated for this project. A self-report of each participant was used to measure the primary and secondary outcomes. The primary outcome evaluated for the SmokefreeTXT intervention was continuous abstinence. Continuous abstinence was defined as smoking five or less cigarettes per participant since the participants' quit date during the follow-up assessment after the completion of the six weeks program (Abroms et al., 2014; Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et al,. 2015; Whittaker et al., 2019; Ybarra et al., 2013).The secondary outcome was evaluated by assessing the current number of cigarettes smoked per day (comparison between pre-intervention number of cigarette smoked per day and post intervention number of cigarette smoked daily). The primary

outcome was evaluated using a dichotomous question (yes or no) and a frequency analysis expressed as percentages was calculated, while the secondary outcome was measured using a paired *t* test which compared pre-intervention data and post intervention data.

Time

The timeline to complete this project consisted of five months. The timeline was divided into pre-implementation (planning), implementation, and post-implementation phase (evaluation). The planning phase consisted of creating awareness for practice change, educating stakeholders, and selecting eligible participants. Eligible participants were selected after a chart review which indicated that the patient was a current smoker and 18 years or older. Potential participants were then approached by the project coordinator during their office visit to inform them about the EBP project. Eligible participants who met all the inclusion criteria were invited to participate. The implementation phase began after eligible persons were selected and also agreed to participate. The implementation phase lasted for six weeks from each participant's quit date as the SmokefreeTXT program is a six weeks automated text messaging program. The quit date for each participant was set as the next day after they signed up for this project (next day after office visit). After each participant completed six weeks of the intervention, each participant was contacted through phone by the project coordinator to verbally obtain post intervention data using the daily tobacco usage tracker to compare pre- and post-intervention data.

Protection of Human Subjects

An IRB approval was obtained from Valparaiso University prior to implementation of this project. The project coordinator also obtained the Collaborative Institutional Training Initiative (CITI) certificate training in patient protection of human rights. Participants were assured that they did not have to participate to be given the standard of care at the clinic. Each participant was assured that their information and text messages were confidential as none of the stakeholders involved in this project had access to the SmokefreeTXT software because it is solely run by the

National Cancer Institute (NCI). To maintain patient anonymity, each participant was assigned a code (see Appendix F) which was the patient identifier for this project. To protect each participant's confidentiality, all consent forms and participant information were stored in a separate secure locker at the clinical site where only the project coordinator had access and project outcomes were reported in aggregate form.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to determine the effectiveness of an automated text messaging application (SmokefreeTXT) for smoking cessation in a primary care setting for adult cigarette smokers aged 18 years or older. The best practice recommendations were used as an intervention with the aim of obtaining data to support adopting this SmokefreeTXT program into care for adult smokers at a primary care clinic. Outcomes for the project included cigarette smoking abstinence (primary) and number of cigarettes smoked per day post-intervention if abstinence was not attained (secondary). This chapter describes the findings of the EBP project: (a) participant characteristics, (b) changes in outcomes, (c) statistical testing, and (d) significance.

Participants

Size

Twenty-three patients were invited to participate in this EBP project after meeting the eligibility criteria. Initial enrollment consisted of 15 participants. Of these 15 people, two people were lost to attrition. One person could not be reached to gather post-intervention data while the other person did not complete the program due to personal reasons. The participants who completed this project consisted of 13 adults who attended the clinic at the project site.

Characteristics

The participants of this project demonstrated the following characteristics summarized in Table 4.1. Pre-intervention, the participants answered questions about age, gender, race, highest educational level attained, annual household income, daily number of cigarette smoked, number of years participant had been smoking till enrollment, if an attempt has been made to quit, number of quit attempts, methods used to quit previously, use of tobacco in another form, and type of other form of tobacco used. The post-intervention questions included program completion, abstinence (smoked five or less cigarettes), number of cigarettes smoked post-

intervention, helpful and least helpful parts of the application, and satisfaction with the application. The ages of participants ranged from 27 to 67 years (M = 46.62 , SD = 11.13) (see Figure 1). The participants included 11 males (85%) and two females (15%). The majority was Caucasian (n = 10, 77%), reported educational level as an associate degree (n = 5, 38%), and reported earning between $25,000 - 50,000 USD ($n$ = 11, 85%).

Table 4.1

Participant Demographic Data (N = 13)

Variable	*n*	*%*
Age in years		
27	1	7.69
33	1	7.69
37	1	7.69
40	1	7.69
42	1	7.69
46	1	7.69
47	2	15.38
50	1	7.69
54	1	7.69
55	1	7.69
61	1	7.69
67	1	7.69
Educational Level		
High school diploma/GED	3	23.08
Associate degree	5	38.46
Baccalaureate	4	30.77
Graduate school	1	7.69
Gender		
Male	11	84.62
Female	2	15.38
Household Income/USD		
25,000-50,000	11	84.62
50,000-75,000	2	15.38
Race		

White/Caucasian	10	76.92
Black/African-American	3	23.08

The characteristics of participants in regard to their smoking status/behaviors indicated that majority of the participants had not previously attempted to quit (*n* = 7, 54%) (see Table 4.2). Those who had attempted to quit (*n* = 4, 31%) had mostly tried medication in the past. Furthermore, none of the participants reported use of another form of tobacco (*n* = 13, 100%). The average number of years participants had been smoking was 22.92 years (*SD* = 9.67) while the average number of quit attempts amongst the participants was 0.54 (*SD* = 0.78) (see Table 4.3).

Table 4.2

Assessment of Smoking Status 1

Variable	*n*	%
Past quit method		
Medication	4	30.77
Counseling	1	7.69
Missing	8	61.54
Past quit attempt		
Yes	6	46.15
No	7	53.85
Use of tobacco in another form		
No	13	100.00

Table 4.3

Assessment of Smoking Status 2

Variable	*M*	*SD*	*n*	Min	Max
Number of years spent smoking	22.92	9.67	13	5.00	40.00
Number of past quit attempt	0.54	0.78	13	0.00	2.00

Changes in Outcomes

Statistical Testing and Significance

Primary and secondary outcomes were analyzed to determine changes in outcomes. A self-report on variables by each participant was used to determine if changes occurred in the outcomes. First, participants pre-intervention cigarettes smoked per day was compared to post-intervention cigarettes smoked per day and abstinence was determined. Abstinence was defined as smoking five or less cigarettes since each participant's quit date (Scott-Sheldon et al., 2016; Free et al., 2011; Whittaker et al., 2019; Ybarra et al., 2013). A Chi-square goodness of fit test was conducted to determine if the quite rate (abstinence) in participants in this project was similar to the quit rate in the population. Secondly, for participants who did not attain abstinence, a paired *t* test was used to determine if there was a change in pre and post cigarette consumption post intervention. Description of outcomes, along with tables detailing data, are explained below.

Primary Outcome

A self-report was used to determine this outcome. Abstinence was determined as those who smoked five or less cigarettes per day since their quit date. This outcome was measured using a descriptive statistic to determine the proportion of participants who either abstained (yes) or did not abstain (no) from cigarette smoking. Also, a Chi-square goodness of fit test was conducted to determine if the quite rate (abstinence) in participants in this project was similar to the quit rate in the population. Out of the 13 participants, a majority of participants attained abstinence (n = 9, 69.23%) and only smoked five or less cigarettes since the beginning of the SmokefreeTXT program, while the others (n = 4, 30.77%) smoked more than five cigarettes for the duration of this EBP project. The average number of cigarettes post-intervention for those participants who smoked more than five cigarettes for the duration of this EBP project was 10.75 (SD = 2.99). Furthermore, when the frequency of participants who abstained were compared to the frequency of similar smokers in the population, it was found that there was no

significant difference in abstinence of participants in this project when compared to the population (χ^2 (1) = 1.92, p = .166).

Secondary outcome

This included the comparison of pre-intervention and post-intervention number of cigarettes smoked daily by each participant who had smoked more than five cigarettes for the duration of the program. A paired *t* test was used to make comparisons at the two different points in time (Cronk, 2018). The mean pre-intervention number of cigarettes smoked per day (M = 10.85, SD = 3.78) and the post-intervention number of cigarettes smoked per day (M = 3.92, SD = 5.19) was compared. A significant decrease from pre-intervention to post-intervention was found ($t(12) = 4.83$, $p < .001$)

Satisfaction with mobile app (SmokefreeTXT)

Each participant was required to fill out a questionnaire evaluating the EBP project and the usage of the mobile application after the completion of six weeks (see Appendix E). Each participant who finished the project answered questions about the most helpful and least helpful part of the application, how the application affected each person's quit rate, and how satisfied they were with the application (see Table 4.4). Most participants answered "very satisfied" (n = 5, 38%) with the SmokefreeTXT application, while no participant answered "very unsatisfied" (n = 0). When asked about the advantages of the application, most participants answered that it was easy to use (n = 4, 30.77%). The most frequently observed category of how the application affected each participant's quit rate was that it made quitting faster (n = 4, 30.77%). When asked about disadvantages of the usage of the application, most of the participants stated that they received too many text messages per day (n = 7, 53.84%).

Table 4.4

Application Satisfaction Survey

Variable	*n*	*%*
Rate app		
Very satisfied	5	38.46
Satisfied	4	30.77
Neutral	2	15.38
Unsatisfied	2	15.38
Very unsatisfied	0	0.00
Advantages of app		
Easy to follow	4	30.77
Straight forward	2	15.38
Free	3	23.07
Missing	4	30.77
Effect of app on quit rate		
Made quitting faster	4	30.77
No effect	2	15.38
Missing	7	53.85
Disadvantage of app		
Too many messages/day	7	53.84
Internet dependent	2	15.38
Missing	4	30.77

Note. Due to rounding errors, percentages may not equal 100%.

CHAPTER 5

DISCUSSION

The aim of this EBP project was to implement an intervention for smoking cessation in the primary care setting using an automated text messaging application such as SmokefreeTXT. This chapter interprets the project findings from chapter 4, enumerates strengths and weaknesses of the EBP project, and discusses implications for the future.

Explanation of Findings

Primary Outcome

The primary outcome for this project was to determine if abstinence was attained after completion of the 6 weeks SmokefreeTXT smoking cessation program. Clinical significance was achieved as a majority of participants were able to achieve abstinence after the program (n = 9, 69.23%). Additionally, there was no significant difference in quit rate (abstinence) of participants in this project when compared to the population (χ^2 (1) = 1.92, p = .166). These findings are synonymous with findings seen in the literature which indicated that clinical and statistical significance were achieved after text messaging was used as a method for smoking cessation (Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Whittaker et al., 2019; Ybarra et al., 2013).

According to literature, different text messaging applications were sampled, and it was concluded that the choice of the text messaging application should be chosen based on the setting and preference (Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Whittaker et al., 2019; Ybarra et al., 2013). Spohr et al. (2015) stated that an advantage of text messaging as a method of smoking cessation in adult smokers is its cost-effectiveness. Since the best practice highlighted from the literature review indicated that any type of text messaging application can be used as an intervention for smoking cessation in adult

smokers (sources for this claim), SmokefreeTXT was chosen. Additionally, the application was chosen because it is easy to navigate, free and widely available.

From these results, SmokefreeTXT can be used as an intervention for smoking cessation in adult smokers. Due to this result (primary outcome) from this EBP project, a decision was made by the project site to adopt this application as a method for smoking cessation. The project facilitator was identified as a key stakeholder for integrating and sustaining this practice change. The practice change will be promoted by change champions such as the project coordinator and MAs who would ensure that current adult smokers are screened and given this option (SmokefreeTXT) as a method for smoking cessation (Verbiest et al., 2017). The project facilitator agreed to adopt this method as a viable method for smoking cessation and would offer this method to all patients in the clinic who want to quit smoking.

Participants benefitted from the SmokefreeTXT application because it is free. Cost-effectiveness was a major determinant for the type of application chosen in this clinic because the majority of patients seen were adults. The project coordinator decided that any application chosen should not place a financial burden on the participant as other types of smoking cessation methods such as pharmacological methods already require some financial commitment.

According to Whittaker et al. (2019), text messaging programs can increase quit rates by about 50% to 60%. The result of this EBP project agreed with that finding as the quit rate was (abstinence) 69.23% (n = 9). Over 60 % of the participants attained abstinence after six weeks of the participation in the SmokefreeTXT program.

Scott-Sheldon et al. (2016) indicated that the efficacy of text messaging interventions for smoking cessation differed by men and women. They indicated that studies with larger proportions of women participants were less successful at improving smoking abstinence (Scott-Sheldon et al., 2016). It was also suggested that women may be less likely than men to quit smoking for a number of reasons including weight concerns, less social support for quitting,

genetic variants that affect the efficacy of pharmacotherapies, and mood regulation In this project (Scott-Sheldon et al., 2016). The majority of participants in this project were males (n = 11). However, it cannot be ascertained that the reason that the SmokefreeTXT application was effective in this project was because the majority of participants were males. Further studies with an equal distribution of gender participation is warranted.

Additionally, Spohr et al. (2015) suggested that the message frequency schedule can affect quit rates, in which fixed schedules performed better than decreasing or variable schedules. In this project, the messaging frequency schedule for SmokefreeTXT was fixed as participants received the same number of messages each day (an average of four). The results from this project agreed with the findings in the literature by Spohr et al. (2015) because more than half of the participants were able to achieve abstinence (*n* = 9, 69.23%).

Secondary Outcome

Comparison was made between the pre-intervention number of cigarettes smoked per day versus the post-intervention number of cigarettes smoked per day. Statically and clinically significant results were recorded as the number of cigarettes smoked per day dropped post-intervention compared to the number of cigarettes smoked pre-intervention. These findings are consistent with findings from the literature which found a decrease in cigarette consumption after using text messaging as an intervention for smoking cessation (Free et al., 2011; Scott-Sheldon et al., 2016; Spohr et el., 2015; Whittaker et al., 2019; Ybarra et al., 2013). However, Ybarra et al. (2013) suggested that more studies should be done to determine the long-term impact of text messaging on smoking cessation as current studies were only done for a short period (four to six weeks).

Future studies on the long-term impact of reduction in the number of cigarettes smoked daily will determine if the change was sustainable and if abstinence was finally attained. A decrease in the daily number of cigarettes smoked by participants indicates that this application is an effective tool in decreasing the rate of smoking because participants were able to reduce

the number of cigarette smoked daily post-intervention. Additionally, a drop in number of cigarette smokers per day in participants in this study is important because this can progressively lead to smoking abstinence (Scott-Sheldon et al., 2016). Furthermore, benefits of a reduction in smoking, such as improving health status and quality of life, are advantages of reduction in cigarette consumed daily. Finally, the SmokefreeTXT application should be suggested to patients who smoked less cigarettes post-intervention in order to attain complete abstinence.

Strengths and Limitations of the DNP Project

Some strengths and limitations were identified during the course of this DNP project. During this evaluation, factors that have enhanced the development and implementation of this EBP project will be discussed as well as limitations will be highlighted.

Strengths

Different strengths were identified during the development and implementation of this EBP project. A major strength identified was the timeliness and relevance of this project to the clinical site and participants. The project coordinator noticed a lack of protocol for smoking cessation in patients that attend this clinic. Also, there was a lack of diversity in the methods for smoking cessation. Traditional methods such as pharmacological and counseling were predominantly known and used by patients in this clinic. The use of technology for smoking cessation was welcomed as changes in trends in healthcare due to the current pandemic (Covid-19) has led to the rise of telehealth. Also, the high number of adult smokers in Indiana warranted the timeliness of this project as this project helped to reduce the number of current cigarette smokers (ISDH, 2020).

Another strength of this project was the ease of implementation using the SmokefreeTXT application. The SmokefreeTXT application is a simple and easy to use application. The website for signing up was also easy to navigate. The website had a page for frequently asked questions which was helpful if participants had questions. Additionally, the

ability to opt out of the program was an added advantage. This made it easy for the project coordinator to navigate the website and also to be able to enroll participants on site in the clinic.

Because of how easy it was to enroll participants in this program, the project coordinator determined that it would be more beneficial to enroll participants at the clinic site after their doctor's appointment and not expect them to go home and enroll. This was beneficial because the project coordinator was able to enroll people quickly and fast in the office and not have to worry about follow-up calls to check if participants who agreed to participate actually enrolled for this program.

The support of the project facilitator was also paramount to the success of this project. He acted as a change champion and was actively involved in every step of the development and implementation of this project. After the project coordinator spoke to potential participants, the project facilitator (physician) reinforced the need for smoking cessation and the need to give this EBP project a trial. After implementation and analysis of results, the project facilitator also served as the disseminator of results of this project at the clinic. He informed other healthcare providers of the success of this project and presented it as an option for smoking cessation to his patients which would ensure sustenance.

Another advantage of this project was the cost-effectiveness of this application as a method of smoking cessation. Unlike pharmaceutical methods or counseling sessions which might incur some financial cost to patients, the SmokefreeTXT is a free service offered by the National Cancer Institute. This made this project more appealing to potential participants as it did not come with any cost.

Smoking cessation education was also an advantage of this project because of the benefits of associated with it. Patients and family members who were not eligible for this project due to various reasons such as no phone, no unlimited text messages subscription, and previous smokers were educated on the advantages of smoking cessation (improved health status and better quality of life) and continued abstinence.

Finally, the use of the revised Iowa model was a strength of this EBP project. The step-by-step and feedback loop approach of this model provided a concrete framework to develop and implement this project. The feedback loop helped to ensure that at every step of the project, there were checks and balances. Therefore, if the team implementing the project hit a roadblock, it was easy to go back to the previous stage to see what amendments need to be made.

Limitations

Although there were benefits to this EBP project, there were also limitations. One of the limitations during this EBP project was the low number of participants. The low number of participants in this project was due to the limited number of in-patient visits to the clinic during the recruitment phase of this project. The limited number of in-patient visits was due to the switch of non-urgent visits to the clinic to telehealth to avoid unnecessary physical contact due to the current Covid-19 pandemic. The project facilitator also noted that the clinic had not been operating in full capacity since the start of the pandemic. The project coordinator believed that the limited number of in-person visits to the clinic limited the potential number of participants that could have benefited from this project as recruitment was done in-person in the clinic. Phone recruitment was not considered because of constraints peculiar to phone usage. There was no way for the project coordinator to ensure or determine if patients contacted through phone actually enrolled in the program as they were not required to follow-up in-person after project completion. Also, it was difficult to contact people by phone as answering telephone calls is dependent on the availability of a person. Factors such as work schedule, rest and sleep, may have hindered potential participants from picking their phone.

Furthermore, the low number of participants was also attributed to the age group of patients seen in this clinic by the project facilitator. The project facilitator alluded to the fact that his clinic mostly saw older adults as he is an older physician and his practice has grown with his patients. Because of the age group that attended this clinic, most of patients encountered were

previous smokers who had quit smoking. Although these set of previous smokers were not eligible to participate in this EBP project, they were able to benefit from the smoking cessation education provided by project coordinator who emphasized the need for continued abstinence. The benefits of continued abstinence discussed included prevention of cardiovascular diseases and lung diseases (CDC, 2020b).

Another limitation noted to the implementation of this project was the dependency of this intervention on a mobile phone. Therefore, if a current smoker wanted to quit but did not own a mobile phone, they would not be able to use SmokefreeTXT application because text messages can only be received on a mobile phone. Also, since the SmokefreeTXT application was dependent on the ownership of a mobile phone, network service was a must. This meant that if a person who enrolled in this program did own a mobile phone but was in an area out of service from his or her network provider, he or she would not be able to receive text messages. Additionally, if participants went in and out of their network service area, there was no way to determine if they missed a message that would have been sent from the application. This was important because messages were sent from the application about four times daily on a fixed schedule (time).

Another major limitation of this project was the inability to contact some participants on phone for a follow-up call to evaluate their participation in this EBP project. Again, this is phone dependent as participants left a phone number to be reached after the duration of six weeks. The project coordinator had to call some participants a couple of times before she was able to reach them by phone. Also, one participant simply never answered the phone so there was no post-intervention data on that participant.

The majority of the participants complained that the text messages they received daily were too many. There was no way the project coordinator was able to vary the number, timing, and frequency of messages; therefore, the project coordinator had no control over the content and frequency of messages. The study done by Spohr et al. (2015) found that there could be a

relationship between message frequency and quit rate. They concluded that message frequency should be assessed to determine which schedule is most appropriate for smokers who want to quit (Spohr et al., 2015). Unfortunately, the SmokefreeTXT application cannot be altered because the SMS sent are automated and cannot be manipulated.

Finally, each participant's self-report was the way that post-intervention data were collected, and there was no objective way of verifying data given by each participant.

Implications for the Future

This EBP project incorporated an evidence based text messaging application as a method for smoking cessation. This section will outline the future implications from the findings of this EBP project on practice, EBP model utilized, research and education.

Practice

Practice implications for this EBP project focus on the role of the APN in smoking cessation. There are limited data regarding the effectiveness of smoking cessation interventions when they are provided in primary care, and APNs are in a position to implement effective interventions for smoking cessation (Pipher et al., 2018). Since the SmokefreeTXT application has shown that it is an effective intervention, APNs are well positioned to implement smoking cessation interventions in the primary care setting to mitigate the growing number of adult smokers in the USA.

Furthermore, family nurse practitioners (FNP) are proponents of health and wellness by advocating for primary, secondary, and tertiary prevention of diseases. An effective smoking cessation intervention such as the SmokefreeTXT application is a tool to promote smoking cessation in patients at risk for further complication such as cardiovascular diseases. Since evidence suggests that any text messaging application is just as effective as the other (Chronic Disease Node Group, 2019; Free et al., 2011; Scott-Sheldon et al., 2016; Whittaker et al., 2019; Ybarra et al., 2013), SmokefreeTXT was chosen. This application was chosen due to its cost-

effectiveness, ease of usage, and widespread availability. FNPs can use the SmokefreeTXT application as a cost-effective smoking cessation method in the primary care settings. Patients can also be confident that there would be few financial implications when using this application. Additionally, FNPs can be confident that they are providing evidence-based practice without an associated financial burden to their patients as any application which warrants a fee before usage might be unappealing to patients especially if they are financially constrained.

EBP Model

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health (The Iowa Model Collaborative, 2017) was used as a framework for this EBP project. This model provided a step by step and feedback loop approach to the development and implementation of this project. In the primary care setting, one of the most important steps while using this model included identifying triggering issues or opportunities. These issues could be patient, clinical, or organizational identified issues that need a practice change. This is important because APNs should be life-long learners and change champions who are always seeking an avenue to improve health outcomes using EBP.

For future projects, this model encourages an interdisciplinary and interprofessional collaboration. The fourth step in the revised Iowa model is to form a team that would be in charge of developing, implementing, and evaluating the practice change. The team for this EBP project utilized interdisciplinary collaboration. The team was comprised of stakeholders such as staff nurses, unit manager, physicians, medical assistances, and project coordinator (DNP student) (Melnyk & Fineout-Overholt, 2019). Therefore, usage of this model encourages collaboration between different disciplines and professions for an EBP project to be successful. Additionally, the use of a feedback loop at different stages of this model would help to create checks and balances during the development, implementation, and evaluation of furture projects. This model would also serve as an effective tool to evaluate the progress of future projects at every step.

Research

Areas of further research were identified during the course of this EBP project. One is that further research is needed on the relationship between a smoker's lifestyle and the use of text messaging as an intervention for smoking cessation. For examples, the SmokefreeTXT application only sends messages during the day and not overnight. This message schedule would be effective for somebody who is awake all day and be ineffective for somebody who works night shift and sleeps during the day. This timing of messages can affect access to the content of the text message sent in a timely manner. Additionally, no application has the propensity to vary text messaging based on a smoker's lifestyle which indicates that further research is also needed in that area (varying text messages based on individual's lifestyle.

Further research is needed on the usage of the SmokefreeTXT messaging application as an intervention for smoking cessation in the primary care setting in a larger and more diverse population. There is no available evidence on the use of this particular application as a method for smoking cessation in primary care. Scott-Sheldon et al. (2016) indicated that the efficacy of text messaging interventions for smoking cessation differed by men and women and that studies with larger samples of women were less successful. Since this project had a majority of men (*n* = 11), a study with a more balanced distribution between males and females would be beneficial to determine if there is a difference in results using text messaging for smoking cessation between both genders.

Education

This project has highlighted some areas where education is needed for patients. APNs are meant to provide health education to their patients in order to promote health and wellness. Smoking cessation education is an avenue for APNs to promote a better quality of life for their patients. This project involved an intervention for smoking cessation and FNPs can employ the method discussed in this project as an educational tool for smoking cessation. Also, FNPs should offer the smoking cessation education for patients and their families even if they refuse

an intervention for smoking cessation. Finally, the benefits and of smoking cessation and the implication of continued cigarette smoking should be well laid out for each patient so that they can make an informed decision.

Conclusion

The purpose of this project was to implement an automated text messaging application such as SmokefreeTXT as an intervention for smoking cessation in adult smokers in the primary care setting. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health was used as a framework for this project (The Iowa Model Collaborative, 2017). Two outcomes were measured (primary and secondary). The primary outcome was to measure the rate of abstinence and the secondary outcome was to determine if there was a decrease in the number of cigarettes smoked post-intervention. Overall, statistically and clinically significant results were found with use of the SmokefreeTXT messaging application in current adult smokers (> 18 years old) regarding abstinence and daily number of cigarettes smoked per day in participants. A majority of the project participants achieved abstinence (n = 9, 69.23%). A chi-square goodness of fit test was also calculated. It was found that there was no significant difference in abstinence of participants in this project when compared to the population (χ^2 (1) = 1.92, p = .166). There was also a decrease in number of cigarettes smoked amongst participants who were not able to abstain. A self-reported decrease from pre-intervention to post-intervention was found ($t(12) = 4.83, p < .001$).

Furthermore, a majority of participants were satisfied with this application due to its ease of usage and simplicity. About 38% of participants were very satisfied with this application while 30.77% stated that it was easy to use. Participants also agreed that the SmokefreeTXT application made quitting faster for them (n = 4, 30.77%). Finally, FNPs should incorporate cost-effective smoking cessation methods into their practice. SmokefreeTXT is an effective method that can utilized in the primary care setting for adult smokers.

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BIOGRAPHICAL MATERIAL

Oluwasayo M. Sinkaiye

Ms. Sinkaiye graduated Summa Cum Laude from Valparaiso University with a Bachelor of Science degree in nursing in 2017. She worked briefly in the intermediate care unit (IMCU) at Porter Regional hospital before transitioning to work in the long-term care setting. Because of her passion to acquire more knowledge and a desire to improve health care outcomes, especially in primary care, Ms. Sinkaiye returned to Valparaiso University in 2018 for a Doctor of Nursing Practice (DNP) degree. She is expected to graduate in May 2021. Since 2018, Ms. Sinkaiye has continued to practice as a registered nurse in a long-term care facility in northwest Indiana. Along her career path, she has had numerous opportunities to interact with diverse groups of people, which has further strengthened her desire to work in the primary care setting. Ms. Sinkaiye is a member of Sigma Theta Tau International Honor Society of Nursing-Zeta Epsilon chapter. Her evidence-based practice project is focused on the use of a daily text message from an application (SmokefreeTXT), developed by National Cancer Institute (NCI) as an intervention for smoking cessation in primary care. Ms. Sinkaiye's DNP project was presented at the University of Iowa's National Evidence-Based Practice Conference in April 2021.

ACRONYM LIST

APN: Advance Practice Nurse

CDC: Center for Disease Control

CINAHL: Cumulative Index to Nursing and Allied Health Literature

CPG: Clinical Practice Guideline

COPD: Chronic Obstructive Pulmonary Disease

CVD: Cardiovascular Disease

DNP: Doctor of Nursing Practice

EBP: Evidence-Based Practice

ISDH: Indiana State Department of Health

JBI: Joanna Briggs Institute

JHNEBP: Johns Hopkins Nursing Evidence-Based Practice

MA: Medical Assistant

NCI: National Cancer Institute

RCT: Randomized Control Trial

SMS: Short-Message Service

SMS USA: Stop My Smoking USA

SR: Systematic Review

U.S.: United States

USDHHS: United States Department of Health and Human Services

WHO: World Health Organization

Appendix A

Recruiting Standardized Statement

Hello, my name is Oluwasayo Sinkaiye. I am a Doctor of nursing practice student at the Valparaiso University nursing school. I am implementing a project on smoking cessation using a text messaging application by the National Cancer Institute, called SmokefreeTXT. This is a 6 weeks program where you would be enrolled on the SmokefreeTXT website today at the office if you agree to participate. You will receive messages focused on smoking cessation about 4 times daily. I have attached an informational sheet on all you need to know about this program. If you choose to participate, I will be signing you up at the office today using your phone number. I will be contacting you via phone at the end of the program (week 6).

Appendix B

Project Coordinator: Oluwasayo Sinkaiye RN, BSN Contact information: 219-791-9476

What is this: **SmokefreeTXT** is an automated text messaging application for smoking cessation by the National Cancer Institute (NCI). Smokefree.gov offers free text messaging programs that give 24/7 encouragement, advice, and tips for becoming smoke free and being healthier.

Sign up (website): https://smokefree.gov/tools-tips/text-programs/quit-for-good/smokefreetxt

Duration: 6 weeks

Requirement: Mobile phone with the ability to receive unlimited text messages (message data rates may apply per carrier). Four messages sent per day.

Sign Up Cost?: NONE

Sample Message*:* "Cravings can be triggered by seeing other people smoking. Spend time in places where smoking isn't allowed. Try malls, museums, or the movies" (smokefreetxt.gov).

OPT-OUT: Yes. Simply reply to one of the messages with STOP. You will receive an opt-out confirmation message, which means you are no longer signed up for the text messaging program (Smokefreetxt.gov).

Note: See frequently asked questions on smokfreetxt.gov for more information

You will be contacted after at the completion of this program by telephone (week 6).

CONTACT PROJECT COORDINATOR FOR ANY CONCERNS/ISSUES WITH CONTACT ABOVE

Appendix C

Participant Information Sheet

Code number_____

Please fill out this form.

1. **Age:** _____

2. **Phone Number**: : _____

3. **Significant Other Phone Number**: _____

4. **Gende**r:

☐ Female ☐ Male

☐ Transgender ☐ Gender non-conforming

☐ Other ☐ Decline to answer

6**. Race:**

☐ White/Caucasian ☐ Black/African American

☐ Hispanic ☐ American Indian/Native American

☐ Asian ☐ Pacific Islander

☐ ☐Other: (specify) _____

8**. Educational Level** (check highest degree attained):

☐ Less than high school ☐ High school diploma or GED

☐ Associate Degree ☐ Baccalaureate Degree

☐ Graduate School

9. **Household Income (annually):**

☐ $0 - $ 24,999 ☐ $25,000 – $49,999

☐ $50,000 - $74,999 ☐ $75,000 - $99,999

☐ $100,000 - $149,999 ☐ $150, 000 or more

10. **Number Cigarettes Smoked per Day:** _____

11.**Year Smoking Began**: _____

12. **Number of Years of Smoking Till Present:** _____

13. **Have you attempted to quit smoking in the past**? ☐ Yes ☐ No

14. If yes, **How many times have you attempted to quit in the past:** _____

15. **What methods/processes have you used to aid quitting in the past ?**

_____

_____

_____

_____

_____

_____

16**. Do you use tobacco in another form other than smoking**? (e.g. chew, vaping) ? ☐ Yes ☐ No

17**. If Yes (No. 16), What other form**: _____

18. **Are there any triggers for your smoking**? ☐ Yes ☐ No If Yes, what are the triggers :

_____

_____

19**. What is your intended quit date**? _____

Appendix D

Tobacco Smoking Weekly Tracker

Instructions:

Please fill out this form daily to track your cigarette smoking each day, using Day 1 as your quit date and fill out cigarette consumption (smoked) each day thereafter till the 6 weeks is complete

Quit date:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Day 1(quit date						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						

Appendix E

Evaluation of the SmokefreeTXT Application

Code number_____

1. **Did you complete this program**: ☐ Yes ☐ No

2. If No (No.1)

   How many days did you use this application:

   _____

   Why : _____

3. **Have you smoked 5 or more cigarettes since your date quit date?** ☐ Yes ☐ No

   If (yes) Daily pre-txt cigarette usage _____ daily post-txt usage_____

4. **What was the most helpful part of this application** :

   _____

   _____

5. **What was the least helpful part of this application**:

   _ _____

   _____

6. **How do you think this application affected your quit rate:**

   _____

   _____

7. **How satisfied are you with this application**:

   ☐ Very Satisfied ☐ Unsatisfied ☐ Neutral

   ☐ Satisfied ☐ Very Unsatisfied

Appendix F

Code Sheet

Participant Name	Phone number	Code number