A Nurse Led Smoking Cessation Intervention

To Reduce Postoperative Complications

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March, 2017
ACKNOWLEDGEMENTS

This project would not be possible without the support and guidance from the following people: Barry Perlman, MD, my clinical mentor; Amanda Schmid, BA, Surgical Services Project Coordinator operationalized the process and Carla Lange, CPHQ, Quality Analytic and Reporting Specialist for PeaceHealth system provided the data analysis. And lastly a special thank you to my faculty advisor, Al Rundio, PhD, DNP, clinical professor for Drexel University, who helped shape the study focus for this project.
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Abstract

**Background:** Research studies show smokers are more likely to suffer from complications after surgery. These preventable events cost the nation approximately $17 billion a year and impact both the health of the community and the finances of healthcare systems. **Purpose:** To determine the effect of a nurse-led smoking cessation intervention in the preoperative setting on reducing both postoperative complications and healthcare costs due to smoking. **Method:** This was a prospective cohort study to include smokers undergoing a surgical procedure. The participants received a brief smoking cessation education intervention in a preoperative clinic given by a nurse, describing the benefits of smoking cessation and the risks smoking presents for surgical recovery. **Evaluation:** All data was cleaned and coded. Patients lost to follow up or with missing data elements were not included. The intervention cohort postoperative complication data results were compared to postoperative complication rates in a historical cohort before implementation of the smoking cessation intervention. Descriptive statistics were used to describe the baseline characteristics of the cohorts. The chi-square test was calculated to analyze the association between the categorical data. **Results:** The sample size of 100 participants meeting the inclusion criteria was reached. 22% of participants quit smoking and 47% reduced the number of cigarettes they smoked preoperatively. Chi-square results comparing postoperative complication rates between the interventional and historical cohorts was not statistically significant with a p-value of 0.08 and resulted in a null hypothesis. The comparison between combined quit/reduced smoking participants with those continuing to smoke within the interventional group was statistically significant for reduced postoperative complications with a p-value<0.05. **Conclusion:** The results concluded a smoking cessation intervention before surgery reduced postoperative complications and healthcare costs for this
hospital in the intervention group. Preoperative patient education should reinforce smoking cessation to optimize postoperative outcomes.

*Keywords*: smoking cessation, preoperative, postoperative complications, surgery
A Nurse Led Smoking Cessation Intervention

To Reduce Postoperative Complications

“The names of the patients whose lives we save can never be known. Our contribution will be what did not happen to them” (Berwick, 2014).

In 1999, the Institute of Medicine (IOM) challenged the nation to reduce harm to patients when the 100,000 lives campaign was released. The focus was to urge hospitals to develop processes to prevent harm and improve the quality of care. In surgical services, this meant the implementation of prevention strategies to reduce the incidence of postoperative complications. Addressing and stabilizing the clinical issues before surgery helps to avoid preventable complications that contribute to reduced quality outcomes and increased healthcare costs (Wachtner & Pronovost, 2006). Smoking cessation before surgery is one opportunity for improving the health and quality outcomes of patients.

The evidence in the literature validates smokers are more likely to die and suffer serious postoperative complications than those who don’t smoke (Musallam et al., 2013). The cardiovascular and respiratory system as well as wound healing are affected due to the various chemicals present in cigarette smoke. These chemicals are known to inhibit a healthy recovery response. Smoking cessation preoperatively can reverse the serious effects smoking has on postoperative recovery (Cavichio et al., 2013).

In a randomized controlled trial (RCT), 381 hospitalized patients from four hospitals were randomized into an intervention group receiving smoking cessation information and a control group receiving usual care. Smoking cessation rates were significantly higher among intervention group participants as compared to control group participants with p value < 0.008.
(Meysman et al., 2010). This study supports the development and implementation of a patient education tool for smoking cessation preoperatively.

The costs of these preventable events from smoking is staggering. Warner et al., (2014) conducted a study comparing the costs between smokers and non-smokers undergoing a surgical procedure. The total costs were measured for each group and included postoperative complications and subsequent healthcare costs associated with increased postoperative complications and slower recovery after the procedure for up to one year. These avoidable complications contribute to an excess of $17 billion dollars to healthcare costs nationally.

The role of the Director for Surgical Services at PeaceHealth Sacred Heart Medical Center RiverBend, is to assure the delivery of care provided to patients meets the policies and procedures recommended by national standards and benchmarks for surgical patients. This includes a review of postoperative complications to identify the potential gaps in care and develop processes designed to improve patient outcomes. The Director for Surgical Services also reviews research studies and discusses the results with key stakeholders responsible for recommending practice changes in order to transform the evidence into clinical pathways. The decision to explore the development and implementation of a nurse led preoperative smoking cessation intervention in the preoperative clinic, was endorsed by the leadership in this medical center and the Surgery Executive Committee (SEC) members as a potential quality improvement opportunity to reduce postoperative complications and improve healthcare costs.

**Problem Identification and Significance**

Surgical quality results from the National Surgical Quality Improvement Program (NSQIP) at PeaceHealth Medical Center RiverBend, are shared semi-annually with the Surgery Executive Committee (SEC) members. The SEC committee includes members of the medical
staff, anesthesia, and quality and surgical services leadership. Their charter is to analyze the results and focus on the opportunities for quality improvement related to the care of surgical patients. NSQIP data for the year 2015, was shared at the SEC in January, 2016. The SEC members noted an increase in the number of postoperative complications specifically related to; longer ventilator times, surgical site infections, sepsis and pneumonia for all types of surgical procedures. Upon further examination, the increase in postoperative complications was noted to be associated with patients who smoked as compared to those who did not smoke. The SEC members asked the question, “would smoking cessation before surgery improve surgical outcomes postoperatively and reduce costs to the organization?”

The time the patient spends in the preoperative clinic, provides an opportunity to assess and educate the patient for surgical readiness. Research shows an appointment in the preoperative clinic and contact with a nurse, has a positive impact on tobacco cessation preoperatively (Shi & Warner, 2010). One of the barriers this hospital has encountered when introducing a smoking cessation program previously, was the belief by the nurses that the intervention will take too long and will not improve smoking cessation rates. Lee, Landry, Jones, Buhrmann, and Morley-Forster (2013), randomized 168 patients into a control and interventional group. The interventional group received a smoking cessation intervention lasting less than five minutes. The results of the study showed improvement in the smoking cessation rates preoperatively. The preoperative clinic visit offers a teaching moment and the best opportunity to provide a nurse-led smoking cessation intervention to improve tobacco abstinence (Shi & Warner, 2010).

PeaceHealth Sacred Heart Medical Center RiverBend has a highly functioning and effective preoperative clinic. Nurses interact with patients in the preoperative clinic environment
and provide focused education for patients undergoing surgery after obtaining their histories and the presence of any chronic conditions. Patients are assessed for potential co-morbidities that are known to complicate surgery and contribute to postoperative complications. If the patient is found to have an unstable medical diagnosis, such as poorly controlled hyperglycemia, the patient is asked to come into the clinic for further assessment and stabilization before surgery.

During the preoperative visit, a smoking assessment is obtained. If the patient is identified as a smoker, there currently isn’t a mechanism to trigger a smoking cessation intervention and the patients goes to surgery without addressing the specific risks smoking has on surgery and recovery. This represents a missed opportunity to provide information to improve surgical recovery and reduce risk. Chandrashekar et al. (2013), found smoking cessation as late as 48 hours before surgery can help reduce postoperative complications caused by smoking and shouldn’t be a barrier to providing smoking cessation education for more urgent surgical procedures. This preoperative visit presents nurses with an opportunity to engage patients in an interaction to affect the health of the surgical patient through assessing, educating, discussing and tailoring a plan of care to improve postoperative outcomes.

This project was designed to be a pilot study for the healthcare system as an evidenced based quality improvement project and to project potential hospital cost savings. These savings will be used to provide justification for implementing a hospital wide smoking cessation program. The results of this project were collected and analyzed and will begin to form the foundation for recommendations towards developing a system wide preoperative smoking cessation program. The design will become part of the framework for preoperative patient education and implemented in all ten hospitals as part of a quality improvement initiative for surgery.
Aims, Objectives and PICOT question

The purpose of this evidence-based project was to design and implement a nurse led smoking cessation intervention in the preoperative clinic to reduce postoperative complications caused by tobacco use. The objectives of the project are:

1. Reduce the prevalence of smoking cessation preoperatively to reduce postoperative complications.
2. Develop smoking intervention education for patients to increase awareness of the benefits smoking cessation has on surgical recovery.
3. Reduce the costs associated with postoperative complications.

To assist the hospital in making an evidenced based decision, this author searched the literature and analyzed the evidence to answer the following PICOT question:

Among smokers having a surgical procedure, what is the effect of a nurse led smoking cessation intervention on postoperative complication rates 14 days after surgery? The hypothesis for this project was: providing a nurse led smoking cessation intervention in the preoperative clinic, will reduce the incidence of postoperative complications as compared to historical data.

Definition of terms

*Preoperative* is defined as the time frame between deciding to have surgery and the start of the surgical procedure. During this time, nursing and anesthesia assess the patient for surgical risks and stabilization of medical conditions if the procedure is not urgent or emergent (Whitlock, 2016).

*Postoperative* refers to the time from completion of the surgical procedure to discharge from the hospital with follow up care and recovery. During this phase, the goals are to reestablish physiologic balance, manage pain and prevent complications (Vera, 2014).
Preoperative clinics are specialty clinics established to evaluate patients before surgery for risk and preoperative stabilization of medical conditions by an anesthesiologist or advanced practice nurse. The goals are to reduce the morbidity, improve quality and increase operational efficiencies of the surgical experience (Gupka & Gupka, 2010).

A surgical complication is any unexpected result of an operation. For the purposes of this project, it refers to surgical site infections, prolonged ventilation, sepsis, pneumonia and any worsening of pre-existing medical conditions not related to the surgical procedure (Sokol & Wilson, 2008).

A nurse-led smoking cessation intervention for this project is providing patient education preoperatively to include the risks of smoking and the benefits of tobacco abstinence (Briggs, 2008).

Evidence Appraisal

The PICOT question provided a framework to determine the relationship between the variables for potential areas of research supporting the search strategy. CINAHL, PubMed, Summon and Cochrane Library databases were searched for randomized control trials and systematic reviews. studies. The primary MeSH terms utilized to generate the research were; smoking cessation, preoperative, postoperative complications and surgery. Pertinent studies were included if they evaluated smoking cessation interventions and measured the occurrence of postoperative complications. The criteria did not limit the type of surgical procedures. Articles within a 10-year search span (2006-present) were included.

There were a total of 8,014 studies retrieved from the databases. To filter the results, additional relevant keywords were added including randomized control trial and systematic review as these are stronger studies to support evidence-based practices (Greenhalgh, 2014). A
total of twenty-one relevant articles were retrieved for critique and appraisal. Thirteen articles were rejected for not meeting the inclusion criteria. The combined search methods produced seven relevant articles to perform a critical appraisal and analysis for evidence linking smoking cessation with postoperative complications. The systematic reviews include randomized control trials as well as retrospective, cohort and observational study methodologies. These were accepted as the pooled participant numbers were large enough to be statistically significant.

In a systematic review among patients having surgery, Mastracci et al. (2011) critiqued and analyzed eleven randomized control trials involving 1,194 smokers undergoing a surgical procedure in the hospital. The intervention groups were given a smoking cessation intervention and the control group was provided usual care. All of the participants were followed after surgery for up to thirty days in an effort to record the number of complication events that occurred postoperatively. The results demonstrated a reduction in postoperative complications among patients who received the smoking cessation intervention and quit tobacco preoperatively. The comparison between the pooled groups were statistically significant with a confidence interval (CI) of 41-78% in the individual studies and 95% when the studies were pooled.

Myers, Hajek, Hinds and McRobbie (2011) conducted a meta-analysis to poll the results of previous studies to determine the effect of smoking cessation interventions on postoperative complication. The meta-analysis included randomized control, retrospective and prospective cohort studies examining the effect of smoking cessation preoperatively on postoperative complications. A total of 889 smokers undergoing a surgical procedure were given a smoking cessation intervention preoperatively and postoperative complication data was collected. Complication rates between participants who quit and those who did not were compared and
analyzed. The results were statistically significant in favor of the smoking cessation program in reducing postoperative complications with confidence intervals ranging from .95-1.46%.

In the third meta-analysis, the researchers focused on wound healing and the impact smoking cessation has on surgical site integrity. Sorensen (2011) published an in-depth review of 140 studies with a combined participant pool of 479,150. He included both randomized control trials and cohort studies if the studies compared an interventional group receiving a smoking cessation intervention as compared to usual care in the control group. Any cohort studies were rejected if they did not meet the maximum score when using the Newcastle-Ottawa Scale (NOS) tool. Participants were followed for 30 days and any wound disruption was recorded as a complication. The results were statistically significant in favor of reduced disruption in the intervention group with an adjusted odds ratio (95% CI) 1.79-3.60.

Among smokers having a surgical procedure, Wong et al. (2012) published a meta-analysis of 25 studies to study the benefits of providing a smoking cessation program preoperatively on postoperative complications. Randomized control trials, and retrospective and prospective trials were included for a total of 21,381 participants. The researchers compared smoking cessation preoperatively and the occurrence of complications postoperatively. Additionally, the data collected included the time smoking cessation occurred before surgery to compare results between groups at different timing intervals. Postoperative risks reduced significantly if smoking cessation occurred between four to eight weeks preoperatively; however the results were statistically significant for smoking cessation preoperatively up to the day of surgery.

Mills et al. (2011) conducted a systematic review of six randomized control trials and fifteen observational studies to analyze the effect that a smoking cessation intervention has on
postoperative complications and determine the optimal cessation time. The researchers pooled the randomized control trials separately from the observational studies for comparison. In both pooled groups, the interventional group received a smoking cessation intervention and the control group received usual care. The researchers concluded smoking cessation preoperatively reduced postoperative complications in both groups. In the randomized control trials, the relative risk was reduced by 41% (RR.59) and the observational groups reduced relative risk by 15% (RR .76); suggesting any tobacco abstinence preoperatively reduces postoperative complications.

Thomsen, Tonnesen and Moller (2009), analyzed eleven randomized control trials in a meta-analysis review for a total of 1,194 smokers randomized into two groups; measuring the effect of a smoking cessation intervention on postoperative complications. The intervention group who received smoking cessation interventions, was compared to the control group receiving usual care. Both groups were followed for 30 days postoperatively. The results validated smoking cessation preoperatively reduced postoperative complications with a confidence interval of .41-.78%. Additional analysis demonstrated the closer to surgery that smoking cessation occurs, the less effect it has on reducing postoperative complications. However, the researchers concluded that any smoking cessation has a positive effect on improving postoperative outcomes.

In a single randomized control trial, Lindstrom et al. (2008), followed 238 smokers undergoing a surgical procedure postoperatively for complications. The patients were randomized into an interventional group receiving a smoking cessation intervention and a control group receiving usual care. The results showed the patients who quit smoking have fewer
postoperative complications with a CI 95% and p<0.03. Additionally, patients receiving a smoking cessation intervention improved the rate of smoking cessation preoperatively.

**Summary of findings**

The findings from the seven research articles indicate that smokers experience more postoperative complications compared to non-smokers. The researchers developed their reviews using a similar methodology by selecting studies that met the same inclusion criteria. Retrospective and prospective cohort studies were included and although these studies are not viewed as the highest evidence, they were included if sufficient rigor was evident in the study methodology. In addition, the individual studies included the incidence and effect of treatment interventions.

Variability existed in each of the studies analyzed, including the type of smoking cessation intervention used, the time period between tobacco abstinence and surgery, as well as method of nicotine replacement strategies. The researchers in all of the studies acknowledged the variability; however, offered that a large pool of studies and participants would significantly reduce bias.

Statistical analysis was presented in detail for two systematic reviews and these studies included additional comparisons based upon the type of data collection for a stronger review. If the studies had included the type of smoking intervention used for the experimental groups and compared the different interventions with the complication rates, this information would have helped guide the development of a smoking cessation intervention designed to produce the best results. Six of the studies supported the hypothesis; a smoking cessation intervention before surgery successfully reduces the incidence of surgical complications. One systematic review explored the assertion that smoking would increase morbidity and mortality and their findings
supported smoking cessation preoperatively to improve quality outcomes (Myers, Hajek, Hinds & McRobbie, 2011).

Further research is needed to compare the types of smoking cessation interventions supporting the best tobacco abstinence outcomes preoperatively. Nevertheless, the results can be replicated and provide strong evidence for translation into a nursing intervention to improve patient outcomes. (Appendix A).

**Theoretical Framework**

The theoretical framework that will be used in this project is the Theory of Planned Behavior (TPB). TPB asserts changes in behavior are guided by three factors; attitudes about the behavior, perceived social pressure, and perceived ability to control the behavior which can lead to intention to change. According to TPB, the stronger the intention to engage in a new behavior, the higher the success rate will be. The goal is to develop strategies to initiate the new behavior (Armitage & Connor, 2001).

Topa and Moriano (2010) hypothesized TPB can predict smoking cessation behavior. The researchers searched the literature for relevant studies to test TPB for predicting smoking cessation behavior. Topa and Moriano pooled 35 studies for a total of 267,977 participants for a meta-analysis study. The results showed significant correlation between intent and behavioral change in univariate analysis and the researchers recommended using the TPB framework to develop interventions promoting smoking abstinence.

The Health Belief Model (HBM) will be used to frame the nurse led smoking cessation intervention education for participants. HBM targets communication as the prime motivator for making positive health behaviors. Specifically, the model asserts if patients perceive the positive
and negative benefits of smoking cessation before surgery, the likelihood is that patients will quit smoking (Carpenter, 2010).

A qualitative study with 20 participants over 65 years of age, studied the effects of using the Health Belief Model (HBM), on smoking cessation in older adults. The researchers focused their questionnaire on understanding the health beliefs of the participants. The study results found smoking cessation occurred more often when there was a health problem that encouraged them to stop smoking, and recommended tailoring the information and advice to the situation. (Kerr, Watson, Tolson,, Lough, & Brown, M., 2006). TPB and HBM was used to design an education tool for assessing the patient’s willingness to quit and create discussion around the risks of smoking and benefits of quitting to improve surgical recovery and reduce complications. (Appendix B)

Methods

The intent of this section is to provide an overview of the project design, sample size, setting, measures, procedures, and evaluation methods. Specific concentration on human subject protection and IRB approval, the consent process and maintaining confidentiality are also presented. The research methodology for this project was a quantitative approach to test the hypothesis using descriptive and inferential statistics.

Project Design

A prospective cohort study was used to compare the effect of a nurse led smoking cessation on postoperative complications. Participants were smokers who were undergoing a surgical procedure. The postoperative complication rates of the intervention group were compared to the results from a historical control cohort at the medical center that received usual care.
Participants/Sample

The participant population includes smokers having a surgical procedure. The inclusion criteria for this project were: 1) participants who were eighteen years and older; 2) were having a surgical procedure; 3) currently smoke when assessed preoperatively; and 4) could read and write English. Exclusion criteria included non-smokers, refusal to participate in the program and participants who didn’t understand English as the program will not be written in other languages until the project was completed and critiqued. Participants were identified by convenience sampling until a sample size of 100 was reached.

Setting

The project was implemented at PeaceHealth Sacred Heart Medical Center RiverBend, Springfield, Oregon, in the preoperative clinic. RiverBend is a not for profit 380 bed tertiary referral center, and performs approximately 14,000 simple to complex surgical procedures. When patients are scheduled for a surgical procedure, they are screened over the phone for the presence of a pre-existing condition and current smoking habits. If any of the answers to the screening questions are positive, the patient is asked to make an appointment in the preoperative clinic. Patients meet with the preoperative nurse and a history is obtained, labs and other outpatient tests are ordered if indicated, and at the end of the visit, the patient is seen by an anesthesiologist for surgical clearance. During this visit, patients receive education to improve surgical readiness. The smoking cessation education was provided during the patient education section of the visit if the patient was a smoker.

Resources supporting this project were the Medical Directors for Anesthesia and Surgery, preoperative nurses and the Director of Surgical Services. Patient postoperative complication data was obtained by quality and infection control employees. Access to this data
can be obtained by query. This author met with the above stakeholders and presented the study outline to the system wide Quality, Clinical Surgery Group, Surgery Executive and General Section committee for input, support and to gain approval.

**Measures**

Data was obtained using a questionnaire for age, gender, surgical procedure and willingness to quit, using a Likert scale of one to five, during the preoperative visit and filled out by the preoperative nurse. On the day of surgery, the participants were asked whether they were able to quit, reduce their smoking or continued to smoke.

**Procedures**

The proposal was submitted for IRB approval from PeaceHealth Sacred Heart Medical Center RiverBend for exempt status and qualified as a quality improvement project without a need for consent as the smoking cessation intervention is considered standard of care. The American Society of Anesthesiologists (ASA), released a statement that scheduling of surgery represents an opportunity to begin smoking cessation education and patients should abstain from smoking before and after surgery. (ASA, 2016). IRB approval was obtained from Drexel University and qualified for a quality improvement project.

The smoking cessation education was built upon a 5A model; ask, advise, assess, assist and arrange (Agency for Healthcare Research & Quality, 2016). In a quasi-experimental study, 773 women who smoked were pooled from three primary care clinics. The intervention clinic used the 5A model to advise smoking cessation and the two control clinics provided usual care. The intervention clinic was compared separately to each of the control clinics using paired t-tests and McNemar’s test for variables. Resulting p-values were less than or equal to 0.05 and considered statistically significant. In both comparisons, the intervention model demonstrated a
smoking cessation intervention resulted in a higher quit rate with a p-value = 0.05. The researchers concluded the 5A model was a more effective smoking cessation delivery model than usual care (Puschel et al., 2008).

Participants meeting inclusion criteria were provided with a brief nurse-led smoking cessation intervention. The risks of smoking and surgery as well as the benefits of tobacco abstinence were highlighted. The participants were also asked about their willingness to quit using a Likert scale from one to five (five was most willing), and provided additional resource material for smoking cessation help. This study did not include arranging for follow up assessment. Three preoperative clinic nurses provided the smoking cessation intervention after attending a one hour orientation of techniques and scripting for a smoking cessation discussion with the patient tailored towards successful tobacco abstinence. (Appendix C) (Appendix D)

On the day of surgery, participants were assessed for current smoking history upon admission to the short stay unit. The nurses recorded whether they had quit, reduced smoking or continued to smoke. All the participants were followed 14 days after surgery to review for postoperative complication occurrences. (Appendix E)

**Evaluation (Data Management and Data Analysis)**

All data was cleaned and coded. Participants lost to follow up were not included. The postoperative complication data from the intervention cohort group was compared to postoperative complication data results obtained from a historical control cohort. Descriptive statistics; mean and gender percentage were used to describe the baseline characteristics of both cohorts. The chi-square test was applied to examine the association of the postoperative complication rates between the historical and interventional cohorts.

**Outcomes**
The primary outcomes for this project were to increase the smoking cessation rates before surgery and reduce the number of postoperative complications in smokers. Secondary outcomes included reduced financial burden incurred due to the costs postoperative complications. Lastly, the overall goal of this project was to improve the health of the community the medical center serves.

**Human Subjects Protection**

Multiple methods were used to protect the participant and their rights. Participants were assigned a unique number blinding their name and demographics to assure confidentiality. Data was collected in a spreadsheet the independent nurse collected. The blinded data was kept on a spreadsheet in a file on a computer with auto log off. The data collection sheets were kept in a locked cabinet within a locked room. The audit sheets were destroyed once the participants were followed at 14 days. Participants maintained the right to refuse smoking cessation education. If the patient refused, the data collection sheet was destroyed.

**Timeline**

The span of time allotted for this project ran over the course of approximately four months until the sample participant number was met and the participants were followed 14 days postoperatively. The final month of this project, month four, was for the dissemination of the evidence.

**Strengths and Limitations**

One of the strengths of this study is the theory and model for the project. Tailoring the education around having a surgical procedure, provides an opportunity to describe risks of smoking and benefits of quitting in the surgical recovery process for improved motivation. Additionally, the clear sequencing of events from the intervention before the preoperative clinic
visit to measurable outcomes 14 days after surgery, defines a structure for calculating incidence and prevalence, and analyzing the effects of a single exposure. Selection bias is reduced as all patients are potential participants if they smoke.

Another strength of the study was the methodology for assessing patients and providing patient education. Adding the smoking cessation intervention created minimal change to the current workflow and reduced any nursing barriers. Since the study design mirrored the processes already in the preoperative clinic, there was less risk of bias when comparing the historical and study cohort results.

The limitation is the type of study methodology. Prospective cohort studies are not the highest level of research as they aren’t randomized and this increases bias. Patients who smoke generally have more complex medical co-morbidities that can cause a higher acuity and therefore experience more complications due to their medical conditions. Furthermore, the participants underwent varying types of surgical procedures. Some surgical procedures were less complex and carried less risk for postoperative complications. The types of anesthesia, co-morbidities, and participant demographics on postoperative complication occurrences were not measured and contributed to the presence of confounding variables that could have influenced the results.

Results

The purpose of this evidenced based quality improvement project was to implement a smoking cessation program preoperatively to improve postoperative outcomes. The patient intervention education material was designed to help patients understands the risks smoking has on surgical recovery and the benefits of quitting smoking. The goal was to use the preoperative clinic visit as an opportunity to interact with patients, reinforce smoking cessation and provide the nurses with an interaction designed to engage the patient.
Characteristics of the intervention and historical cohorts

The majority of the intervention participants were female (62.4% in the intervention cohort and 50.3% in the historical cohort) and the mean age was 52.9 years as compared to the historical mean of 57.4 years. Comparison and analysis of the surgical procedures between the two cohorts was statistically insignificant as both groups underwent a variety of surgical procedures, making the sample size too small to statistically test for significance. The total number of participants for the intervention cohort was 100 compared to 543 in the historical cohort receiving usual care.

(Table 1)

Statistical testing

Statistical analysis was performed to answer the PICOT question. An analysis compared the postoperative complication results between the intervention cohort receiving the smoking cessation education and the postoperative complication rates in the historical cohort receiving usual care. The chi-square test was used to compare the total postoperative complication rates between the cohorts and within the groups as well as the differences between those who quit and those who didn’t in the intervention cohort.

The postoperative complication rate in the intervention cohort was compared between the participants who quit or reduced smoking and the participants who continued to smoke. The chi-square was 7.56 with a p-value of .01, which is statistically significant. Then the complication rate in the historical cohort was compared between smokers and non-smokers. The chi-square was 0.2 and the p value = .65 and was not statistically significant. Finally, when comparing the historical smoker complication rate to the intervention complication rate, the findings were not statistically significant with a chi-square of 3.6 and p value = 0.08.
Isolating the complication “sepsis” and comparing the cohort results was statistically significant with a chi-square result of 11.61 and p value = .0006. This is most likely due to a larger sample size and standardization of the definition of sepsis. Comparing prolonged ventilator, surgical site infections between the groups was not statistically significant due to small sample sizes. Conversely, when analyzing the occurrence rate percentages between the historical and intervention cohorts, the results demonstrated a decrease of the number of complications between the historical and intervention cohorts. Sepsis decreased from 4.6% in the historical group to 1% in the intervention group. Pneumonia decreased from 7% to 1% and prolonged ventilator times decreased from .7% to 0 occurrences. Surgical site infections increased slightly from 2.94% to 3%. (Table 2)

**Conclusion**

From the analysis of the results, a couple conclusions can be made. First, a focused smoking cessation intervention with a nurse, results in increased rates of participants quitting or reducing smoking preoperatively as compared to those without any intervention. Second, using percentages to measure occurrence rates of postoperative complications, a reduction in the complication events was noted with sepsis, prolonged ventilator times, and pneumonia when comparing the rates between the intervention and historical cohorts.

The hypothesis for this project was a nurse led smoking cessation would reduce postoperative complications as compared to a historical cohort. Comparison of the postoperative complication rates between the historical and interventional cohorts resulted in a p value > 0.5 and therefore was a null hypothesis. This was most likely due to the small sample numbers with exception of sepsis, which resulted in a statistically significant decrease with a p value = .0006. The quality improvement project did affirmatively answer the PICOT question
and was statistically significant when comparing postoperative complications between the quit/reduced and continued smoking rates within the intervention groups with a p value < .05. The number of postoperative occurrences decreased overall between the historical and intervention groups and support the goal of reducing the financial burden from postoperative complications in patients who smoke by providing a nurse led smoking cessation intervention as part of preoperative patient education. (Table 2)

During the preoperative visit, the nurses obtained the participants willingness to quit using a Likert scale of one to five, five meaning most motivated. This data shows a higher quit rate for those participants who had a high motivation to quit. Conversely, the highest number of participants who continued to smoke were the least motivated to quit. Since the participants self-reported, there is an increased risk of bias in the data however the results support providing an opportunity in surgical services to engage patients in a meaningful discussion around smoking cessation to improve surgical outcomes. (Table 3)

Financial analysis of this project is not exact due to the differences between the two groups and the smaller sample sizes. Nevertheless, if we look at the reduction in sepsis which is statistically significant, the results show 1 occurrence in 100 participants against 25 occurrences in 543 patients, we would see an approximate decrease of 19 sepsis events over a year in smokers who continue to smoke. The American College of Surgeons (2016), calculated the cost of sepsis to organizations is $39,000 per sepsis event for an estimated total reduction in costs for sepsis of $741,000 and untold hardship to patients in the community. Although the return on investment calculator doesn’t define the variance in costs per region in the United States, the results are compelling for this one postoperative complication.
The next steps of this project will be to share the results of this quality improvement initiative with the Surgery Executive Committee and make recommendations to: offer patients smoking cessation pharmacological interventions and choices in the preoperative clinic; provide for a nurse resource to follow patients in the postoperative inpatient units to reinforce the smoking cessation education; and share the results with the other nine medical centers in the system to create a system wide smoking cessation program for surgical patients.
References


Appendix A

Table 1: Table of Evidence

<table>
<thead>
<tr>
<th>Authors:</th>
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<th>Hypotheses:</th>
<th>Setting:</th>
<th>Design:</th>
<th>Research Variables:</th>
<th>Intervention:</th>
<th>Findings:</th>
<th>Conclusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastracci, T., Carli, F., Finley, R., Muccio, S., &amp; Warner, D. (2011)</td>
<td>To determine the effects of a smoking cessation intervention preoperatively on postoperative complications.</td>
<td>Preoperative smoking cessation interventions reduces the risk of postoperative complications.</td>
<td>Systematic review of 11 studies performed in preop clinic of hospitals, n=1,194.</td>
<td>Systematic review of 11 randomized control trials</td>
<td>Independent Variables:</td>
<td>Nurse delivered smoking cessation intervention preoperatively as compared to the control group who received usual care.</td>
<td>Reduction in postoperative occurrences.</td>
<td>Participants in the intervention group did better than the control group for reducing postoperative complications. Further research is needed to assess the efficacy and timing of the smoking intervention program for optimal results.</td>
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<td>Smoking cessation intervention</td>
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<td>Confidence intervals ranged from 41.78% individually. Pooled confidence interval 95%. p=0.001. Pooled risk ratio was 0.56%. Pooled results increased both power and statistical significance.</td>
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<td>Dependent Variables:</td>
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<td>Postoperative complication</td>
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<td>Measurement Tools:</td>
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<td></td>
<td>Postoperative phone call to assess for complications and type.</td>
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<tr>
<td>Purpose:</td>
<td>To determine the effects smoking cessation has on postoperative complications.</td>
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<tr>
<td>Hypotheses:</td>
<td>Smoking cessation up to 8 weeks before surgery may have detrimental effects and increase morbidity and mortality.</td>
<td></td>
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<tr>
<td>Setting:</td>
<td>Systemic review of studies in the hospital.</td>
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<tr>
<td>Design:</td>
<td>Systematic review of 2 randomized control trials, 5 retrospective and 2 prospective.</td>
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<td>Inclusion:</td>
<td>Smokers 18 years and older having a surgical procedure who quit tobacco up to 8 weeks preoperative.</td>
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<tr>
<td>Exclusion:</td>
<td>Participants under 18 years of age.</td>
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<tr>
<td>Variables:</td>
<td>Independent Variable: Smoking cessation before surgery. Dependent Variable: Postoperative complication</td>
<td></td>
<td></td>
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<td>Measurement Tools:</td>
<td>Postoperative phone call to assess for complications and type 30 days postop.</td>
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<td>Intervention:</td>
<td>Participants quite smoking preoperatively as compared to the control group (smokers who didn’t quit tobacco preop)</td>
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<tr>
<td>Findings:</td>
<td>Smoking cessation up to 8 weeks before surgery did not increase morbidity and mortality. Confidence intervals 95%. Relative risk 1.18%. p=&lt;0.001.</td>
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<td>Conclusion:</td>
<td>Null hypothesis. Smoking cessation reduced the occurrence of postoperative complications and should be a part of the preoperative assessment and patient education process.</td>
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<th>Design:</th>
<th>Research Variables:</th>
<th>Intervention:</th>
<th>Findings:</th>
<th>Conclusion:</th>
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<tr>
<td>Mills, E.,</td>
<td>To determine the effects of smoking cessation preoperatively on postoperative complications.</td>
<td>Preoperative smoking cessation reduces the risk of postoperative complications</td>
<td>Systematic review of 21 trials in a hospital. n=30,677.</td>
<td>Systematic review of 21 randomized control and observational studies.</td>
<td>Independent Variables: Smoking cessation before surgery. Dependent Variables: Postoperative complications Measurement Tools: Collection of postoperative complications and type.</td>
<td>Smoking cessation preoperatively reduced postoperative complications. Pooled randomized trials = confidence interval 95%. p=&lt;0.01. Pooled observational trials = confidence intervals 95%. p=&lt;0.0001.</td>
<td>Long periods of smoking cessation improves the reduction of postoperative complications.</td>
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<td>Eyawo, O.,</td>
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<td>Lockhar, I.,</td>
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<td>DLitt, P.,</td>
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<td>Kelly, S.,</td>
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<td>Wu, P., &amp; Ebbert, J.</td>
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<td>(2011).</td>
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<tr>
<td>Thomsen, T.,</td>
<td>To determine the effects of smoking cessation preoperatively on postoperative complications.</td>
<td>A preoperative smoking cessation intervention reduces the risk of postoperative complications</td>
<td>Systematic review of 11 trials in a hospital. n=1194.</td>
<td>Systematic review of 11 randomized control trials.</td>
<td>Independent Variables: Smoking cessation intervention before surgery. Dependent Variables: Postoperative complications Measurement Tools: Collection of postoperative complications</td>
<td>A smoking cessation intervention preoperatively reduced postoperative complications Confidence interval 95%. p=&lt;0.001.</td>
<td>Surgical patients benefit from preoperative smoking cessation interventions before surgery. Researchers recommend using a nicotine replacement strategy for optimal success and start at least 4 weeks out for</td>
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<tr>
<td>Tonnesen, H.</td>
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<td>Moller, A.</td>
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<td>(2009).</td>
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Before surgery > 6 months.
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<tbody>
<tr>
<td>Hypotheses:</td>
<td>A preoperative smoking cessation intervention 4 weeks before surgery, reduces the risk of postoperative complications</td>
<td>Setting:</td>
<td>Randomized control trial in a 4 hospital cohort for patients having general and orthopedic surgery. n=238.</td>
</tr>
<tr>
<td>Inclusion:</td>
<td>Smokers 18-79 years having general and/or orthopedic surgical procedure.</td>
<td>Dependent Variables:</td>
<td>Postoperative complications</td>
</tr>
<tr>
<td>Exclusion:</td>
<td>Participants under 18 years of age.</td>
<td>Measurement Tools:</td>
<td>Collection of postoperative complications and type.</td>
</tr>
<tr>
<td>Intervention:</td>
<td>Participants receiving a smoking cessation intervention 4 weeks preoperatively as compared to the control group, who received usual care.</td>
<td>Findings:</td>
<td>A smoking cessation intervention preoperatively reduced postoperative complications by 41% as compared to the control group. Confidence interval 95%. p=&lt;0.03.</td>
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<td>Conclusion:</td>
<td>Surgical patients benefit from preoperative smoking cessation interventions before surgery. Researchers recommend using a nicotine replacement strategy for optimal success and start at least 4 weeks out for maximum benefits.</td>
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</tbody>
</table>
Appendix B

Theoretical Framework

*Ajzen’s Theory of Planned Behavior and the Health Behavior Model*

- **Attitude towards smoking** – TPB
  - Perceived preferences
    - HBM

- **Subjective Norm**
  - (spouse/friends smoke) – TBP
  - Age, sex, socioeconomic

- **Intention to quit** – TPB
  - Perceived threat of risks of continued smoking/understanding of benefits of smoking cessation – HBM

- **Perceived Control over behavior**
  - (How many times tried to quit) – TPB
  - Perceived serious of the smoking risks – HBM

- **Smoking cessation before surgery**
Appendix C

Participant flow chart

ASK:
Preoperative nurses collect data
  Age
  Gender
Surgical procedure

ADVISE:
Preoperative nurses provide smoking

ASSESS:
Willingness to quit

ASSIST:
Provide resources for smoking cessation

DAY OF SURGERY:
Ask participant if he/she quit smoking

14 DAYS POST SURGERY:
Collect postoperative complication data
Appendix D

**SURGERY SMART QUIT TO PREP**

Welcome, and we’re excited to join you on your journey!

As you plan for your surgery and consider your health, you should do all you can to be healthy. This can help ensure the best outcome after your surgery. Surgery Smart: Quit to Prep is a national initiative and can help you prepare for your surgery. When you prepare, you increase the chances for the best results.

**Surgery Smart: Quit to Prep** has tools and resources for patients facing surgery. The materials included here focus on helping you quit smoking. Quitting tobacco can be tough. Staying quit is tougher. But we have resources to help you quit before your surgery, and stay quit after.

**Smoking makes it harder to heal after surgery. It may:**
- Lengthen your healing time and hospital stay
- Raise the likelihood that your wound will get infected
- Harm your lung function
- Increase your chance of having a heart attack or stroke
- Slow the healing of your bones and cartilage

**Specific risks of smoking before and after surgery include:**

**Heart and circulation risks**
- Smoking increases your risk of heart attack or stroke during and after surgery.

**Lung risks**
- Smoking harms the lungs.
- Possible effects from smoking include pneumonia and more time on a ventilator.

**Wound healing**
- Smoking can make wounds heal more slowly. It also raises your chance of infection.

**Smoking Leads to Longer Hospital Stays**
- You want to get on your feet and home as soon as possible after surgery. Cutting out cigarettes is important. Active cigarette smoking is strongly linked with longer recovery times and hospital stays.

**Bone and cartilage healing**
- Smoking has been shown to delay healing time.

References:
1. Thadani U, Cosgrove M. Effects of preoperative smoking cessation on the incidence and risk of intraoperative and postoperative complications in adult smokers: a systematic review. Tob Control. 2007;16(2):151-5.

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A Nurse-Led Smoking Cessation Intervention

You can start to quit smoking today.
Willing to quit? Help is available.

There are many tools and resources available to help you quit smoking.

<table>
<thead>
<tr>
<th>Program</th>
<th>Type</th>
<th>Description</th>
<th>How to Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>PeaceHealth Smoking Cessation Program</td>
<td>Group and Individual Counseling</td>
<td>Physician-supervised Smoking cessation Counseling and medication management program</td>
<td><a href="https://www.peacehealth.org/">https://www.peacehealth.org/</a></td>
</tr>
<tr>
<td>Quit Line*</td>
<td>Phone</td>
<td>This quit line offers one-on-one counseling for smokers who are willing to quit</td>
<td>1-800-QUITNOW (1-800-784-8669)</td>
</tr>
<tr>
<td>Quitter's Circle**</td>
<td>Website</td>
<td>This website provides resources to help support a quit attempt</td>
<td><a href="http://www.quitterscircle.com">www.quitterscircle.com</a></td>
</tr>
<tr>
<td>Plan Q®*</td>
<td>Mobile Application</td>
<td>This application supports your quit smoking journey</td>
<td>Download Plan Q from App Store User Code: PCH</td>
</tr>
</tbody>
</table>

PLEASE NOTE: When searching in "Google Play," enter "Plan Q" (with quotation marks and a space) or PlanQ (with no quotation marks and no space) to find the app.

*A Pfizer-sponsored program.
*An American Lung Association-sponsored program.
*A Pfizer does not own or operate the quitline(s) and is not responsible for the information provided.
*Quitter's Circle and Quitter's Circle logo are trademarks of Pfizer Inc. The American Lung Association does not endorse products, devices, or services.

**Pharmacologic Aids**

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<tr>
<th>Type</th>
<th>Regimen</th>
<th>How to Access</th>
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</thead>
<tbody>
<tr>
<td>Non-nicotine pills</td>
<td>As directed by your healthcare provider</td>
<td>By prescription</td>
</tr>
<tr>
<td>Nicotine replacement therapy (NRT)—Nicotine gum, lozenge, patch, or inhalant</td>
<td>Talk with your doctor and/or healthcare team about how best to use</td>
<td>Available over the counter and by prescription</td>
</tr>
</tbody>
</table>

**Medications have risks and benefits and patients should speak to their healthcare provider about which medication is best for them. The health information contained herein is provided for educational purposes only and is not intended to replace discussions with a healthcare provider. All decisions regarding patient care must be made with a healthcare provider, considering the unique characteristics of the patient.
Quit smoking can be tough...

Don't go on this journey alone.

Plan Q is a mobile application that provides support to patients who want to quit smoking. With Plan Q, you can have quitting support in the palm of your hand.

Key features in this app include:

- Customizable tools, such as the smoking log and cost calculator, to help track your progress
- Games and inspirational messages to help you when you have the urge to smoke
- A built-in support community to make it easy to connect to other users and share your experience

Download the Plan Q app today to take advantage of all these features, and more.

To download the Plan Q app to your device, search for and download "Plan Q" from the Apple App Store or Google Play Store, and when prompted, enter the following code:

PCH

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Appendix E: Questionnaire

Smoking Cessation Health Data Collection Form

Anesthesia Clinic

Date of Surgery & Time ________________
Age ____
Gender (Please Circle) Male Female Transgender
Surgical Procedure ________________
How many cigarettes do you smoke per day? ____
Willingness to quit score 1-5 (5 = motivated) 1 2 3 4 5

Short Stay Unit (SSU)

Were you able to quit smoking before surgery? (Please circle) Yes No
If yes, how long have you been quit? Number of Days ____
If you are still smoking, were you able to reduce? (Please circle) Yes No

Postoperative Complications

14 days after, did you quit? (Please Circle) Yes No

Notes:
### Interventional and Historical Characteristics

<table>
<thead>
<tr>
<th>Trait</th>
<th>Intervention Group (n=100)</th>
<th>Historical group (n=543)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>63% (n=63) Female</td>
<td>50.3% (n=273) Female</td>
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<tr>
<td></td>
<td>37% (n=37) Male</td>
<td>49.7% (n=270) Male</td>
</tr>
<tr>
<td>Age</td>
<td>Mean = 52.9 years</td>
<td>Mean = 57.4 years</td>
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<tr>
<td>Current smokers</td>
<td>100% (n=100)</td>
<td>100% (n=543)</td>
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Table 2

**Chi-square Table for Comparing Complications Occurrences**

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<th>Historical group with complications</th>
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<td>No</td>
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<tr>
<td>Yes</td>
<td>72</td>
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<td>Chisquare p-value</td>
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**Chi-square Statistical Table for Intervenional Group**

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<th>Complications</th>
<th>Quit or Reduced Smoking</th>
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<tbody>
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<tr>
<td>No</td>
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<tr>
<td>Yes</td>
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<td>Chisquare p-value</td>
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**Chi-square Statistical Table Comparing Sepsis Occurrences**

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<td>No</td>
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<tr>
<td>Yes</td>
<td>25</td>
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<td>Chisquare p-value</td>
<td>11.61</td>
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</table>
Table 3

Willingness to Quit Scale (WTQ)  5 = most motivated

![Quit Rate based upon WTQ scale](image)

![Continued Smoking using WTQ scale](image)

![Reduced Smoking using WTQ scale](image)
I certify that this assignment is presented as entirely my own intellectual work. Any words and/or ideas from other sources (e.g. printed publications, Internet sites, electronic media, other individuals, groups, or organizations) have been properly indicated using the appropriate scholarly citation style required by the department or College. I have not submitted this assignment in its entirety to satisfy the requirements of any other course. Any parts of this assignment from other courses have been discussed thoroughly with the faculty member before this submission so that there is an understanding that I have used some of this work in a prior assignment.

Cindy Lilley  March, 2017